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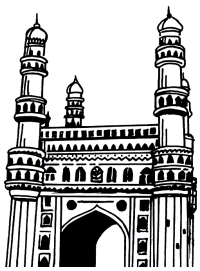

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UNIT I

Nature and Scope of Managerial Economics

Meaning of Managerial Economics - Managerial Economics and Economic Theory - Managerial Economics and Decision Sciences - Nature of managerial decision making - Types of business decisions - Managerial decision making process - Firm-meaning-Objectives - Nature of profits (economic vs. accounting profit) Optimization-functions-slope of functions-optimization techniques-Concept of derivative - Simple rules of derivation - Application of derivatives to optimization problems – Role of marginal analysis in decision making - Total, average and marginal relationship

1.1 MANAGERIAL ECONOMICS

1.1.1 Meaning

Q1. Define Managerial Economics.

Ans : **(Jan.-18)**

Managerial economics is a discipline which deals with the application of economic theory to business management. It deals with the use of economic concepts and principles of business decision making.

Formerly it was known as "Business Economics" but the term has now been discarded in favour of Managerial Economics. Managerial Economics is often called as Business Economics or Economic for Firms.

Meaning

Managerial economics is a branch of economics that applies microeconomic analysis to decision methods of businesses (or) other management units.

Definitions

Managerial economics has been defined by different scholars as follows.

(i) According to Spencer and Siegelman, "Managerial economics is the integration of economic theory with business practice for the purpose of facilitating decision-making and forward planning by management".

(ii) According to Mc Nair and Meriam, "Managerial economics is the use of economic models of thought to analyze business situations".

(iii) According to Brigham and Pappas, "Managerial economics is the application of economic theory and methodology to business administration practice".

Managerial economics by nature is a specialized discipline of management studies that deals with the application of economic theory, tools and methodologies to business management practice.

Management economics has evolved as an integration of economic theory and decision sciences with business management.

1.1.2 Nature of Managerial Economics

Q2. Explain the nature of Managerial economics.

Ans : **(Dec.-20)**

(a) Close to microeconomics

Managerial economics is concerned with finding the solutions for different managerial problems of a particular firm. Thus, it is more close to microeconomics.

(b) Operates against the backdrop of marco economics

The macroeconomic conditions of the economy are also seen as limiting factors for the firm to operate. In other words, the managerial economist has to be aware of the limits set by the macroeconomic conditions such as government industrial policy, inflation, and so on.

(c) Normative statements

A normative statement usually includes or implies the words 'ought' or 'should'. They reflect people's moral attitudes and are expressions of what a team of people ought to do. For instance, it deals with statements such as 'Government of India should open up the economy'.

(d) Prescriptive actions

Prescriptive action is goal oriented. Given a problem and the objectives of the firm, it suggests the course of action from the available alternative for optimal solution. It does not merely mention the concept, it also explains whether the concert can be applied in a given context or not. For instance, the fact that variable costs are marginal costs can be used to judge the feasibility of an export order.

(e) Applied in nature

'Models' are built to reflect the real life complex business situations and these models are of immense help to managers for decision making. The different areas where models are extensively used include inventory control, optimization, project management etc. In managerial economics, we also employ cases study method to conceptualize the problem, identify the alternatives and determine the best course of action.

(f) Offers scope to evaluate each alternative

Managerial economics provides an opportunity to evaluate each alternative in terms of its costs and revenues. The managerial can decide which is the better alternative to maximize the profits for the firm.

(g) Interdisciplinary

The contents, tools and techniques of managerial economics are draws from different subjects such as economics, management, mathematics, statistics, accountancy, psychology organisational behaviour, sociology, etc.

(h) Assumptions and limitations

Every concept and theory of managerial economics is based on certain assumptions and as such their validity is not universal. Where there is change in assumptions, the theory may not hold good at all.

1.1.3 Scope of Managerial Economics

Q3. Discuss the scope of Managerial Economics.

Ans : **(Dec.-20, Dec.-15)**

The scope of managerial economics include all the economic concepts, theories, ideas, principles, tools and techniques that can be used to analyze the business environment and find solutions to practical business problems. The following business areas can be considered as the scope of managerial economics.

1. Objectives of a Business Firm or Organization

Managerial economics provides a sound framework by facilitating a business firm to frame its objectives both in the short-run and long-run.

2. Resource Allocation

Managerial economics provide the methods of effective resource allocation. It mainly aims at achieving high output through low and proper allocation of resources.

3. Demand Analysis and Demand Forecasting

It suggests the methodologies for analyzing the demand of a product. The demand forecasting techniques it provides are proven to be quite efficient for meeting the competition.

4. Competitive Analysis

The techniques provided by managerial economics facilities a firm to withstand in a competitive situation.

5. Strategic Planning

Managerial economics guides a business manager in making strategic decisions.

6. Production Management

Managerial economics plays a vital role in production management. It's effective tools helps to plan the business schedule, regulate the production process and effectively place the output in the market.

7. Cost Analysis

Managerial economics provide various cost concepts and cost curves that facilitate in determining cost-output relationship both in short-run and long-run.

8. Pricing Strategies

Managerial economics provide various cost concepts and cost curves that facilitate in determining cost-output relationship both in short-run and long-run.

9. Market Structure Analysis

The techniques and concepts of managerial economics analyze the market structure and guide in taking necessary decisions that are required for a firm to exist in the market.

10. Investment and Capital Budgeting Decisions

The concept of opportunity cost provided by managerial economics facilitates in making appropriate investment decisions and choose the best alternative that fits the organisational requirements.

11. Marketing Strategies

Managerial economics provide marketing strategies like

- Product policy
- Sales promotion
- Segmentation, Targeting and positioning of markets.

12. Economics of Scale

Managerial economics in the long-run helps a firm to enjoy economics and diseconomics of scale.

13. Profit Management

Managerial economics mainly concentrates on the primary goal of a firm i.e., profit maximization. It deals with the activities like profit estimation and profit planning.

14. Input and Output Analysis

The concept of production function managerial economics depicts the input and output relationship.

15. Inventory Control

Effective inventory control techniques of managerial economics readily meet the organisational requirements.

Q4. What is the significance of managerial economics ?

Ans : **(Dec.-15)**

Managerial Economics is a useful subject. In fact is the most significant of all social sciences. Its study is highly useful for analyzing and understanding the various economic problems. Its study brings utility to all sections of the people.

Managerial Economics became the intellectual region of the day. Managerial Economics is described as both light giving and fruit bearing science. It enriches our knowledge and brings utility (or) significance. Managerial Economics is explained from the following points :

A) Theoretical Significance

1. **Understanding the Economic Behavior :** The study of Managerial Economics help us to understand the economic behavior of human beings.
2. **Working of the Economic System :** Managerial Economics explains the conditions which influence the progress of the economy. It makes suggestions for overcoming the complicated problems faced by the people and the government in various economic systems. Hence it has great significance for understanding the working of the economic system.

3. **Intellectual value :** The study of Managerial Economics sharpens the intellectual calibers of individuals. It imparts certain qualities like rational behavior, proper allocation of resources etc.,

4. **Economics Tools :** Mrs. John Robinson described economics as a box of economic tools. It provides a good knowledge regarding the nature, causes, effects of various economic phenomena.

5. **Economic Growth :** managerial Economics suggests various ways and means for maintaining the growth rates in the developed economies. I also analyses the factors obstructing the economic growth of these countries.

6. **Economic Development :** Developing countries aim at achieving economic development with in a short span of time. Managerial Economics enables us to understand the nature and conditions necessary for the successful organizations of business firm.

7. **Performance of the Economy :** Managerial Economics helps us to asses the performance of the economy. We can judge the position, progress and future of an economy through several theories and models of Managerial Economies.

8. **Economic Planning :** Economics planning is an important branch of economics. Economics provides a good knowledge and information regarding the techniques of economic planning. It sharpens our mental abilities by clearly explaining the types, aims and objectives of economic plans.

9. **Prediction :** Managerial Economics serve as the best means for predicting the economic events. It helps us to predict the consequence of various economic phenomena.

10. **Ethical Value :** Managerial Economics indicates certain ethical norms like honesty, responsibility and adjustability etc., It upholds the moral and cultural values of individual. It makes them honest and dignified citizens.

B) Practical Significance

1. **Useful of the Finance Minister :** The study of Managerial Economics is highly useful to the finance minister and the personal working in the finance department. It provides a good knowledge about public revenue, public debt and public expenditure. It helps them in forming a sound financial policy and result oriented budget.

2. **Useful to the Minister for Planning :** The study of Managerial Economics is also useful to the minister for planning It furnishes a good knowledge about the various types of plans. Mobilization, plan implementation, capital output ratio, investment strategy etc.,

3. **Useful to the Bankers :** Managerial Economics is also useful to the bankers. It enables them to understand the nature, purpose and implications of different economic policies implemented by the business firms.

4. **Trade Union Leaders :** Knowledge of Managerial Economics is also significant for the trade union leaders. The study of Managerial Economics helps the trace union leaders to understand the nature and causes of industrial disputes, wages problems etc.,

5. **Businessmen :** Economics is also useful to the businessmen. Businessmen with the help of Managerial Economics can study the fluctuations in business, prices, production and employment. They can adopt a proper strategy for producing goods and services according to the charges in demand.

6. **Statesmen :** Statesman will also get benefit by studying managerial economics. It enables them to understand the nature an causes of economic problems. It helps them to

solve the economic problems like unemployment, inflation, scarcity of goods etc.,

7. **International Economic Problems :** International economics as an important branch of economics. It deals with the matters like terms of trade, balance of payments, export and import regulations etc., Its knowledge enables the international agencies to determine the foreign exchange value of various national currencies. Thus, managerial economics has both theoretical and practical significance. Its study is useful to all sections of the people.

1.1.4 Managerial Economics and Economic Theory

Q5. Explain briefly about economic theory.

Ans :

- The application of theories to the process of business decision-making helps in arriving at an appropriate business decisions.
- The gap between the theoretical and the real world which is bridged by managerial economics is discussed below.

Difference between Theory and Practice

In a real life, there exists a gap between theory and practice, especially in the case of economic thinking and behaviour. A theory which gives sound reasoning may not be directly applicable in practice. For instance, when economies of scales are there, it appears theoretically sound that if inputs are doubled, output will be more or less double and if inputs are tripled, output will be more or less triple. However, this theoretical concept may not be achieved practically.

The real economic world is extremely complex in nature because in an economy everything is interdependent. Economic decisions and activities of economic entities- individuals, households, firms are related and dependent on each other - this means that change in one economic variable leads to changes in all other variables (interdependence). Under such conditions of changing environment and changing economic conditions it becomes very difficult to predict human behaviour.

On the other hand, economic theories are very simple because they are based on economic models having simple assumptions. According to these models, economic variables are interdependent. The most common assumption of the economic models is the 'ceteris paribus' assumption i.e., other things remain constant. This assumption is unrealistic as change is the only constant in life.

Even though economic theories are hypothetical in nature, they are not far from reality.

There is clearly a gap between economic theory and practice.

- Economic theories provide a frame work for logical economic thinking and analysis. This is essential because the real economic world is too complicated to permit considerations as economic decisions are influenced by economic facts.
- Economic theorists attempt to solve problems of logic that do not always apply to the practical problem faced by the management in framing policy.
- Economic logic and analytical tools are applied by managerial economists to guide them in,
  - i) Identifying their problems in achieving their goals.
  - ii) Processing and interpreting the results.
  - iii) Identifying and estimating the alternative means to achieve the goal.
  - iv) Gathering relevant data and related facts.
  - v) Drawing relevant conclusions and
  - vi) Making a decision.

Without applying the economic logic and analytical tools, business decisions are ineffective and arbitrary.

1.1.5 Managerial Economics and Decision Sciences

Q6. How managerial economics is Related with other areas.

Ans :

Managerial economics is closely linked with many other disciplines such as economics,

accountancy, mathematics, statistics, operations research, psychology and organizational behavior. Let us see these linkages in detail :

1. Economics and Managerial Economic

Economics contributes a great deal towards the performance of managerial duties and responsibilities. Just as the biology contributes to the medical profession and physics to engineering, economics contributes to the managerial profession. All other qualifications being same, managers with working knowledge of economics can perform their function more efficiently than those without it.

2. Mathematics and Managerial Economics

Mathematics in Managerial Economics has an important role to play. Businessmen deal primarily with concepts that are essentially quantitative in nature e.g. demand, price, cost, wages etc. The use of mathematical logic I the analysis of economic variable provides not only clarity of concepts but also a logical and systematical framework.

3. Statistics and Managerial Economics

Statistical tools are great aid in business decision making. Statistical techniques are used in collecting processing and analyzing business data, testing and validity of economics laws with the real economic phenomenon before they are applied to business analysis. Statistics is important to managerial economics in several ways. Managerial Economics calls for marshalling of quantitative data and reaching useful measures of appropriate relationship involves in decision making.

4. Operation Research and Managerial Economics

Operations Research is an interdisciplinary solution finding techniques. It combines economics, mathematics, and statistics to build models for solving specific business problems. Linear programming and goal programming are two widely used OR in business decision making.

It has influenced Managerial Economics through its new concepts and model for dealing with risks. Though economic theory has always recognized these factors to decision making in the real world, the framework for taking them into account in the context of actual problem has been operationalized.

5. Management Theory and Managerial Economics

As the definition of management says that it's an art of getting things done through others. But now a days we can define management as doing right things, at the right time, with the help of right people so that organizational goals can be achieved. Management theory helps a lot in making decisions.

6. Accounting and Managerial Economics

There exists a very close link between Managerial Economics and the concepts and practices of accounting. Accounting data and statement constitute the language of business. Cost and revenue information and their classification are influenced considerably by the accounting profession. The focus of accounting with in the enterprise is fast changing from the concept of bookkeeping to that of managerial decision making.

7. Computers and Managerial Economics

Everyone is totally dependent on computers. These computes have affected each one of us in every field. Managers also have to depend on computers for decision making. Computer helps a lot in decision making. Through computers data are presented in such a nice manner that its really very easy to take decisions.

Relationships of Managerial Economics with other Functional Areas in Economics

The relationships of managerial economics with other area of business administration are as follows :

1. Managerial Economics and Statistics

Statistical tools are a great aid in business decision-making. Statistical techniques are used in collecting, processing and analysing

data, testing the validity of the economic laws with the real economic phenomenon before they are applied to business analysis. A good deal of business decisions is based on probable economic events. The statistical tools, e.g., theory of probability, forecasting techniques, help the decision-makers in predicting the future course of economic events.

2. Managerial Economics and Mathematics

The major problem of a businessman is how to minimise cost or how to maximise profit or how to optimise sales. Mathematical concepts and techniques are widely used in economic logic with a view to finding out answers to these questions. Knowledge of geometry, trigonometry and algebra is not only essential but certain mathematical tools and concepts such as logarithms and exponentials, vectors, matrix, calculus, differential as well as integral, are required for managerial economics.

3. Managerial Economics and Accounting

Accounting information is one of the principal sources of data required by a managerial economics for his decision-making purpose. For example, the profit and loss statement of a firm tells how well the firm has done and managerial economist to throw significant light on the future course of action-whether it should improve or close down.

4. Managerial Economics and Theory of Decision-Making

Decision theory has been developed to deal with problems of choice or decision- making under uncertainty, where the applicability of figures required for the utility calculus are not available. Economic theory is based on assumptions of a single goal whereas decision theory breaks new grounds by recognizing multiplicity of goals and persuasiveness of uncertainty in the real world of management.

5. Managerial Economics and Economics

Managerial economics has been described as economics applied to decision-making. Managerial economics has been studied as a special branch of economics, bridging the gap between pure economic theory and managerial practice. Economics has two main branches - micro-economics and macro-economics.

Economics is the study of how human beings make choices to allocate scarce resources to satisfy their unlimited wants in such a manner that consumers can maximise their satisfaction, producers can maximise their profits, and the society can maximise its social welfare. Basic function is to study how people - individuals, households, firms, and nations - maximise their gains from their limited resources and opportunities.

6. Managerial Economics and Production Management

Economic techniques are used to analyze production efficiency, optimum factor allocation, costs, and economies of scale and to estimate the firm's cost function. A firm needs to answer four basic questions - what to produce, how to produce and how much to produce and for whom to produce i.e. product management. A firm will produce according to its perception of the customer demand; Firms have the option of producing goods by labour intensive technique and capital intensive technique. Labour intensive technique is the one in which manual labour is used to produce goods. A firm has to decide its target population (i.e. to whom they will serve products and/or services).

7. Managerial Economics and Finance

Managerial economics relates to finance for resource allocation decisions on stockholder/ stock issuance decisions, capital budgeting issues, employee salary decisions or any matter related to finance. In these scenarios, managerial economics analysts access applicable financial data, apply the necessary statistical and mathematical models to that data and create optimal decision criteria for decision-makers.

The most common finance application of managerial economics is capital budgeting

where corporate executives need to make informed decisions on how to allocate financial resources to the various departments. In a global economy, these decisions need to be made swiftly and effectively. A simple example would be a decision between building a new factory, expanding and upgrading the existing factory or outsourcing manufacturing to another country. Several variables from past performance can be plugged into managerial economics models to help guide this kind of decision.

8. Managerial Economics and Marketing

Managers use this to get better of all external risks to maximise profits for the firm. A long list of alternate paths of marketing and sales and the best trade-off is chosen. Marketing strategies are devised to penetrate the market as deeply as possible. This tool also enables organizations to price their product in a manner that is most profitable to them and most acceptable to customers. Risk analysis is used to study the risks associated with marketing and finally supply. Firms use pricing analysis to determine the most optimum price for their produce, capital budgeting highlights the best investments to make.

9. Managerial Economics and Personnel

The application of economic and econometric methods to traditional questions in human resources management. It is an area of applied micro labour economics, but there are a few key distinctions. One distinction, not always clear-cut, is that studies in personnel economics deal with the personnel management within firms, and thus internal labour markets, while those in labour economics deal with labour markets as such, whether external or internal. In addition, personnel economics deals with issues related to both managerial-supervisory and non-supervisory workers.

10. Managerial Economics and Operations Research

Managerial economics depends heavily on the models and tools of operations research or quantitative techniques. Operations research is a subject that consists of a number of models and analytical tools which are developed on the basis of inter-disciplinary research for solving complex problems of planning and allocation of scarce resources, primarily in defence industries. Managerial economics has generalised and developed the models and tools of operations research for the purpose of business decision-making. Linear programming models, inventory models, game theory, etc. are a few tools that have originated in the works of operation researchers.

1.2 Nature of Managerial Decision Making

Q7. Explain the nature of business decision making problem. How is an optimal business decision made.

(OR)

What is the role of managerial economics in decision making ?

(OR)

Discuss the scope and significance of managerial economics in decision making.

(OR)

Explain the role of managerial economics in decision making.

Ans : **(Dec.-20, Jan.-20, Dec.-16, Jan.-16)**

To solve the business decisions problems is the task of a business economist. Resources at the disposal of an organisation are scarce. Therefore optimum solution to the business decision- making problem requires that resources should be so used as to achieve the objective efficiently. The limited amount of resources is one type of constraint faced by the manager of a firm. The other type of constraint faced by the manager of a firm is imposed by the economic environment which includes the state of the economy, the phase of business cycles, the competition from the rival firms, Government's fiscal and monetary policies, export and import

policies etc. Given these constraints the manager has to make business decisions. Therefore, the decision-making problem faced by a manager is one of Constrained decision-making.

The Nature of Decision-Making Problem

Decision-making problem requires a choice among alternative courses of action so as to achieve the objective. These alternative courses of action among which choice has to made are often called business strategies. The nature of decision-making problem faced by business firm is therefore of the following type.

To identify the alternative courses of action of achieving given objective(s), and then to select the course of action that achieves the objective in the economically most efficient way.

- Modem economics is divided into two broad branches: micro economics.
- macro economics. Micro economics is concerned with theory of individual choice.
- Choice by a consumer and choice by a business firm.
- On the other hand, macro economics focuses on analysing the economy as a whole and its aggregates such as GNP, the general price level the level of employment, etc.
- Managers or rational businessmen get assistance from both the micro economics and macro economics while making business decisions, but concepts and techniques of micro economic theory is of greater help for them. This is because micro economics tells us how to make a rational choice in allocating scarce resources of the firm while making decisions regarding price, output, technology, advertising expenditure, and capital investment expenditure which are the direct concern of business management.
- Through their individual actions and choice managers can do little to affect the aggregate economy, with which macro economics is concerned. But macro economics tells him how his business environment will change as a result of movements in the aggregate economy such as situations of recession or inflation, changes in economy's balance of payments and the Government policy to tackle them which affect the outcome of business decisions. Thus, the managers during their decision-making process must take into the account the current macro economic outlook and likely changes in it in the future.

1.2.1 Types of Business Decisions

Q8. Explain various types of business decisions that managers of firms have to make?

Ans :

(i) Price-Output Decision

Pricing of a product by a business firm is an important decision that has to be made by a manager. Price of a product will determine to a good extent how much quantity of its product it will be able to sell. Price along with cost per unit and output sold will determine its profits. In deciding about price of its product, a firm has to estimate demand for its product and also to estimate cost-output relationship. Its estimates of demand and production cost will determine how much quantity of output it should produce to maximise its profits. Profit is the difference between revenue and cost. Demand for a product tells the firms the quantities of a product that can be sold at various prices, and cost-output relationship (i.e., cost function) determines the cost per unit that has to be incurred by producing different levels of output. Thus, demand together with cost determines the profit possibilities of producing a product.

It is important to note that price-output decisions made by a firm depends on the type of market structure, i.e., the degree of completion prevailing in the market. As seen above, a firm working in perfectly competitive market structure exercises no control over the price of the homogeneous product and is merely a price taker. Firms working in

monopoly and monopolistic competition can take to a greater or lesser extent independent price-output decisions keeping in view the degree of competition they are facing in the market. The areas of microeconomics which deals with demand theory, cost theory, and product-pricing are particularly useful for making decisions about wheat price to be charged and what quantity of output to be produced.

(ii) Demand Decision

Marking correct estimates (or) decisions about demand for a product is crucial for achieving the objective of profit maximization. To arrive at correct estimates of demand, the firm has not only to study consumer's behaviour and their preferences but also the trends in macroeconomy regarding growth of GNP, price situation, changes in the level of employment and balance of payments which determine the demand for a product. Managers of business firms have not only to estimate current demand for their products but also the growth of demand for their products in future. Besides, firms have to estimate their own demand for the resources they need for manufacturing their products. Theories of demand and forecasting are of great significance for estimating demand for the products.

(iii) Choice of a Technique of Production

The other important decision to be taken by business firms relates to the choice of a technique of production. A technique of production involves the use of particular combination of factors, especially labour and capital to produce a commodity. Usually various alternative techniques of producing a commodity are available among which a firm has to choose. Some production techniques involve the use of relatively more labour as compared to capital and are therefore called labour-intensive techniques. Some others use more capital relative to labour and are therefore called capital-intensive techniques. The choice between different techniques would depend on the available supplies of different factors of production and their relative prices.

Scarcity of resources demands that goods should be produced with the most efficient method. If the economy uses its resources inefficiently, the output would be smaller and there would be unnecessarily sacrifice of goods that otherwise would have been available. Therefore, it is in firm's interest that the technique of production which is used minimises the cost of production for producing a given level of output.

(iv) Advertising Decision

Advertising expenditure plays an important role in the market structure of monopolistic competition and differentiated oligopoly where firms have to compete to sell their products. Advertisement is required to promote sales of a product, and to create wants for the new product which is planned to be introduced in the market. Through advertisement management of a firm tries to influence the consumers about good quality of its product. Thus, how much expenditure has to be incurred on advertisement and through what media (Newspapers, Television, Radio, Cable TV Network) is an important decision to be made by a business firm. Theory of monopolistic competition and oligopoly is of great help in deciding about optimal advertisement expenditure to be made by business firms.

(v) Long-run Production Decisions

Not only the decision regarding how much quantity of output to be produced is to be made in the short run, long-run decisions pertaining to production have also to be taken by firm's management. For example, where to locate the plant for manufacturing, what size of plant, that is, magnitude of productive capacity to be built and which technology or production technique involving a particular factor-combination or factor proportion is to be used for producing a product. Besides, what product-mix should be produced to maximize profits. Developing and introducing a new product also falls in this category of long-run production decisions.

The choice among alternative courses in these matters obviously depends on the costs. The firms will aim at economising the use of scarce resources so as to achieve efficiency in production. They will decide to use technology or production technique that will minimise cost for producing a given level of output.

Cost depends on prices of resources or inputs such as capital, labour, raw materials on the one hand and productivity of these inputs on the other. Theory of production which analyses the relationship between output and inputs and theory of product pricing which are important branches of microeconomic theory are of great help in making decisions on these matters.

(vi) Investment Decisions

The other type of long-run decisions relates to investment or capital expenditure. Investment expenditure is required to expand the productive capacity, developing and introducing new products. Since they are of long-run nature, investment decisions precedes other decisions. Investment decisions relate to how much investment or capital expenditure is to be undertaken in a period, what should be the rate of investment over the years, and on what projects capital expenditure is to be made. It is important to note that investment or capital expenditure on establishing or expanding production capacity yields returns in future periods. The theory of capital budgeting which has been developed in recent years is useful for deciding whether or not to undertake any specific investment or capital expenditure, or whether it is desirable to take over other firms to expand capacity.

Theory of capital budgeting essentially involves evaluating costs of an investment project and returns or profits flowing from it in future years. If the present discounted value (PDV) of expected returns from an investment project exceeds the cost, it is worthwhile to incur the particular capital expenditure.

1.2.2 Managerial Decision Making Process

Q9. Explain the various steps in Managerial Decision Making, at what step does the knowledge of economic theory and its method help a manager to arrive at an optimum strategy?

(OR)

Explain the process of decision making.

Ans : **(Jan.-20)**

Decision making is crucial for running a business enterprise which faces a large number of problems requiring decisions. Which product to be produced, what price to be charged, what quantity of the product to be produced, what and how much capital advertisement expenditure be made, how much investment expenditure be incurred to promote the sales are some of the problems which require decisions to be made by managers. Decision making process in each of these problems contains several phases or steps which are explained below:

1. Establishing the Objective

The first step in the decision making process is to establish the objective of the business enterprise. The important objective of a private business enterprise is to maximise profits. However, a business firm may have some other objectives such as maximization of sales or growth of the firm.

But the objective of a public enterprise is normally not of maximization of profits but to follow benefit-cost criterion. According to this criterion, a public enterprise should evaluate all social costs and benefits when making a decision whether to build an airport, a power plant, a steel plant, etc.

2. Defining the Problems

The second step in decision making process is one of defining or identifying the problem. Defining the nature of the problem is important because decision making is after all meant for solution of the problem. For instance, a cotton textile firm may find that its profits are declining. It needs to be investigated what are the causes of the problem of decreasing profits. Whether it is

the wrong pricing policy, bad labour-management relations or the use of outdated technology which is causing the problem declining profits. Once the source or reason for falling profits has been found, the problem has been identified and defined.

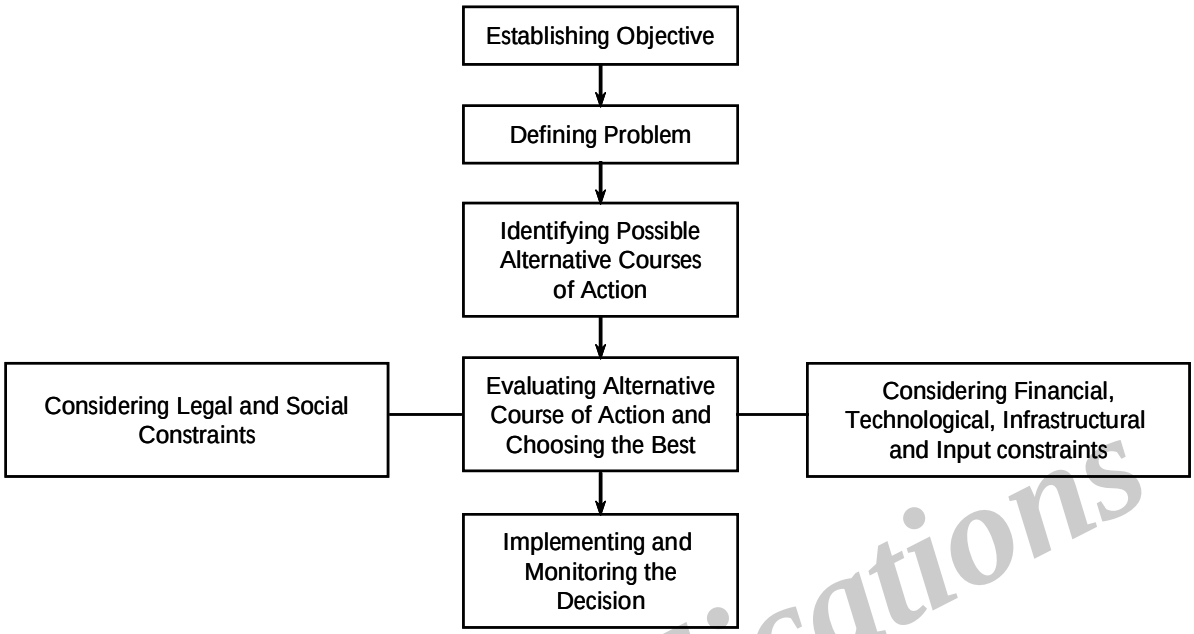


Fig. : Process of Decision Making

3. Identifying Possible Alternative Courses of Action

Once the problem has been identified, the next step is to find out alternative solutions to the problem. This will require considering the variables that have an impact on the problem. In this way, relationship among the variables and with the problems has to be established. In regard to this, various hypotheses can be developed which will become alternative courses for the solution of the problem. For example, in case of the problem mentioned above, if it is identified that the problem of declining profits is due to the use of technologically inefficient and outdated machinery in production, the two possible solutions of the problem are :

(a) Updating and replacing only the old machinery.

(b) Building entirely a new plant equipped with latest machinery.

The choice between these alternative courses of action depends on which will bring about large increase in profits.

4. Evaluating Alternative Courses of Action and Choosing the Best

The next step in business decision making is to evaluate the alternative courses of action. This requires the collection and analysis of the relevant data. Some data will be available within the various departments of the firm itself, the other may be obtained from the industry and government. The data and information so obtained can be used to evaluate the outcome or results expected from each possible course of action. Methods such as regression analysis, differential calculus, linear programming, cost-benefit analysis are used to arrive at the optimal course. The optimum solution will be one that helps to achieve the established objective of the firm. The course of action which is optimum will be actually chosen. It may be further noted that for the choice of an optimal solution to the problem, a manager works under certain constraints. The constraints may be legal such as

laws regarding pollution and disposal of harmful wastes; they may be financial (i.e., limited financial resources); they may relate to the availability of physical infrastructure and raw materials, and they may be technological in nature which set limits to the possible output to be produced per unit of time. The crucial role of a business manager is to determine optimal course of action and he has to make a decision when working under all these constraints.

5. Implementing and Monitoring the Decision

After the alternative courses of action have been evaluated and optimal course of action selected, the final step is to implement the decision The implementation of the decision requires constant monitoring so that expected results from the optimal course of action are obtained. Thus, if it is found that expected results are not forthcoming due to the wrong implementation of the decision, then corrective measures should be taken.

However, it should be noted that once a course of action is implemented to achieve the established objective, changes in it may become necessary from time to time in response in changes in the conditions or firm's operating environment on the basis of which decisions were taken.

1.3 FIRM

1.3.1 Meaning and objectives

Q10. What is firm? Explain the objectives and theories of firm.

Ans : **(Dec.-20, Dec.-16)**

A firm is an organisation which transforms the hired input into outputs for sale. Two types of input are used by the firms, human resources (such as labour resource and entrepreneurial resource) and capital resources (such as land, man made capital, forests rivers etc.). The most important task of the firm as to purchase the resources or inputs and transform them into goods or services for sale.

Objectives of a Firm

Initially, profit maximization was considered as the single most objective of firm. But now the scholars has also considered sales maximization and growth maximization as the objectives of the firm. All the organisations has certain objectives which helps in providing a structure for all the functions, strategies and managerial decisions of that firm.

Theories

The following are the various theories of the firm,

1. Profit Maximization Theory

Profit maximization is one of the most common and widely accepted objective of a firm. According to the profit maximization theory, the main aim of the firm is to produce large amount of profits. Profit is considered as the internal source of funds and the market value of the firm also rely mainly on the profits earned by the firm. In order to survive in the market, it is very essential for the firms to earn profits.

Profits are obtained by deducting total revenue from the total cost i.e.,

Profit = Total revenue – Total cost

The profit maximizations theory is supported by Nobel Laureate Milton Friedman. He considered it as valid for anticipating future business trends and practise.

2. Baumol's Theory of Sales Revenue Maximisation

The validity of profit maximisation as an objective of firm was questioned by Baumol. According to Baumol, maximisation of sales revenue is the main objective of the firms in the competitive markets. He found that sales volumes helps in finding out the market leadership in competition. According to him, in large organisation, the salary and other benefits of the managers are connected with the sales volumes instead of profits. So, managers try to maximise the total revenue of the firms. The volumes of sales represents

the position of the firm in the market. The increase in the sales figures enhances the competitive new of the firm. The managers of firm performs the operations of the firm and their performance is measured on the basis of the attainment of sales target so the management will try to maximise sales and maintain minimum profit. Thus, the main aim of the firm to maximise sales revenue and maintain minimum profits for satisfying shareholders.

3. Marris Hypothesis Maximisation of Growth Rate

According to Marris, owners/shareholders strives for attaining profits and market share and managers strives for better salary, job security and growth. These two objectives can be attained by maximizing the balanced growth of the firm. The balanced growth of the firm rely mainly on the growth rate of demand for the firm's products and growth rate of capital supplied to the firm. If the demand for the firm's product and the capital supplied to the firm grows at the same rate then the growth rate of the firm will be considered as balanced.

Marris found that the firms faces two difficulties while attaining the objective of maximisation of balanced growth which are managerial difficulties and financial difficulties.

For maximizing the growth of the firm the managers should have skills, expertise, efficiency and sincerity in them. The prudent financial policy of the firm depends on atleast three financial ratios which restricts the growth of the firm.

4. Williamson Model of Managerial Utility Functions

Williamson's model combined profit maximisation and growth maximisation objectives. According to the model of managerial utility functions, managers makes use of their discretionary power for maximising their own utility function and maintains minimum profits for satisfying shareholders.

The Williamson's model is written as,

$$X_N = f(R, N, Y_A)$$

Where,

X_N = Manager's utility function

R = Salary

N = Managerial emoluments

Y_A = Power of discretionary investments.

The utility function of the managers rely on salary of the managers, job security, power, status, professional satisfaction and power to affect the objectives of the firm.

5. Behavioural Theories

According to the behavioural theories the firm tries to attain a satisfactory behaviour instead of maximisation. These are two important behavioural models, Simon's satisfying model and model developed by Cyest and March.

The Simon's satisfying model states that firms carry out their operations under 'bounded rationality' and can only attain a satisfactory level of profit, sales and growth, Simon carried out a research and found that modem business does not have adequate information and is uncertain about future due to which it is very difficult to attain profit, sales and growth objectives.

The model developed by Cyest and March states that firms should be oriented towards multigoal and multi decisions making. Instead of dealing with uncertainty and inadequate information, the firms should fulfill the conflicting goals of various stakeholders such as shareholders, employees, customers, financiers, government and other social interest groups.

Thus, the above mentioned were the various theories of firm.

Q11. Explain briefly about theory of firm (or) profit maximization.

Ans :

The 'theory of firm' has been developed on the basis of the assumption that rational firms pursue

the objective of profit maximisation, subject to the technical and market constraints. The basic propositions of the theory of firm may be summed up as :

(a) Firm is a unit which transforms valued inputs into outputs of a higher value, given the state of technology.

(b) The firm strives towards the achievement of its goal—usually profit maximisation.

(c) The market conditions (like competition, monopoly, etc.) for a firm to operate are given.

(d) While choosing between alternatives, the firm prefers the alternative which helps it to consistently achieve profit maximisation.

(e) The primary concern of the theory of firm is to analyses changes in the prices and quantities of inputs and outputs.

Taking these as central points, the theory of firm has been carried to varying degrees of elaboration and refinement. Before taking it up in detail, let us note the basic assumptions on which this theory rests.

Assumptions

(1) The firm has a single goal, viz., to maximise profit.

(2) The firm acts rationally to pursue its goal. Rationality implies perfect knowledge of all relevant variables at the time of decision-making; and

(3) The firm is a single-ownership one, i.e., run by its owner, called the entrepreneur.

- The term 'profit maximisation' is usually taken to mean the generation of largest absolute amount of profits over the time period being analysed. This then leads us to defining the term ' time period'.
- Economists have suggested two broad time periods : the short run and the long run consequently, there is short-run profit maximisation and long-run profit maximisation.
- The short run is defined as a period where adjustments to changed conditions are only partial, e.g., if demand for the product for a firm increases, in the short run it can meet the increased demand through changes in manhours and intensive use of existing machinery, but it cannot increase its production capacity.
- On the other hand, long run is a period where adjustment to changed circumstances is complete.
- Firm can meet the increased demand in the long run by making changes in its production capacity or by setting up an additional plant, besides changes in man-hours and intensive use of its existing machinery. Thus, in the short run there are certain constraints (physical or financial or both) on expansion. As time passes, these constraints can gradually be overcome and, when all the constraints are overcome, the long run is reached.

Q12. Explain about Managerial theories of Firm.

Ans :

The main argument of managerial theories is that in modem large firms, ownership and control are divorced. Managers, therefore, have a primary role in the effective control of the firm. The firm, then, seems to behave so as to maximise managerial objectives rather than shareholders' profits. Like the traditional theory of firm the managerial theories are also optimizing theories, though what is maximised differs : in the theory of firm it is the profit maximisation, while in the managerial theories it is the maximisation of managerial utility. Different managerial theories of the firm view managerial utility as a function of different combinations of variables like, salary, status, power, growth and job security. Managerial theories may be broadly classified into three categories:

1. Sales Revenue Maximisation Model by Baumol,
2. Managerial Utility Models, and
3. Growth Maximisation Models.

Q13. Explain sales Revenue maximization model.

Ans :

According to Baumol, the oligopolistic firms aim at maximising their sales revenue. The reasons for this are the following :

- Financial institutions judge the health of a firm largely in terms of the rate of growth of its sales revenue.
- There is evidence that slack earnings and salaries of top management are correlated more closely with the firm's sales than with its profits.
- While increasing sales revenue over time provides prestige to the top management, profits go to shareholders.
- Growing sales help in keeping a healthy personnel policy, thus keeping employees happy by giving them higher salaries and better terms. On the other hand, declining sales result in reduction in salaries, slack earnings and eventually lead to layoff of the employees, thus creating dissatisfaction and uncertainty among them.
- It has been observed that managers prefer a 'steady performance with satisfactory profits' than spectacular profit-maximisation projects. This is so because if the managers declare their aim as spectacular profit maximisation but, for obvious reasons, cannot give the spectacular profits year after year, they shall be penalised for the non-achievement of the goal. On the other hand, setting the goal as steady performance with satisfactory profits is safe for the growth managers.

  The desire for a steady performance with 'satisfactory' profits along with the separation of ownership and management, tend to make the managers reluctant to adopt promising projects which are risky. The top managers become, to a certain extent, risk-averters. New projects suggested by the research units of the firm are adopted but are spread over time so as to avoid wide swings in economic performance of the firm.
- Large and growing sales by maintaining or increasing the market share of the firm increases competitive power of the firm.

Assumptions

According to Baumol, the firm while pursuing the goal of sales maximisation cannot completely ignore the shareholders. The goal of the firm is, thus, the maximisation of sales revenue subject to a minimum profit constraint; the profit constraint is determined by the expectation of the share-holders (as reflected in the level of share prices of the firm) and to enable it to raise new capital at a future date. The assumptions of the model are :

(a) Goal of the firm is sales maximisation subject to minimum profit constraint.

(b) Advertisement is a major instrument of the firm as non-price competition is the typical form of competition in oligopolistic markets.

(c) Production costs are independent of advertising.

(d) Advertising will always result in creating favourable conditions for the product. In other words, it will always shift the demand curve to the right, which implies that the firm will sell larger quantity and earn larger revenue {i.e., $\frac{\partial R}{\partial a} > 0$, where R is sales revenue and a is the advertising expenditure).

(e) Price of the product is assumed as constant.

Q14. Explain briefly about managerial utility models.

Ans :

There are at least two main versions of the cases where managers in the modem large corporations are asked to influence the goals of the firms and not go along wholly pursuing the goals of the owners. These theories are discussed below.

(i) Berle-Means-Galbraith Model of 'Corporate Power Structure'

The Modern Corporation and Private Property in 1932, Berle and Means suggested for the first time the important implications of the separation of ownership and management in a

modern corporation. According to them, while owners are interested in maximising profits, the managers have their own desires, needs and motivations., Further, due to lack of corporate democracy the managers have a greater power on corporate policy. Moreover, sufficient investible funds can be generated from retained earnings, consequently the management need not venture into capital markets where the firm would be subject to close scrutiny. Hence, Berle and Means concluded that corporate managers are free to pursue their own goals.

In recent times, Galbraith has provided several variations of the Berle-Means approach. According to Galbraith, the traditional viewpoint of management of a corporation (where the owner is also the manager of the firm) may by depicted in terms of the vertical corporate power structure. Fig. where shareholders (or owners) hold the ultimate power.

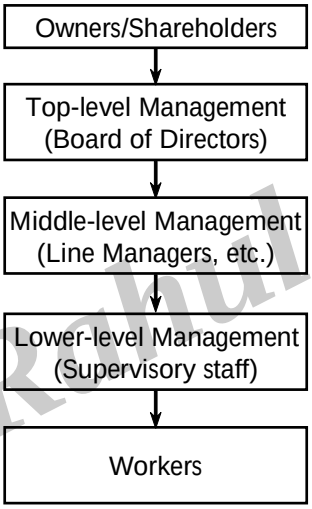


Fig.: Corporate Power Structure: Traditional Viewpoint

In large modern industrial corporations, the ownership and managerial control generally happen to be in the hands of two separate sets of people—the shareholders and managerial team—rather than in the hands of only one set, as suggested by the traditional theory. The traditional viewpoint has been depicted in Fig. which shows shareholders holding the ultimate power. They pass on their decisions downwards in the hierarchical structure of directors, middle-level management, supervisory staff and workers.

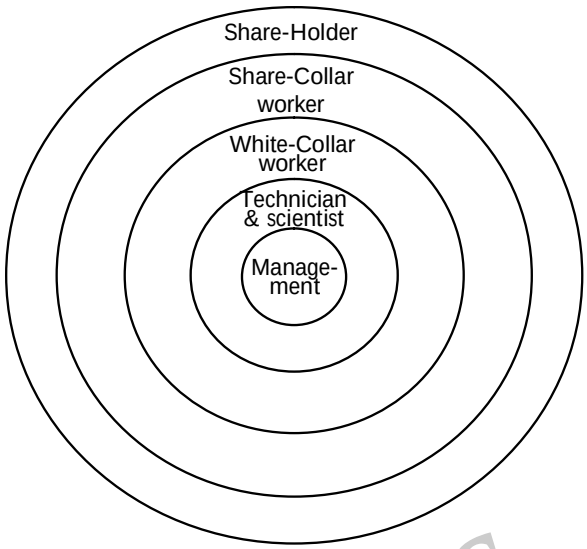


Fig.: Corporate Power Structure: Modern Viewpoint

Propositions :

(a) Profit rates are higher in owner-controlled firms than in manager-controlled firms. This is so because management ignores profit-maximising interests of the owners (or, share-holders); and,

(b) Professional corporate managers have no personal motivation to maximise profits.

(ii) O. Williamson's Model of Managerial Discretion'

A more useful model of managerial utility is given by O. Williamson, known as the 'Model of Managerial Discretion'. In the Williamson's model, managers are free to pursue their own self-interest once they have achieved a level of profit that will pay satisfactory dividends to shareholders and still ensure growth. The managers' self-interest depends upon many other things besides salary. Further, so far as the goodwill of the firm serves their own ends and ambitions, the managers would be concerned about it, else they would try to bypass it.

Assumptions of the Model. Williamson adopts the same set of assumptions as does Baumol in his Sales Revenue Maximisation model, viz.,

(a) Market is non-perfectly competitive.

(b) Ownership of the firm and management of the firm are divorced from each other.

(c) A minimum profit constraint is imposed on the managers by the capital market (or, shareholders) which cannot be ignored by the management.

Q15. Explain about growth maximization models.

Ans :

Growth of the firm is obviously the cornerstone of corporate strategy. Rate of growth and potential of growth are generally used as yardsticks to measure corporate success. Growth of a firm must be financed either from retained earnings or from market borrowings or both. Internal financing of growth is often preferred to growth through borrowed funds, even when internally generated funds involve cost in terms of their opportunity cost. The main reason for this is that debt service payments in future may inhibit growth capacity.

Internal funds can, however, grow only through profit-maximisation. The decision to maximise growth, therefore, is necessarily a decision to maximise profit.

(i) Baumol's Model of Growth Maximization :

Baumol assumes that growth is needed primarily to increase profitability. According to him the firm aims to find the optimal short run growth rate that will contribute the most to long-run profitability. Baumol's model states that total cost rises faster than total revenue at higher rates of growth because :

- capital markets are imperfectly competitive,
- construction and expansion costs become exceptionally high,
- fixed investments start yielding decreasing returns, and
- business risks increase.

Higher ratio of costs to revenues at higher rates of growth implies that profits start diminishing after reaching a peak.

(ii) Marris' Model of Managerial Enterprise:

Marris tried to improve upon Baumol's model. He offered a variation of Baumol's model that stressed the maximisation of growth subject to the security of management's position. Marris' hypothesis is that executive actions are limited by the need for management to protect itself from dismissal or takeover raids in the event of failure.

Like Williamson, Marris' approach is also based on the fact that ownership and control of the firm is in the hands of two different sets of people. He, like Williamson, also suggests that managers have a utility function in which salary, status, power, prestige and security are important variables. Owners of the firm {i.e., shareholders) are, however, more concerned about profits, market share, output, etc. In other words, goals of the managers and shareholders differ from each other. The utility function of managers (U_M) and that of the owners (U_0) may, therefore, be defined as:

U_M = f (salaries, power, status, job security)

and U_0 = f (profits, market share, output, capital, public esteem).

(iii) Penrose's Theory of the Firm :

The preoccupation of Penrose's analysis is to examine the managerial constraint on growth of the firm. Though her theory is not directly concerned with the objectives of the firm, yet it finds its place here because of its focus on the role of managers in the growth process of the firm.

Penrose makes a bold assumption that the firm is both a profit and a growth maximiser and that there is no conflict in these two objectives when pursued simultaneously. She emphasises that growth depends upon managerial services within the firm—the incentive for growth comes form the underutilised skills and capacities of the managerial staff.

The Model. Penrose divides managerial roles into two categories :

(i) to conduct operations and activities according to plan; and

(ii) to plan and carry out activities related to expansion.

She argues that a firm with a given managerial staff may grow for two reasons :

- A fixed amount of managerial services devoted to expansion will create a flow of expansionary projects; and
- With time, the running of each new project will become less demanding in terms of managerial services, thus creating underutilised 'managerial capacity' for undertaking additional projects.

1.4 Nature of Profits (Economic vs. accounting Profit)

Q16. Define profit. What are the characteristics of profit.

Ans :

The term "Profit" is usually understood to mean the difference between the total sale-proceeds obtained by a businessman and his total expenses of production. It is the surplus that remains in the hands of the businessman after paying rent, wages, interest on borrowed capital etc.

Definitions:

Important definitions of Profit as given by different authors are as follows:

1. **According to Prof. Marshall –** "Profit is the earning of management".
2. **According to Walker –** "Profit is the rent of ability".
3. **According to Croome –** "Profit is the reward for uninsured risks".
4. **According to Ely –** "Profit is a surplus over and above the expenses of production".
5. **As Taussig has said –** "Profit is a mixed and vexed income."
6. **According to Prof. J. K. Mehta –** "The element of uncertainty introduces a fourth category of sacrifice in the productive activities of man in a dynamic world. This category is risk-taking or uncertainty bearing. It is remunerated by Profit."

Since economists are of this opinion that

Profit = Gross Profit – (Rent + Wages + Interest)

Characteristics

1. Profit is a Residual Reward

It means profit is received by the entrepreneur as a residual surplus, which is left over after meeting all the business expenses from the sales receipts.

2. It is not Contractual or Pre-Determined Payment

Remember Profit is not like rent, wages, interest and Profit a pre-determined contractual payment. Therefore, it can be said that it is not an explicit cost.

3. It is the End Result of Business

In profit other factors rewards such as rent, wages and interest are received by their agents during the process of production. Profit is realized by the entrepreneur only after the completion of the business, i.e., after completing the sales and meeting all the expenses.

4. Profit is a Dynamic Concept

Profit depends on many factors such as entrepreneur's organisational ability, changes in market demand and supply conditions, element of monopoly power, innovation such as production of new items, discovery of new-markets, new modes of advertising and sales propaganda etc. and many other dynamics changes in the economy.

5. It is not Determined through Formal Factors of Market

In all other factor prices are determined in a formal market.

Example 1

Let's say that a firm's total revenue is Rs.80,000 and its explicit costs and implicit costs are Rs.50,000 and Rs .25,000, respectively. What are the firm's economic and accounting profits ?

Sol :

Economic Profits are: Rs.80,000 – Rs.75,000 = Rs 5,000.

Accounting Profits are: Rs 80,000 - Rs 50,000 = Rs 30,000

Example 2

Let's say that a firm's total revenue is Rs 80,000 and its explicit costs and implicit costs are Rs 70,000 and Rs 25,000, respectively. What are the firm's economic and accounting profits ?

Sol :

Economic Profits are: Rs 80,000 - Rs 95,000 = Rs.-15,000 (a loss of Rs 15,000).

Accounting Profits are: Rs 80,000 - Rs 70,000 = Rs 10,000

Q17. Explain the differences between economic profit and accounting profit.

Ans : **(Jan.-20, Dec.-16, Dec.-15)**

S.No.	Accounting Profit	Economic Profit
1.	It is the gap between total revenue and accounting cost or explicit costs.	It is the gap between total revenue and economic costs.
2.	Accounting profit does not accounts implicit or opportunity cost in its cost side.	Economic profit includes both explicit as well as implicit cost in its cost side.
3.	Accounting profit can be taken as a part of economic profit.	Economic profit can not be taken as a part of accounting profit.
4.	It is micro concept and based on accounting period.	It is macro concept and based on comprehensive market view.
5.	It is considered for income tax and measure of financial performance of a company or firm.	It is considered to determine the financial situation and basis for knowing whether or not stay in the market.
6.	It only deals with profitability of the firm.	It is more than that and also consider the measure of resource allocation.
7.	It is more practically determined and short-run phenomenon	It is calculated based on assumption and long run phenomenon.

1.5 OPTIMIZATION

Q18. What do you understand by Optimi-zation?

(OR)

What is Optimization?

Ans : **(Jan.-20)**

Meaning

Optimization deals with the determination of extreme values which could be maximum or minimum for the goal (objective) variable. The goal variable could be just one (unique) or more (multiple).

For example, a private firm might pursue profit-maximization as its single goal. If so, the optimization technique must determine the values of the variables, which are under the firms control, called choice variables, so that they ensure the achievement of maximum possible profit to the firm. Alternatively, a public sector firm might aim at minimizing its average cost of production as the sole objective. In that case, the role of optimization techniques would be to find out the values of the variables under the firm's control that arc consistent with the minimum possible value for its average cost.

In contrast, a government undertaking might have twin goals, namely, maximization of profit and maximization of employment of unskilled labour. Further, these two goals may or may not be compatible i.e. the achievement of one may lead or harm the attainment of the other.

If the two (or) more goals are conflicting, one has to resort to the multiple optimization techniques which arc outside the scope of this-text. It will be sufficient to point out here, that the problem could be handled by choosing one goal variable as the objective and the remaining goal variables having some assigned specific (target) values to act as the constraints. If necessary, iterations could be carried out by changing the goal variables and/or by redefining the targets of the residual goal variables.

This leads us to an another classification of optimization problem. This is regarding whether, the profit (objective variable) determining variable is just one or more. If it is the former, we have the single (choice) variable optimization problem and if the latter, there is the multiple variable optimization problem. Thus, if profit depends only on the level of production, the profit- maximizing problem is a single variable optimization problem. In contrast, if the profit depends on the level of output as well as the advertisement budget (or in addition on some other variables as well), there is a multiple variable optimization problem.

The optimization problem facing a decision-making unit is further classified into unconstrained and constrained problems. In the former, the decision-maker optimizes subject to no constraints, internal or external. In the latter, it has one or more constraints (also called side conditions), imposed either, by itself (internal) or by outside agencies (external) such as government and or market conditions.

1.5.1 Functions

Q19. What do you understand by function?

Ans :

A function describes the relation between two or more than two variables. That is, a function expresses dependence of one variable on one or more other variables. Thus, if the value of a variable Y depends on the value of another variable X, we may write

$$Y = f(X) \quad \text{..... (1)}$$

Where f stands for function.

This expression (1) is read as ' Y is function of X'. This implies that every value of the variable Y is determined by a unique value of the variable X. In the function (1), Y is known as the dependent variable and X is the independent variable. Thus in function (1) Y is the dependent variable and its value depends on the value of X. Further, the independent variable is interpreted as the cause and the dependent variable as the effect. An important function which is extensively used in economics is a demand function which expresses that quantity demanded of a commodity is a function of its price, other factors being held constant. Thus, demand for a commodity X is described as under :

$$D_x = f(P_x)$$

Where D_x is the quantity demanded of commodity X and P_x is its price.

Similarly, supply function of a commodity X is expressed as

$$S_x = f(P_x)$$

When the value of the variable Y depends on more than two variables X_1, X_2 ..... X_n this function is written in general form as :

$Y = f(X_1 X_2, X_3, X_4 ..... X_n)$

This shows the variable Y depends on several independent variables $X_1, X_2, ...X_n$ where n is the number of independent variables. Again note that in economics we write 'causes' as the independent variables and 'effect' as the dependent variable.

For example, demand for a product is generally considered to be a function of its own price, prices of other commodities (which may be substitutes or complements), income of the consumers, tastes and preferences of the consumers and advertising expenditure made by a firm to promote its product. Thus,

$D_x = f(P_x, P_y, M, T, A)$

Where

D_x = demand for the commodity X

P_x = price of the commodity X.

P_y = price of a substitute product Y.

M = income of the consumers

T = tastes and preferences of the consumer for the product.

A = advertising expenditure incurred by the firm.

The exact nature of relation of dependent variable with the independent variables can be known from the specific form of the function. The specific form of a function can take a variety of mathematical forms.

Q20. Explain different types of functions.

(OR)

What are the different types of function?

Ans :

(i) Linear functions

A widely used mathematical form of a function is a linear function. A linear function can be stated in the following general form :

$$Y = a + bX$$

Where a and b are positive constants and are called parameters of the function. Parameters of a function are variables that are fixed and given in a specific function. The values of constants a and b determine the specific nature of a linear function. The linear demand function with price as the only independent variable is written as

$$Q_d = a\text{-}bP$$

The minus sign before coefficient b indicates that quantity demanded of a commodity is negatively related with price of the commodity. That is, if price of a commodity falls, its quantity demanded increases and vice versa.

If a equals 7 and b equals 0.5, the linear demand function can be expressed in the following specific form :

$$Q_d = 7 - 0.5\ P$$

The above specific demand function shows that a unit fall in price of the commodity will cause 0.5 units increase in the quantity demanded of the commodity. If price (P) is zero, the second term (0.5P) in the demand function drops out and the quantity demanded is equal to 7.

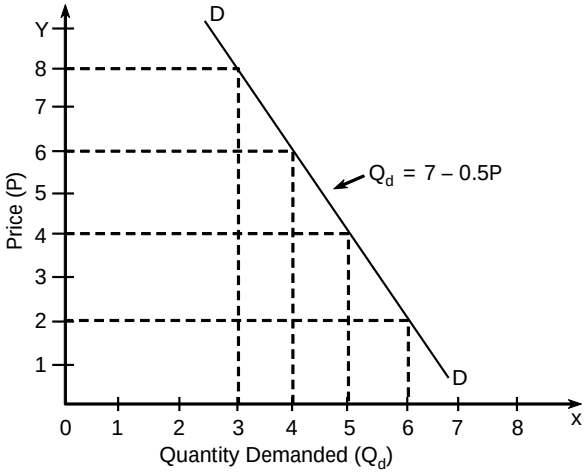


Fig. : Graph of a Linear Demand Function
(Q_d = 7 – 0.5P)

We can take various values of P and find out different quantities (Q_d) of a commodity demanded at them. In Figure we have plotted these price-quantity combinations on a graph and have obtained demand curve DD of the commodity representing the given demand function (Q_d = 7 – 0.5 P).

It should be noted that, contrary to mathematical practice, by convention in economics to represent a function we show the independent variable (price in the above case of demand function) on the X-axis and the dependent variable (the quantity demanded in the present case) on the X-axis. Graph of linear demand function is shown in Figure. It is worth noting that slope of the demand function curve in Figure will represent $\frac{\Delta P}{\Delta Q}$. However, if we represent quantity demanded (Q_d) on the Y-axis, and price (P_x) on the X-axis; the slope of the demand curve so drawn would be equal to $\frac{\Delta Q}{\Delta P}$.

(ii) Power Functions

The linear functions stated above are known as first degree Junctions where the independent variables X_1, X_2, X_3 etc are raised to the first power only. In economics power functions of the quadratic and cubic forms are also extensively used.

(a) Quadratic Functions : In quadratic function one or more of the independent variables are squared, that is, raised to the second power. Note that power is also referred to as exponent. A quadratic function may be written as

$$Y = a + b X + c X^2$$

This implies that value of the dependent variable Y depends on the constant a plus the coefficient b times the value of the independent variable X plus the coefficient c times the square of the variable X.

Suppose a = 4, b = 3 and c = 2 then quadratic function takes the following specific form :

$$Y = 4 + 3X + 2X^2$$

We can obtain the different values of Y for taking different values of the independent variable X. Quadratic functions are of two types : convex quadratic functions and concave quadratic functions. The form of quadratic function depends on the sign of the coefficient c of X^2. The quadratic function, $Y = a + bX + cX^2$, where the coefficient c of X^2 is positive (i.e. $c > 0$) is called convex quadratic function, because its graph is U-shaped as shown in Figure. On the other hand, if coefficient of X^2 is negative ($c < 0$), that is, when $Y = a + bX - cX^2$, then we have concave quadratic function because its graphs is of inverted U- shape (i.e. $\cap$ - shaped) as shown in Figure.

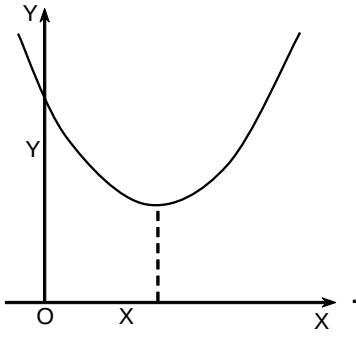


Fig. Convex Quadratic function

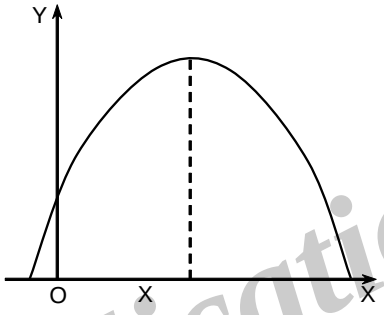


Fig. Concave Quadratic Function

It is worth noting that slope of the curve of convex quadratic functions as is evident from U-shaped graph in this case where coefficient of X^2 is positive, slope is increasing every where. On the other hand, in case of concave quadratic function where coefficient of X^2 is negative ($c < O$). slope of its graph is decreasing every where. It should be further noted that in analytical geometry it is proved that graph of any quadratic function is a parabola which may be be either convex or concave. A parabola is a curve which has a turning point and unlike the curve of a linear function its slope is changing at different values of X.

(b) Cubic function : A cubic function is a power function in which there is a third degree relating to an independent variable. Thus, a cubic functions may have first degree, second degree and third degree terms. A cubic function may have the following form :

$$Y = a + bX + cX^2 + dX^3$$

a is the intercept term, the dependent variable X has the first degree, second degree and third degree terms. When the signs of all the coefficients a, b, c and d are positive, then the values of Y will increase by progressively larger increments as the value of X increases. However, when the signs of various coefficients differ in the cubic function, that is, some have positive signs and some have negative signs, then the graph of the function may have both convex and concave segments depending on the values of the coefficients. Such a cubic function where signs of the coefficients of variables differ may be expressed as follows:

$$Y = a + bX - cX^2 + dX^3$$

In which the sign of the coefficient c of variable X^2 is negative where as the coefficients of others are positive.

1.5.2 Slope of Functions

Q21. Explain the slope of functions with an examples.

Ans :

In economics it is important to know the rate at which a variable changes in response to a change in another variable the slope of a variable measures this rate.

For example, it is important to know the rate at which quantity demanded of a commodity changes in response to a change in price of a commodity. In the field of economics we find both linear and non-linear functions. Let us first take the slope of a linear function.

Consider the following linear function.

$$Y = f(X) = 2 + 0.5\,X$$

In Table we have calculated the values of the variable Y by taking different values of X such as 1, 2, 3, 4 etc. Further, we have plotted the different values of Table on a graph shown in Figure. The slope of the function. (X = 2 + 0.5X) between two points, say, A and B in Figure is

Value of X	0	1	2	3	4	5	6	7
Value of Y	2	2.5	3	3.5	4	4.5	5	5.5

Table: Linear Function, Y = 2 + 0.5X

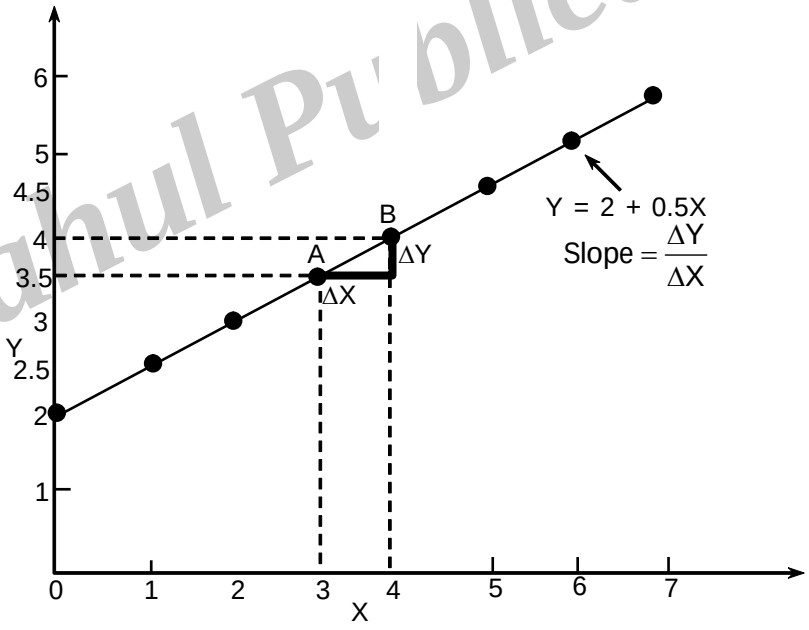


Fig. : Graph of Y = 2 + 0.5X

given by the ratio of change in Y to the change in X. That is, slope = $\frac{\Delta Y}{\Delta X}$.

For example, at point A of the given function value of variable X is 3 and corresponding to it the value of variable Y is 3.5. When value of A' rises from 3 to 4, value of Y increases from 3.5 to 4. Thus, the slope of the function (Y = 2 + 0.5X) is :

$$\frac{\Delta Y}{\Delta X} = \frac{4-3.5}{4-3} = \frac{0.5}{1} = +0.5$$

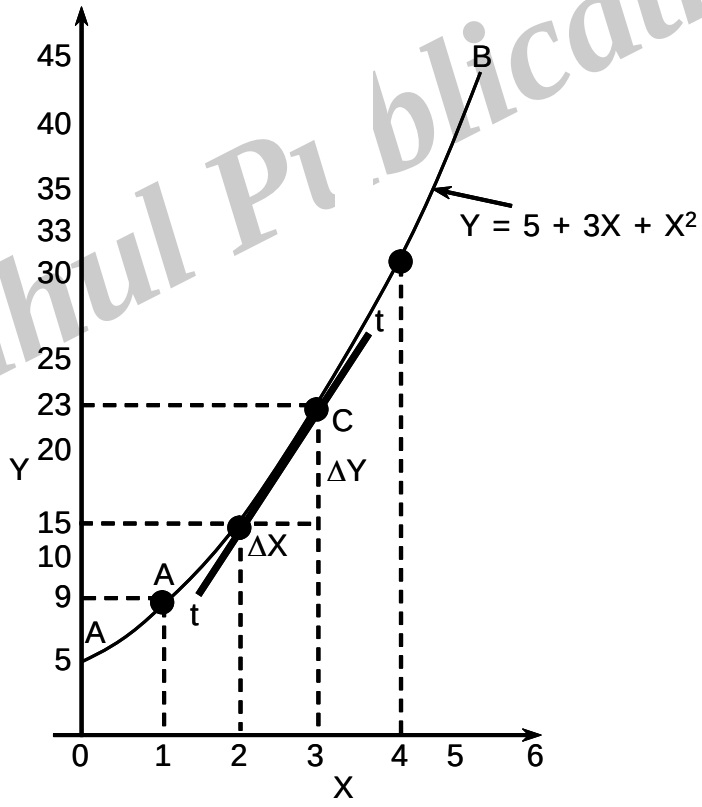
This implies that value of Y increases by 0.5 when value of X increases by 1. It should be noted that slope of a linear function is constant.

However, the slope of a linear function can be directly known from the linear function itself and for that purpose there is no need to plot the data.

Consider the following linear function

$$Y = a + bX$$

It will be seen from this linear function that when the value of X is zero, the value of Y will be equal to a. Thus a is Y intercept. Further, in this function b is the coefficient of X and measures change in Y due to change in X, that is, $\frac{\Delta Y}{\Delta X}$. Thus, b represents the slope of the linear function. In linear function Y = 2 + 0.5X, 2 is the Y - intercept, that is, value of Y when X is zero, 0.5 is the b coefficient which measures the slope $\frac{\Delta Y}{\Delta X}$ of the linear function.



Slope of a Non-linear Function

It say, a quadratic function ($Y = a + bX + cX^2$) can be measured. On plotting the non-linear function in a graph, we get a non-linear curve.

Let us take the following specific quadratic function :

$$Y = 5 + 3X + X^2$$

In Table we have calculated the various values of Y by taking different values of X (0, 1, 2, 3, etc)

Quadratic Function : $Y = 5 + 3X + X^2$

Value of X	0	1	2	3	4	5	6
Value of Y	5	9	15	23	33	45	59

The data so obtained have been plotted to get a curve in Figure

The slope at a point on the non-linear function curve can be measured by the slope of a tangent drawn to the curve at that point. Thus slope of AB curve in Fig can be measured by drawing a tangent it at point C and measuring its slope.

1.5.3 Optimization Techniques

Q22. Explain the various techniques of optimization.

Ans :

Optimization is one of tools of decision making. Optimization is the output level where the firm maximizes profits.

- In optimization analyzing the relation between total average and marginal concepts and measures is very important.
- Objective of a firm is to make profit.
- Even if a firm is maturing profit it tries to maximize this profit by minimizing the costs.
- Profit maximizations means the generation of a large volume of profits over a period of time. This period of time may be short run or long-run. In short run some costs may be fixed but all costs are variable in the long-run.
- The company should therefore recover its fixed costs in the long run and continue only if it can recover the cos along with the opportunity costs of the capital. In short run more output is possible only through by the fixed factor working overline.
- For profit maximization low unit cost has to be achieved along with earning highest possible revenues. The extent of profit depends upon revenues that a firm can attain for a given level of costs.
- Reservation price is the maximum price a consumer is willing to pay for one more unit of a particular good. Firms must operate in such a way so as to gain this price.
- If a firm in order to gain an extra consumer reduces the price of its product, it may have gained an extra consumer and revenue but it would have cost the goodwill or value of revenue of its existing consumers. The net of these two values is marginal revenue.
- Value of revenue lost value of revenue of existing consumer gained of new consumer = MR (Marginal Revenues).
- Marginal Cost (MC) is as a result of a one unit change in total output (Q).

$$\text{So, MC} = \frac{\text{Change in TC}}{\text{Change in Q}}$$

- MC and MR are derivatives of TC and TR.
- MC and MR defined in terms of slopes of TC and TR curves.
- When marginal cost is equal to marginal revenue (MC = MR) the extra additional consumer would make no substantial to the firms profit. Beyond this point all later on added consumers only add to the cost rather than revenue and hence will be no longer be profitable to serve. So, MC = MR is point of maximum profit.
- From all of this, it can be seen that profit maximization is only when firms utilize a correct price-output combination where marginal revenue from last unit sold is equal to marginal cost of producing that unit.
- Presenting all these points graphically is the profit maximization model firm act rationally to achieve its objectives. Profit is the excess of Total Revenue (TR) over Total Cost (TC).
- Profit of firm (P) = TR – TC.

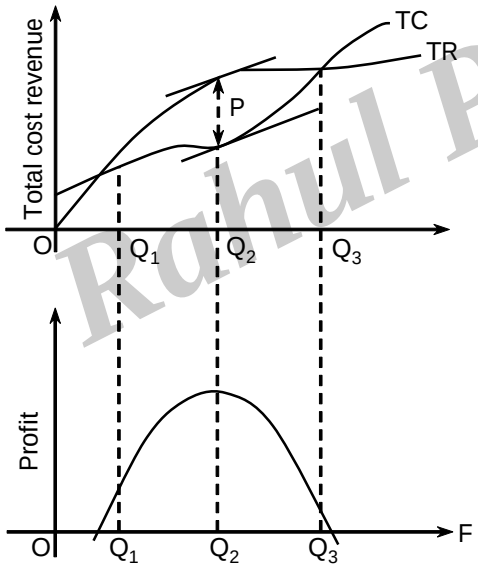


Fig. : Profit Maximization

Technique

- Total Revenue of a firm (TR)

$$TR = P.Q.$$

where,

P = Price

Q = Quantity sold

- The rule of maximization of total revenue (sales) is that TR is maximum at level of sale Q where MR = 0
- Both TR and TC are functions of output,

$$Tr = f_1(Q) \text{ and } TC = f_2(Q)$$

$$P = f_1(Q) - f_2(Q) = f_3(Q)$$

- Prompt is also a function of output
- Derivative of the function is the rate at which a function changes with respect to its independent variable.
- Condition for a function to be maximum

First Condition

First derivative of function should be zero.

Second Condition

Secondary derivative of function should be negative.

$$\therefore \frac{dP}{dQ} = 0 \quad \text{and} \quad \frac{d^2P}{dQ^2} = -\text{ve}$$

According to first condition According to second condition

$$\frac{dP}{dQ} = 0 \qquad \frac{d^2P}{dQ^2} < 0$$

$$\frac{dTR}{dQ} - \frac{dTC}{dQ} = 0 \qquad \frac{d^2TR}{dQ^2} < \frac{d^2TC}{dQ^2}$$

$$\frac{dTR}{dQ} = \frac{dTC}{dQ} \qquad \frac{d}{dQ}\left(\frac{dTR}{dQ}\right) < \frac{d}{dQ}\left(\frac{dTC}{dQ}\right)$$

Slope of TR = Slope of TC $\quad \frac{dMR}{dQ} < \frac{dMC}{dQ}$

MR = MC ... (1)

Slope of MR < Slope of MC ... (2)

MC cuts MR from below.

Optimization is a rigorous approach which takes into account all of the factors that influence decisions in business. Optimization implies careful modeling of the business, a process which itself invariably gives valuable insights.

Techniques

(a) Non-linear programming is that form of programming in which some or all of the variables are curvilinear. In other words, this means that either the objective function or constraints or both are not in linear form. In most of the practical situations, we encounter with non-linear programming problems but for computational purposes we approximate them as linear programming problems. Even then there may be some non-linear programming problems which may not be fully solved by presently known methods.

(b) Dynamic programming refers to a systematic search for optimal solutions to problems that involve may highly complex interrelations that are, moreover, sensitive to multistage effects such as successive time phase. Dynamic problems involve manipulation of a large amount of information and require electronic computers.

(c) Integer programming Integer programming applies when the values of decision variables are restricted to integers. Applications include financial management and plant location.

(d) Goal programming It deals with problems having multiple objectives. It is a technique quite similar to linear programming. Applications include production scheduling, transportation problems, portfolio analysis, and crop selection in agriculture.

(e) Heuristic programming also known as discovery method refers to step by step search toward an optimal when a problem cannot be expressed in mathematical programming form. The search procedure examines successively a series of combinations that lead to stepwise improvement in the solution and the search stops when a near optimal has been found.

(f) Algorithm programming is a just the opposite of Heuristic programming. It may also be termed as mathematical programming. This programming refers to a thorough and exhaustive mathematical approach to investigate all aspects of the given variables in order to obtain optimal solution.

(g) Quadratic programming refers to a modification of linear programming in which the objective function and constraint equations appear in quadratic form, i.e., they contain squared terms.

(h) Parametric programming is the name given to linear programming when the latter is modified for the purpose of inclusion of several objective equations with varying degrees of priority. The sensitivity of the solution of these variations is the studied.

(i) Probabilistic programming also known as stochastic programming, refers to linear programming that includes an evaluation of relative risks and uncertainties in various alternatives of choice for management decisions.

Q23. Explain various Tools for Optimization.

Ans :

(a) Queuing Theory

'Queuing theory' also designed as 'waiting line theory' deal with analysis of queues behaviour and has been used for solution of problems pertaining to the optimization of effectiveness of defined functions with random times of arrival and servicing.

Techniques of queuing theory have been applied for solution of a large number of problems such as :

- Scheduling of aircraft at landing and take off from busy airports.
- Scheduling of work and jobs in production control.
- Inventory analysis control.
- Minimization of congestion due to traffic delay at tool booths.
- Scheduling of parts and components to assembly lines.
- Routing and scheduling of Salesmen and sales lines.

(b) Game Theory

In the competitive world, it is essential for an executive to study or at least guess the activities

or actions of his competitor. Moreover, he has to plan his course of action or reactions or counter actions when his competitor uses certain technique. Such war or game is a regular feature in the market and the competitors have to make their decisions in choosing their alternatives among the predict outcomes so as to maximize the profits (or) minimizing the loss.

(c) Bench Marking

Bench Marketing is also known as fast cycle or rapid bench marking tool. Bench marking is an investigation by a firm into another firm's quick, cheap and efficient functioning techniques so that these methods could be adopted and incorporated by the investigating firm.

- **Benchmarking Defined :** Benchmarking is the systematic search for best practices, innovative ideas, and highly effective operating procedures.

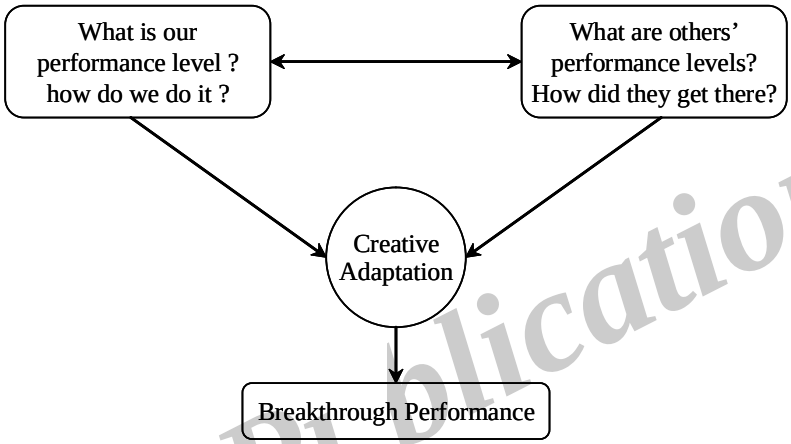


Fig. : Benchmarking Concept

As shown in Figure benchmarking measures performance against that of best-in-class organizations, determines how the best in class achieve those performance levels, and uses the information as the basis for adaptive creativity and breakthrough performance.

Requirements for Bench-Marking

1. **Selection of a Specific Process :** The investigating firm should first select a process that it feels is inefficient, expensive and needs to be updated as regards its functioning. To update means to improve its efficiency.
2. **Identification of Firms :** The investigating firm after selecting a process should then demarcate a few firms having similar process but which are much cheaper, efficient and productive than its own process.
3. **Sending of a Bench Marking Mission Team :** The investigating firm should send a bench marketing team to the firms so that they can study and make a detailed report about the technique followed by the firm.

(d) Total Quality Management

Total quality management (TQM) is an approach to improving the effectiveness and flexibility of business. TQM is a method involving everyone in the process of improvement. Improving effectiveness of work so that results are achieved in less time. The method and techniques used in TQM can be applied through the organization.

Principles

TQM stresses on three principles.

1. Customer satisfaction
2. Employee involvement
3. Continuous improvements in quality.

1. Customer Satisfaction

It is relative concept that varies from one customer to another. Also, a customer may be satisfied with today's products but not satisfied in the future each person defines quality in relation to his or her own needs and means at a particular point of time.

2. Employee Involvement

It is in quality management is crucial in achieving and sustaining high levels of quality. Employees may have to be empowered to take prevention and necessary corrective action without management approval. Employees must be involved in quality management by encouraging them to use quality control tools and techniques. To track performance and identify areas that needs improvement. Employee training and motivation are essential for achieving and sustaining high levels of service quality.

3. Continuous improvement

It is never ending process and is driven by knowledge and problem solving.

Determinants of a TQM Success Programme

1. Involvement of upper management must be strong.
2. A TQM programme highlighting the benefits to its customer and how it enhances a firm's values.
3. Objective of TQM programme must be comprehensible.
4. TQM programme must be quick and efficient and give rapid results.
5. Every TQM programme must be personalized.

Success a TQM program increased quality of products, reduction determinants of a TQM success programme.

Advanced TQM model is called six sigma developed by motorola. It is defined as a model where noneffective products or procedures fall are encompassed within six standard deviations of the mean.

(or)

Six sigma can also be defined as a situation in which everything (from product design to manufacturing to billing) proceeds flawlessly with fewer than 3.4 defects per million widgets or producers or 99.99966 percent almost perfect.

Companies using six sigma are motorola and General Electric (GE).

Q24. Explain the concept of unconstrained optimization.

Ans :

Unconstrained optimization problems consider the problem of minimizing an objective function that depends on real variables with no restrictions on their values. Mathematically, let $x \in R_n$ $x \in R_n$ be a real vector with $n \geq 1$ $n \geq 1$ components and let f: $R_n \rightarrow R_f$: $R_n \rightarrow R$ be a smooth function. Then, the unconstrained optimization problem is

$$\min \times f(x) . \min \times f(x).$$

Unconstrained optimization problems arise directly in some applications but they also arise indirectly from reformulations of constrained optimization problems. Often it is practical to replace the constraints of an optimization problem with penalized terms in the objective function and to solve the problem as an unconstrained problem.

Algorithms

An important aspect of continuous optimization (constrained and unconstrained) is whether the functions are *smooth*, by which we mean that the second derivatives exist and are continuous. There has been extensive study and development of algorithms for the unconstrained optimization of smooth functions. At a high level, algorithms for unconstrained minimization follow this general structure:

- Choose a starting point x0x0.
- Beginning at x0x0, generate a sequence of iterates {xk}"k=0{xk}k=0" with non-increasing function (ff) value until a solution point with sufficient accuracy is found or until no further progress can be made.

To generate the next iterate xk+1xk+1, the algorithm uses information about the function at xkxk and possibly earlier iterates.

1.6 Concept of Derivative

1.6.1 Simple Rules of Derivation

Q25. Define derivative. Explain simple rules of derivation with an examples.

Ans :

In a continuous and smooth non-linear curve when a change in the independent variable, that is, ΔX gets smaller and approaches zero, $\frac{\Delta Y}{\Delta X}$ becomes better approximation of the slope the function, Y= f (X), at a particular point. Thus, if ΔX is infinitesimally small, $\frac{\Delta Y}{\Delta X}$ measures the slope of the non-linear function at a particular point and is called the derivative $\frac{dY}{dX}$ of the function with respect to X. The derivative $\frac{dY}{dX}$ or more precisely the first derivative of a function is defined as limit of the ratio $\frac{\Delta Y}{\Delta X}$ as ΔX approaches zero. Thus

$$\frac{dY}{dX} = \underset{\Delta x \to 0}{\text{limit}} \frac{\Delta Y}{\Delta X}$$

It is thus evident that derivative of a function shows the change in value of the dependent variable when change in the independent variable (ΔX) becomes infinitely small. Note that derivative of a function [Y = f(X)] is also written as $\frac{d(fX)}{dX}$ or f'(X).

As explained above, the derivative of a function at a point measures the slope of the tangent at that point. Consider Figure when $\Delta X = X_3 - X_1$, the slope of the corresponding straight line AB is equal to $\frac{Y_3 - Y_1}{X_3 - X_1}$. When ΔX becomes smaller and is equal to $X_2 - X_1$, slope of the corresponding line AC is equal $\frac{Y_2 - Y_1}{X_2 - X_1}$. It will be seen from Figure that slope of line AC is more near to the slope of the tangent tt drawn at point A to the function curve. Similarly, if AY is reduced further, slope of the straight line between the two corresponding points will go on becoming closer and closer to the slope of the tangent tt drawn at point A to the curve. At the limit of $\frac{\Delta Y}{\Delta X}$ when ΔX approaches zero, slope of the tangent such as tt at a point on a function becomes the derivative $\frac{dY}{dX}$ of the function with respect to X.

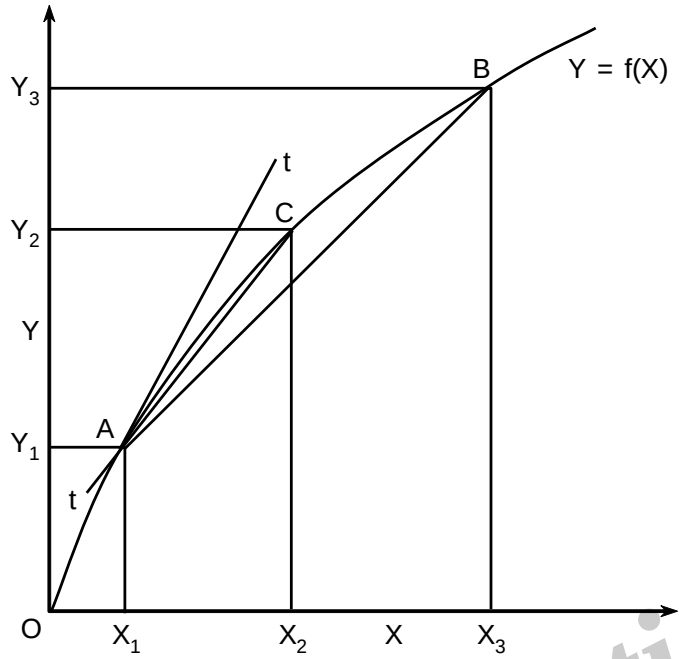


Fig. : Finding Derivative of a Function (Y = f(x) at a point

Thus, derivative $\frac{dY}{dX}$ is slope of a function whether it is linear or non-linear and represents a change in the dependent variable due to a small change in the independent variable. The concept of a derivative is extensively used in economics and economic decision making, especially in solving the problems of optimization such as those of profit maximisation, cost minimisation, output and revenue maximisation.

There are various types of functions and for them there are different rules for finding the derivatives. We will explain below the basic rules of finding derivatives of the various types of functions.

Rules

Process of finding the derivative of a function is called differentiation. As stated above, derivative of a function represents the change in the dependent variable due to a infinitesimally small change in the independent variable and is written as $\frac{dY}{dX}$ for a function $Y = f(X)$. A series of rules have been derived for differentiating various types of functions. We describe below these rules of differentiation.

(i) Derivative of a Constant Function

A constant function is expressed as

$$Y = f(X) = a$$

Where 'a' is constant. The constant 'a' implies that Y does not vary as X varies, that is, Y is independent of X. Therefore, the derivative of a constant function is equal to zero. Thus, in this constant function.

$$\frac{dY}{dX} = 0$$

For example, let the constant function be

$$Y = 2.5$$

This is graphed in Figure. It will be seen that a constant function is a horizontal straight line (having a zero slope) which shows that irrespective of the value of the variable X, the value of

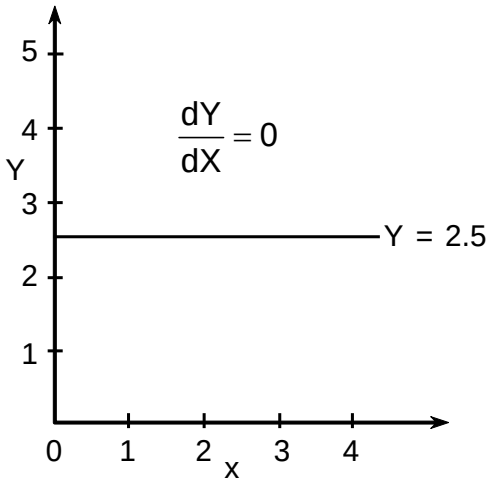


Fig.: Graph of a Constant Function

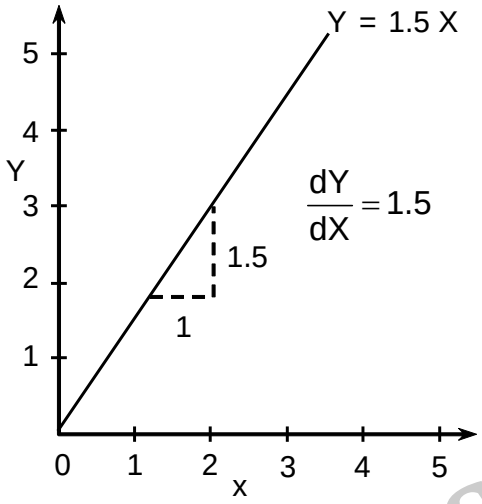


Fig.: Graph of a Linear Function

Y does not change at all. Therefore, in this case derivative $\frac{dY}{dX} = 0$

(ii) Derivative of a Power Function

A power function takes the following form :

$$Y = aX^b$$

Where a and b are constants. Here a is the coefficient of the X term and the variable X is raised to the power b. The derivative of this power function is equal to the power b multiplied by the coefficient a times the variable X raised to the power b – 1. Thus rule for the derivative of power function ($Y = a X^b$) is

$$\frac{dY}{dX} = b.a.X^{b-1}$$

Let us take some examples of determining the derivative of a power function.

First, take the following power function :

$$Y = 1.5 X$$

In this function 1.5 is the coefficient of variable X, that is, a and the power b of X is 1 (implicit). Using the above rule for the derivative of a power function we have

$$\frac{dY}{dX} = 1 \times 1.5X^{1-1} = 1 \times 1.5\, X^0 = 1.5$$

This is graphically shown in Figure. It will be seen from this figure that slope of the linear function (Y = 1.5X) is constant and is equal to 1.5 over any range of the values of the variables X.

(iii) Quadratic Power Function

Let us take the following example of a power function which is of quadratic type.

$$Y = X^2$$

Its derivative, $\frac{dy}{dx} = 2X^{2-1} = 2X^1 = 2X$

To illustrate it we have calculated the value of Y, associated with different values of X such as 1,2 2.5 and –1, –2, –2.5 and have been shown in Table.

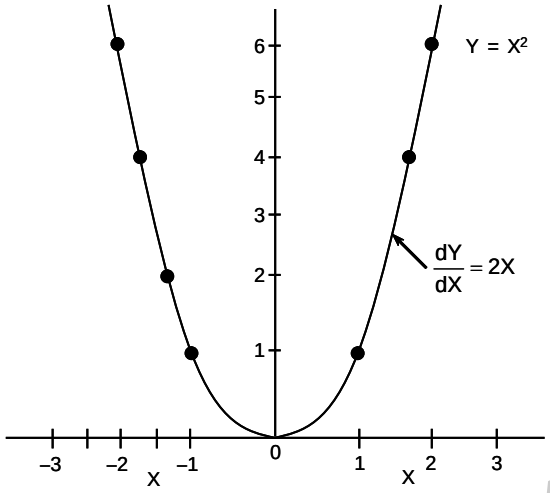


Fig . Graph of a Quadratic function

Value of X	–2.5	–2	–1	+1	+2	+2.5
Value of Y	–6.25	–4	–1	+1	+4	+6.25

Table: Quadratic Power Function $Y = X^2$

We have plotted the values of X and corresponding values of Y to get a U-shaped parabolic curve in Figure. It will be seen that derivative $\frac{dY}{dX}$ or, in other words, slope of this quadratic function is changing at different values of X. Some other examples of power function and their derivatives are :

For power function, $Y = 3X^2$

$$\frac{dy}{dx} = 2 \times 3. X^{2-1} = 6X$$

For power function; $Y = X^5$

$$\frac{dY}{dX} = 5 \times 1. X^{5-1} = 5X^4$$

For power function; $Y = X$

$$\frac{dY}{dX} = 1 \times 1 X^{1-1} = 1 \times 1. X^0 = 1$$

It should be noted that any variable raised to the zero power (as in our example X^0) is equal to 1 For power function, $Y = 3X^{-2}$

$$\frac{dY}{dX} = -2 \times 3. X^{-2-1} = -6X^{-3}$$

(iv) Derivative of a Sum (or) Difference of Two Functions

The derivative of a sum of the two functions is equal to the sum of the derivatives obtained separately of the two functions.

Suppose, $Y = f(X) + g(X)$

Where f(X) and g(X) are the two unspecified functions and Y is the sum of the two functions. The derivative of their sum is

$$\frac{dY}{dX} = \frac{df(X)}{dX} + \frac{dg(X)}{dX}$$

Likewise, the derivative of the difference of the two or more different functions is the difference of their separate derivatives. Thus, if

$$Y = f(X) - g(X)$$

then $$\frac{dY}{dX} = \frac{df(X)}{dX} - \frac{dg(X)}{dX}$$

To illustrate, we take some examples.

If, $Y = 4X^2 + 5X$

then $$\frac{dY}{dX} = 2 \times 4X^{2-1} + 1 \times 5X^{1-1} = 8X + 5$$

If $Y = 5X^2 - 2X^5$

$$\frac{dY}{dX} = 10X - 10^4$$

Now, consider the following profit function where each of the three terms represents a function

$$\pi = -40 + 140Q - 10Q^2$$

Where π stands for profit Q for profit and Q for level of output. Then, derivative of profit (π) with respect to output (Q) is

$$\frac{d\pi}{dQ} = 0 + 140 - 20Q$$

$$= 140 - 20Q$$

Note that derivative of a constant (–40) is zero, derivative of 140 Q is 140 and derivative $10Q^2 = 20Q$

(v) Derivative of a Product of the Two Functions

Suppose Y is the product of the two separate functions f(X) and g(X)

$$Y = f(X).g(X)$$

The derivative of the product of these two functions is equal to the first function multiplied by the derivative of the second function plus the second function multiplied by the derivative of the first function. Thus,

$$\frac{dY}{dX} = f(X).\frac{dg(X)}{dX} + g(X).\frac{df(X)}{dX}$$

For example, take the following function

$Y = 5X^2 (2X + 3)$

$f(X) = 5X^2$ and $g(X) = (2X + 3)$ are the two functions. Then, derivative of the product of these two functions,

$$\frac{dY}{dX} = 5X^2.\frac{d(2X+3)}{dX} + (2X+3).\frac{d(5X^2)}{dX}$$

$$\frac{dY}{dX} = 5X^2.2 + (2X + 3).\ 10X$$

$$= 10X^2 + 20X^2 + 30\ X$$

$$= 30X^2 + 30\ X$$

$$= 30\ (X^2 + X)$$

Take another example of the product rule, Let

$$Y = (X^3 + X^2 + 5)\ (2X^2 + 3)$$

then, $$\frac{dY}{dX} = (X^3 + X^2 + 5).\frac{d(2X^2+3)}{dX} + (2X^2+3).\frac{d(X^3 + X^2 + 5)}{dX}$$

$$= (X^3 + X^2 + 5)\ .4X + (2X^2 + 3).\ (3X^2 + 2X)$$

$$= (4X^4 + 4X^3 + 20X) + 6X^4 + 9X^2 + 4X^3 + 6X$$

$$= 10X^4 + 8X^3 + 9X^2 + 26\ X$$

1.6.2 Application of Derivatives to Optimization Problems

Q26. Explain the Application of Derivatives to Optimization Problems.

Ans :

The process of optimisation often requires us to determine the maximum or minimum value of a function. For a function to be a maximum (or minimum) its first derivative is zero, derivative of a function measures its slope. Therefore, maximization of a function occurs where its derivative is equal to zero, Thus, an important optimisation problem facing a firm is to produce a level of output which maximises firm's profits. Similarly, optimum use of resources requires that cost be minimised for producing a given level of output. These problems of maximisation and minimisation can be solved with the use of the concept of derivative.

(i) Use in Profit Maximisation

For example, consider the following profit function :

$\pi = -100 + 160\ Q - 10\ Q^2$

where π = profits and Q is units of output

For the profit (π) function to be maximum, its first derivative must be equal to zero.

Therefore, to find the profit-maximising level of output we find the derivative of the given profit function and set it equal to zero. Thus

$$\frac{d\pi}{dQ} = 160 - 20Q$$

Setting it equal to zero.

$$\frac{d\pi}{dQ} = 160 - 20\,Q = 0$$

$$20\,Q = 160$$

$$Q = \frac{160}{20} = 8$$

At 8 units of output profits will be maximum. Maximisation of profits through the use of derivative is graphically shown in Figure. It will be seen that profit maximisation curve reaches its maximum point at point H. Therefore, at point H, the slope of the tangent (which measures the value of the first derivative $\frac{d\pi}{dQ}$) drawn to the profit curve at this point is equal to zero. It will be seen that corresponding to maximum profit point H on the profit function level of output is 8 units.

Total profits made at 8 units of output can be obtained by substituting 8 for Q in the given profit function. Thus

$$\pi = -100 + 160 \times 8 - 10\,(8)^2$$

$$= 1280 - 740 = 540$$

Thus at output level of 8 units profits are equal to 540.

Graphical analysis cannot tell us easily exactly at what level of output, profits will be maximum, for it takes time to draw a graph and conclude from it. However, it is easier to use differential calculus to find the profit-maximising output. For this we simply find the first derivative of the profit function and set it equal to zero.

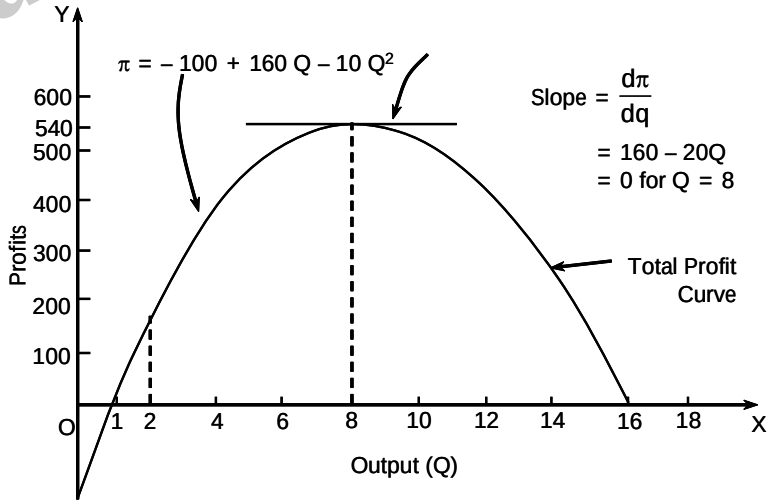


Fig. Profit Maximisation is reached at output level where $\frac{d\pi}{dQ} = 0$

(ii) Second Derivative and Second Order Condition for Optimisation

A problem arises when we use the first derivative of a function to determine its maximum or minimum value. For setting the first derivative of a function equal to zero and solving the resulting equation for the optimum value of the independent variable does not guarantee that optimum value (maximum or minimum as the case may be) will in fact he obtained. For the optimum value, the first derivative being equal to zero is a necessary condition for maximum or minimum, but it is not a sufficient condition : For example, in a profit function, first derivative is equal to zero, both at maximum and minimum profit levels. To ensure that the derivative is zero at the profit maximising level of the decision variable {i.e., output in the present case), we require to apply the second order condition. According to the second order condition, for profit maximisation, the second derivative of the profit function must be negative, that is, $\frac{d^2\pi}{dQ^2} < 0$ Thus, if optimisation requires maximisation of function say, $y = f(x)$, then the second derivative, which is written as $\frac{d^2y}{dx^2}$, must be negative.

It should be noted that the second derivative of a function is obtained by differenting the first derivative with respect to the independent variable. In case optimisation requires minimisation of a function as incase of minimisation of cost for producing a given level of output, the second derivative must be positive, that is, $\frac{d^2y}{dx^2} > 0$.

A profit function curve such as the one drawn in Figure may have both minimum point and maximum points. It will be seen from Figure that point /, represents the minimum point and H represents the maximum point of the profit curve. Important thing to note is that at both minimum point L and maximum point H, first order condition, that is, first derivative $\frac{d\pi}{dQ}$ be zero is satisfied at both points, L and H, corresponding to OQ_1 and OQ_2 levels of output. However, at point L profits are minimum and at point H profits are maximum. It is with the help of the second derivative of a function that we can distinguish between maximum and minimum along a function. Whereas the first derivative measures the slope of a function, the second derivative measures the slope of the first derivative. Thus, in case of profit function,

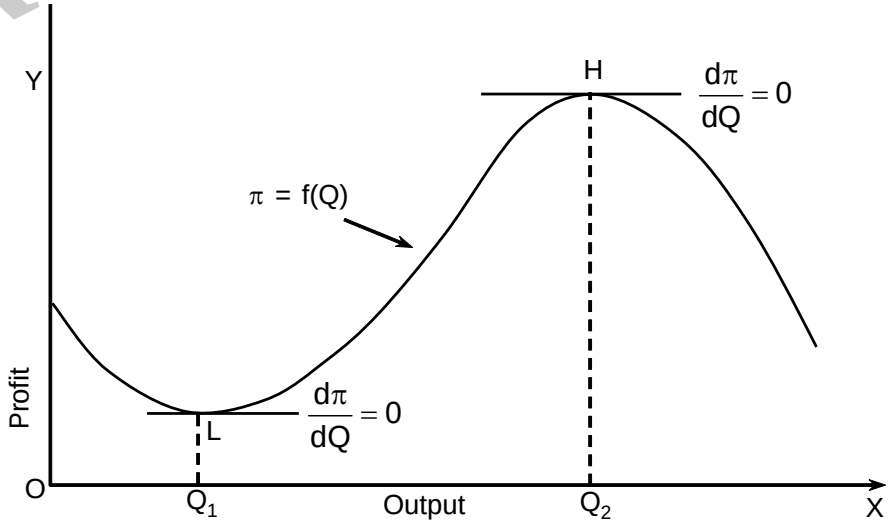


Fig. : Second Order Condition for Optimisation

where as first derivative, $\frac{d\pi}{dQ}$, measures the slope of the profit function curve, that is, marginal profit, its second derivative, $\frac{d^2\pi}{dQ^2}$, measures slope of the marginal profit function curve.

Since the second derivative of a function when measured at the maximisation level is always negative and when measured at the minimisation level is always positive, it can be used to distinguish between points of maximum and minimum.

For example, if the second derivative in our profit function curve is negative, it implies that profits are maximum at the level where first derivative is equal to zero. On the other hand, if the second derivative at a point on a profit function where first derivative is zero is positive, it shows profits are in fact minimum rather than maximum. It can be easily known from having a look at Figure. It will be seen from this figure that up to point L, marginal profit $\left(\frac{d\pi}{dQ}\right)$, that is, slope of the total profit curve, is negative and has been causing the total profits to fall. At point L, marginal profit $\left(\frac{d\pi}{dQ}\right)$ becomes zero and thereafter it becomes positive and therefore it will causes the total profit to increase. Hence, point L beyond which the second derivative (i.e. the slope of the first derivative) is positive, and therefore profits will be increasing, cannot be point of maximum profits.

Now consider point H on the total profit corresponding to output level OQ_2 . At point H, first derivative $\left(\frac{d\pi}{dQ}\right)$ is again equal to zero but after that marginal profit $\frac{d\pi}{dQ}$ becomes negative as the slope of total profit curve is negative as output is expanded beyond Q_2 This causes the total profits to fall. This shows that point H at which first derivative, $\frac{d\pi}{dQ}$ is zero and also beyond which second derivative $\left(\frac{d^2\pi}{dQ^2}\right)$, that is, slope of the first derivative becomes negative is indeed the point of maximum profit.

To conclude, we get a following general test for maximum and minimum.

(a) If the second derivative $\frac{d^2y}{dx^2}$ of a function is negative (< 0) at the point where first derivative $\left(\frac{dy}{dx}\right)$ is zero, it will represent a point of maximum.

(b) If the second derivative $\left(\frac{d^2y}{dx^2}\right)$ function is positive (> 0) at the point where first derivative is zero, it will represent a point of minimum.

(iii) Minimisation Problem

In some decision making problems the objective of a firm is to minimise the objective function. For example, efficiency in the use of resources requires that a firm should produce at the minimum possible cost per unit of output.

For example, the following average cost function of a firm is given :

$$AC = 25{,}000 - 180\ Q + 0.50\ Q^2$$

A firm is interested to find what level of output it will minimise its average cost. This can be obtained by differentiating the AC function with respect to output (Q) and setting it equal to zero,

Thus

$$\frac{d(AC)}{dQ} = 180 + 1.0Q$$

Setting it equal to zero and solving for Q we have

$$-180 + 1.0\ Q = 0$$

$$Q = 180$$

Applying the second order condition to ensure whether it is really minimum we take the second derivate of AC function

$$\frac{d^2AC}{dQ^2} = + 1.0$$

Since second derivative of AC function is positive, $\frac{d^2AC}{dQ^2} > 0$, output of 12.0 units of output is one than minimise average cost of production.

1.6.3 Role of Marginal Analysis in Decision Making

Q27. Explain the Role of Marginal Analysis in Decision Making.

Ans :

- Business economics is the application of economic theory and methodology to explain how a business firm achieves its objective most efficiently.
- The objective of a firm is generally considered to be maximisation of profits.
- The pursuit of profit-maximisation objective usually involves decisions regarding small increases or decreases in output and consequently small extra cost incurred and extra revenue earned.
- For example, decision regarding whether to produce small extra output depends upon how much extra cost it will require to be incurred and how much extra revenue it will yield. These small increase in cost incurred to produce an extra small quantity of a product is generally referred to as marginal cost and the small extra small revenue earned is referred to as marginal revenue.
- If the marginal revenue from small increase in output is greater than marginal cost incurred, it will be worthwhile to produce the extra small quantity of the product. The scale of the small increase or decrease in production, that is, the extent of marginal change depends on the overall operations and nature of commodity being produced.
- For example, an electricity generating firm will not be concerned with whether to produce one or 5 more watts of electricity. For the electricity generating company, the proper small quantity will refer to some hundred watts of electricity.
- However, for purposes of analysis of optimal decision making in economics marginal cost is conceived as extra cost of one additional unit of output and marginal revenue is conceived as extra net revenue earned from producing an extra unit of output.
- Not only in case of production decision regarding output of a good but also with regard to employment of a factor, say labour, the magnitude of employment is extended to the point at which marginal revenue product of a factor (i.e., extra revenue from employing an extra unit of labour equals marginal factor cost (MRP = MFC) of labour.
- Not only in the field of production activity but also in other economic activities such as demand and investment, marginal analysis serves as an important too! of optimal decision making.
- Thus, consumers while deciding about the demand for a good compare the marginal utility from an additional unit of a good with the price they have to pay for it and reach in equilibrium state when marginal utility from consumption of an extra unit equals the price of the good.
- Similarly, investment in more projects is made so long as marginal return from investment equals rate of interest.

1.7 TOTAL AVERAGE AND MARGINAL RELATIONSHIP

Q28. Explain the Relationship between total, average and marginal product.

Ans : **(June-16)**

In many economic models, a special set of functional relationships called total, average, and marginal functions is used. Such functions are

involved in the theory of demand, cost, production, and market structure. A basic command of these concepts is essential to understanding the principles of managerial economics.

The following production example will help in understanding these relationships. Suppose that there is a small building containing four machines and a stock of raw materials ready to be processed. Ten equally skilled and diligent workers are lined up outside ready to go to work in this factory. If there arc no workers, output will be zero. As workers arc added, output in-creases. The total amount of output associated with a particular input of labor working with those four machines is called the total product of labor. For example, the total product of one worker might be two units of output. As the labor input changes, so does total output. An ex-ample of a total product schedule is shown in the first two columns of Table.

As just indicated, one person working alone in this factory produces two units of output. Adding a second person and organizing the production system so that the workers complement each other results in total product increasing to five units. The first worker is associated with a two-unit increase in output; having two workers instead of one will increase output by three units; three workers will increase output by four units; and so on. The change in output

Number of Workers (L)	Total Product (Q)	Average Product (AP)	Marginal Product (MP)
0	0	—	
1	2	2.0	2
2	5	2.5	3
3	9	3.0	4
4	14	3.5	5
5	22	4.4	8
6	40	6.7	18
7	57	8.1	17
8	63	7.9	6
9	64	7.1	1
10	63	6.3	-1

Table : Total Average, and Marginal Product of Labor Schedules

associated with a one-unit change in workers is called the marginal product of labor. Using the Greek capital letter delta (A) to indicate a change, the marginal product function (MP) can be defined as

$$MP = \frac{\Delta Q}{\Delta L}$$

where Q represents output and

L represents the input of labor.

Note in Table that for the first six workers, the marginal product increases as the rate of labor input increases. However, marginal product declines thereafter. That is, the sixth worker adds 18 units to output, but the seventh adds only 17 units and the eighth worker only 6.

Finally, having 10 workers actually causes output to decline; the marginal product associated with the tenth worker is negative. The point has been reached where there are too many workers in this plant. Perhaps they are getting in each other's way; in any event, the presence of 10 workers has the achievement of efficient production.

The average product of labor function (AP) measures the average output per unit of labor used. Average product is found by dividing total product by labor input. That is,

$$AP = \frac{TP}{L}$$

The total product function is plotted in Figure (a), and the average and marginal product functions are shown in Figure (b). There are important relationships among the three functions that arc true for all total, average, and marginal functions. First, the value of the average function at any point along that curve is equal to the slope of a ray drawn from the origin to the total function at the corresponding point.

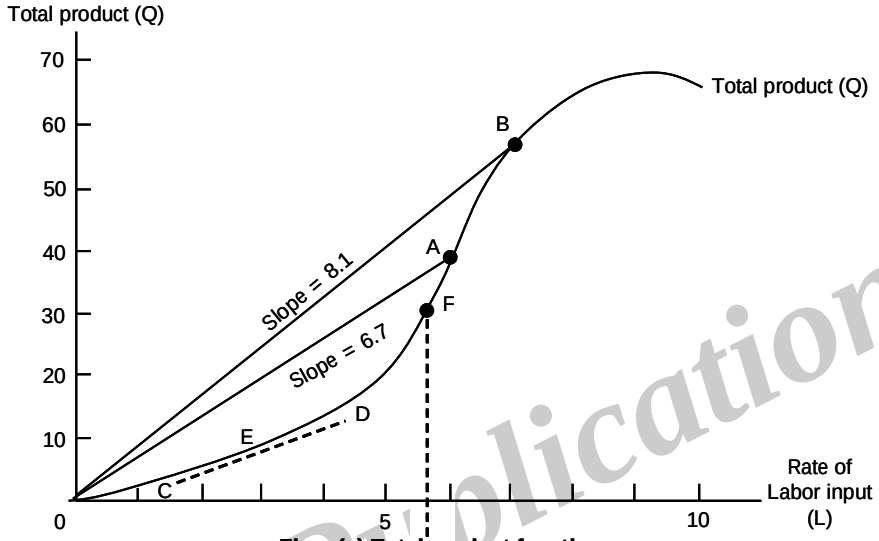


Fig. : (a) Total product function

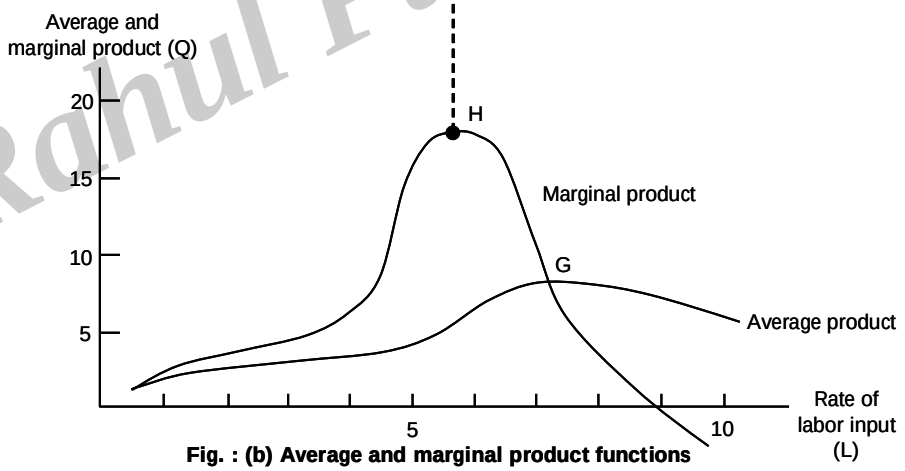


Fig. : (b) Average and marginal product functions

- For example, from Table it is known that the average product of six workers is 6.7. Thus, the slope of a line (OA) drawn from the origin to point A on the total product function has a slope of 6.7. Similarly, the average product of seven workers is 8.1: this is equal to the slope of a line (OB) drawn from the origin to point B on the total product function.
- Another key relationship is that the value of the marginal function is equal to the slope of the line drawn tangent to the total function at a corresponding point. For example, the slope of the dashed line CD, which is drawn tangent to the total function at E, is about 4. This means that the marginal product corresponding to this point (i.e., between 2 and 3 units of labor) is 4.

- Point F on the total function is called an inflection point. To the left of point F, the total function is increasing at an increasing rate: to the right of F. The total function is increasing but at a decreasing rate. Note that this inflection point, corresponding to about six workers, occurs at the point where the marginal product function is at a maximum (i.e.. point H in Figure (b)).
- If the marginal and average functions intersect, that point of intersection will be at the minimum or maximum point on the average function. In Figure (b), the intersection occurs at point G, which is the maximum point of the average product function.
- The logic of this relationship is quite straightforward. Suppose that the average product for two workers is 2.5 and the marginal product of three workers is more than that average, say, 4. Thus the average product for three workers must increase to 3.
- If the additional output associated with hiring another worker is above the previous average product, the average product must be increasing.
- Conversely, suppose that eight workers average 7.9 units of output per period and that the marginal product of nine workers is only l. This will cause average product to fall to 7.1.
- If an additional worker adds less to total output than the average product prior to that addition, average product must fall.
- This logic leads to the following conclusion. For any set of average and marginal functions, if the marginal function is greater than the average function, the average must be rising. If marginal is below average, the average must be falling.
- This implies that the intersection of the two functions must occur where the average function is at a maximum or minimum.
- Because the total function increases as long as the marginal function is positive and decreases when marginal is negative, it follows that total product is at a maximum when the marginal function is zero. In Figure (a) the maximum of the total product function occurs at nine workers.
- This point corresponds to the point where the marginal function intersects the horizontal axis, that is, where marginal changes from being positive to negative.
- An understanding of total, average, and marginal relations is an important foundation for the effective study of managerial economics.

PROBLEMS

1. Fill in the blanks in the following Table

Units of labour	Total product	Average product	Marginal product
1	-	40	-
2	-	-	48
3	138	-	-
4	-	44	-
5	-	-	24
6	210	-	-
7	-	29	-
8	-	-	27

Sol :

Units of labour	Total product	Average product (TP/Q)	Marginal product ($TP_n - TP_{n-1}$)
1	40	40	40
2	88	44	48
3	138	46	50
4	176	44	38
5	200	40	24
6	210	35	10
7	203	29	– 7
8	176	22	– 27

2. Given the total cost function TC = 150 + 7Q + 3Q² + Q³. Find the total cost, marginal cost and variable cost if the level of output is 10 units.

Sol : **(June-16)**

Given Total cost function = $150 + 7Q + 3Q^2 + Q^3$

Total cost = $150 + 7(10) + 3(10)^2 + 3(10)^3$

Total cost = 150 + 70 + 300 + 3000 = ` 3520/-

Marginal cost = $\frac{\Delta TVC}{\Delta Q} = a + 2bQ + 3CQ^2 + 4d^3$

$= 150 + 2(7)(10) + 3(3)(10)^2 + 4(10)^3$

$= 150 + 140 + 900 + 4000$

Marginal cost = ` 5190/-

Average cost = $\frac{TVC}{Q} = \frac{a}{Q} + \frac{bQ}{Q} + \frac{CQ^2}{Q} + \frac{dQ^3}{Q}$

$= \frac{150}{10} + \frac{70}{10} + \frac{300}{10} + \frac{3000}{10}$

$= 15 + 7 + 30 + 300$

Average cost = ` 352/-

3. Give the total cost function TC = 6 + 4q² derive the marginal cost function and average cost function.

Sol : **(Dec.-20, Dec.-16)**

$TC = 6 + 4q^2$

$$AC = \frac{TC}{q} = \frac{6}{q} + \frac{4q^2}{q}$$

$$AC = 4q$$

$$MC = \frac{d(TC)}{d(Q)}$$

$$= 6 + 8q$$

$$MC = 6 + 8q$$

4. A carpenter makes 100 chairs per month and sells on them at Rs. 200 per piece. His expenses on rent of the shop, cost of the wood and other material are worth Rs. 5000. He employs two workers whose monthly wages are Rs. 1,200 per worker. He also pays electricity bill of about Rs. 500 p.m. He has invested Rs. 1,00,000 on machinery tools and inventory of which Rs. 56,000 is from his own funds (earlier he used to get 6% p.a as interest) and the remaining Rs. 50,000 as a loan from bank @ 9% interest p.a. Further assume, imputed cost of his own time and his own premises at Rs. 3,000 and Rs. 1,000 p.m. respectively. Compute accounting profit and Economic profit.

Sol : **(Dec.-16)**

Accounting Profits = Total Revenue – Explicit Cost

Economic Profits = Total Revenue – Explicit Cost – Implicit Cost

Accounting Profit = (200 × 100) – 5000 – (1200 × 2) – 500 – 4500

= 20,000 – 5000 – 2400 – 500 – 4500

Accounting Profit = 20,000 – 12,400 = 7600

Economic Profit = 20,000 – 12,400 – 3000 – 1000

Economic Profit = Rs. 3600

5. Mr. X turned down a job offer of Rs. 5,00,000 per annum and started his own business. He invested Rs. 50,00,000 of his own money in the business by withdrawing the money from fixed deposit which was earning an interest of 7% per annum. He is using his own building for the business on which he was getting a rent of Rs. 15,000 per month.

The total revenue from the business during the first year was Rs. 85,69,000. The expenses were Rs. 60,62,000. Did Mr. X take correct decision by starting the business?

Sol : **(Dec.-15)**

Economic Profit = Accounting Profit – Imputed cost

Accounting profit = Revenues - Expenses

= 85,69,000 – 60,62,000

Accounting profit = 25,07,000

Imputed cost = Salary + Rent + Interest

= 41,667 + 15,000 + 3,50,000

Imputed cost = 4,06,667

Economic Profit = 25,07,000 – 4,06,667

Economic Profit = 21,00,333

6. Akash gave up his job (in which he used to get a monthly salary of Rs. 10,000) and started a business of retailing garments in own shop (earlier he used to get a monthly rent of Rs. 5,000 pm(with Rs. 1,00,000 capital (withdrawn from bank on which he used to get Rs. 6,000 interest p.a). He reported the following revenues and expenses :

Sales Rs. 4,80,000, cost of goods sold Rs. 1,90,000, Labour Rs. 10,000, Advertising and Insurance of Rs. 15,000, find out economic profit and accounting profit.

Sol :

Particulars	Amount	Amount
Sales	4,80,000	
Less :		
Cost of goods	1,900,00	
Labour	10,000	
Adv & Insurance	15,000	2,15,000
		2,65,000
Imputed cost		
Salary	10,000	
Rent	5000	
Interest	6,000	21,000
Accounting profit		2,44,000

(Economic profit = Accounting profit – Imputed cost)

(2,65,000 – 21,000 = 2,44,000).

7. A.M. Com Graduate quit his Rs. 5,00,000 salary job for starting a new business. He will Invest Rs. 7,00,000 of his own money, which has been in a bank account earning 8 percent interest per year. He also plans to use building he own in Hyderabad that has been rented for Rs. 209,000 per month. Revenue in the new business during the first year was Rs. 12,00,000 while other expenses were

Advertising	**Rs. 1,00,000**
Taxes / Licence fee	**Rs. 75,000**
Salaries	**Rs. 3,50,000**
Supplies	**Rs. 50,000**

Calculate the Accounting profit and economic profit.

Sol : **(Jan.-20)**

Accounting Profit = Total revenue – Accounting cost

Economic Profit = Total revenue – Economic cost

Economic Cost = Accounting cost + Opportunity cost

Accounting cost = 1,00,000 + 75,000 + 3,50,000 + 50,000

= 5,75,000

Economic cost = 5,75,000 + 5,00,000 + 96,000 (7,00,000)

= 11,31,000

Total revenue = 12,00,000

Accounting Profit = Total revenue – Accounting cost

= 12,00,000 – 5,75,000

= 6,25,000

Economic Profit = Total revenue – (Accounting cost – Opportunity cost) or Economic cost

= 12,00,000 – 11,31,000

= 69,000

8. A firm's total revenue (TR) and total cost (TO) functions are

$TR = 110Q - 5Q^2$

$= 10Q - Q^2 + 0.33Q^2$

Determine

(a) Equations for marginal revenue and average revenue

(b) The output rate that maximizes total revenue.

Sol : **(Jan.-20)**

Given that

$RR = 110Q - 5Q^2$

$TC = 10Q - Q^2 + 0.33Q^3$

(a) $MR = \frac{d(TP)}{d(Q)} = 110Q - 5Q^2$

$= 110Q^{1-1} - 2.5.Q^{2-1}$

$= 110 - 10Q$

$AR = \frac{TR}{Q} = \frac{110Q - 5Q^2}{Q} = 110 - 5Q$

(b) The output rate that maximiger total revenue =

$= MR = 0$

$MR = 110 - 10Q = 0$

$= 110 = 10Q$

$= Q = \frac{110}{10} = 11$

At the level of 11 units of output total revenue will maximized.

9. Given the total revenue function TR = 1000Q – 10Q². Where Q is the rate of output per period. Determine the rate of output that results in maximum total revenue.

Sol : **(Dec.-20)**

Given that

$TR = 1000Q = 10Q^2$

When

$TR = 0$ the output maximizes

$TR = 1000Q - 10Q^2 = 0$

$$\frac{d(TR)}{dQ} = 1000Q - 10Q^2 = 0$$

$$= 1000 - 20Q = 0$$

$$= 1 - 20Q + 1000$$

$$= Q = \frac{1000}{20} = 50$$

When the output rate 50 units total revenue will maximizes.

10. A study indicated that the average cost function for a high school is AC = 10.3 – 0.4Q + 0.00012Q² where Q is the number of students in the school. What number of the students results is minimum average cost. Find equation for marginal and total cost?

Sol : **(June-16)**

$AC = 10.3 = 0.4Q + 0.001\ 2Q^2$

$$MC = \frac{d(TC)}{dQ} = -0.4 + 0.0024Q$$

$$\frac{d(AVC)}{dQ} = -0.4 + 0.00024Q.$$

Setting it equal to zero, we have

$-0.4 + 0.0024\ Q = 0$

$0.0024\ Q = 0.4$

$Q = 0.4$

$$Q = \frac{0.4}{0.0024}$$

$Q = 1667.$

11. Given a profit function $\pi = -100 + 160Q + 10Q^2$. Find the profit maximization level of output.

Sol : **(Dec.-15)**

Given,

Profit Function $p = -100 + 160\ Q + 10\ Q$

Where

π = profit,

$Q \rightarrow$ Units of output

For the profit (π) function to be maximum, its first derivative must be equal to zero.

Therefore, to find the profit-maxiising level of output, we find the derivative of the given profit function and set it equal to zero.

Therefore, to find the profit-maximizing level of output, we find the derivative of the given profit function and set it equal to zero.

Thus $\frac{d\pi}{dQ} = 160 - 20\ Q$

Setting it equal to zero

$$\frac{d\pi}{dQ} = 160 - 20\ Q = 0$$

$20\ Q = 160$

$$Q = \frac{160}{20} = 8.$$

At 8 units of output, the profit will be maximum.

Total profits made at 8 units of output can be obtained by substituting 8 for Q in the given profit function.

$\pi = -100 + 160 \times 8 - 10(8)^2$

$= 1280 - 740$

$\pi = 540.$

Thus at output level of 8 units, profits are equal to 540.

Short Question and Answers

1. Define managerial economics.

Ans :

Managerial economics is a discipline which deals with the application of economic theory to business management. It deals with the use of economic concepts and principles of business decision making.

Formerly it was known as "Business Economics" but the term has now been discarded in favour of Managerial Economics. Managerial Economics is often called as Business Economics or Economic for Firms.

Meaning

Managerial economics is a branch of economics that applies microeconomic analysis to decision methods of businesses or other management units.

Definitions

Managerial economics has been defined by different scholars as follows.

(i) According to Spencer and Siegelman, "Managerial economics is the integration of economic theory with business practice for the purpose of facilitating decision-making and forward planning by management"

(ii) According to Mc Nair and Meriam, "Managerial economics is the use of economic models of thought to analyze business situations"

(iii) According to Brigham and Pappas, "Managerial economics is the application of economic theory and methodology to business administration practice"

Managerial economics by nature is a specialized discipline of management studies that deals with the application of economic theory, tools and methodologies to business management practice.

Management economics has evolved as an integration of economic theory and decision sciences with business management.

2. Scope of managerial economics.

Ans :

The scope of managerial economics include all the economic concepts, theories, ideas, principles, tools and techniques that can be used to analyze the business environment and find solutions to practical business problems. The following business areas can be considered as the scope of managerial economics.

1. Objectives of a Business Firm or Organization

Managerial economics provides a sound framework by facilitating a business firm to frame its objectives both in the short-run and long-run.

2. Resource Allocation

Managerial economics provide the methods of effective resource allocation. It mainly aims at achieving high output through low and proper allocation of resources.

3. Demand Analysis and Demand Forecasting

It suggests the methodologies for analyzing the demand of a product. The demand forecasting techniques it provides are proven to be quite efficient for meeting the competition.

4. Competitive Analysis

The techniques provided by managerial economics facilities a firm to withstand in a competitive situation.

5. Strategic Planning

Managerial economics guides a business manager in making strategic decisions.

6. Production Management

Managerial economics plays a vital role in production management. It's effective tools helps to plan the business schedule, regulate the production process and effectively place the output in the market.

3. What do you understand by Optimization?

Ans :

Optimization deals with the determination of extreme values which could be maximum or minimum for the goal (objective) variable. The goal variable could be just one (unique) or more (multiple).

For example, a private firm might pursue profit-maximization as its single goal. If so, the optimization technique must determine the values of the variables, which are under the firms control, called choice variables, so that they ensure the achievement of maximum possible profit to the firm. Alternatively, a public sector firm might aim at minimizing its average cost of production as the sole objective. In that case, the role of optimization techniques would be to find out the values of the variables under the firm's control that arc consistent with the minimum possible value for its average cost.

In contrast, a government undertaking might have twin goals, namely, maximization of profit and maximization of employment of unskilled labour. Further, these two goals may or may not be compatible i.e. the achievement of one may lead or harm the attainment of the other.

If the two or more goals are conflicting, one has to resort to the multiple optimization techniques which arc outside the scope of this-text. It will be sufficient to point out here, that the problem could be handled by choosing one goal variable as the objective and the remaining goal variables having some assigned specific (target) values to act as the constraints. If necessary, iterations could be carried out by changing the goal variables and/or by redefining the targets of the residual goal variables.

4. What do you understand by function?

Ans :

A function describes the relation between two or more than two variables. That is, a function expresses dependence of one variable on one or more other variables. Thus, if the value of a variable Y depends on the value of another variable X, we may write

$Y = f(X)$ ..... (1)

Where f stands for function.

This expression (1) is read as ' Y is function of X'. This implies that every value of the variable Y is determined by a unique value of the variable X. In the function (1), Y is known as the dependent variable and X is the independent variable. Thus in function (1) Y is the dependent variable and its value depends on the value of X. Further, the independent variable is interpreted as the cause and the dependent variable as the effect. An important function which is extensively used in economics is a demand function which expresses that quantity demanded of a commodity is a function of its price, other factors being held constant. Thus, demand for a commodity X is described as under :

$$D_x = f(P_x)$$

Where D_x is the quantity demanded of commodity X and P_x is its price.

Similarly, supply function of a commodity X is expressed as

$$S_x = f(P_x)$$

When the value of the variable Y depends on more than two variables X_1, X_2 ..... X_n this function is written in general form as :

$$Y = f(X_1 X_2, X_3, X_4 ..... X_n)$$

This shows the variable Y depends on several independent variables X_1, X_2, ...X_n where n is the number of independent variables. Again note that in economics we write 'causes' as the independent variables and 'effect' as the dependent variable.

5. Nature of managerial economics.

Ans :

(a) Close to microeconomics

Managerial economics is concerned with finding the solutions for different managerial problems of a particular firm. Thus, it is more close to microeconomics.

(b) Operates against the backdrop of marco economics

The macroeconomic conditions of the economy are also seen as limiting factors for

the firm to operate. In other words, the managerial economist has to be aware of the limits set by the macroeconomic conditions such as government industrial policy, inflation, and so on.

(c) Normative statements

A normative statement usually includes or implies the words 'ought' or 'should'. They reflect people's moral attitudes and are expressions of what a tam of people ought to do. For instance, it deals with statements such as 'Government of India should open up the economy'.

(d) Prescriptive actions

Prescriptive action is goal oriented. Given a problem and the objectives of the firm, it suggests the course of action from the available alternative fro optimal solution. It does not merely mention the concept, it also explains whether the concert can be applied in a given context or not. For instance, the fact that variable costs are marginal costs can be used to judge the feasibility of an export order.

(e) Applied in nature

'Models' are built to reflect the real life complex business situations and these models are of immense help to managers for decision making. The different areas where models are extensively used include inventory control, optimization, project management etc. In managerial economics, we also employ cases study method to conceptualize the problem, identify the alternatives and determine the best course of action.

(f) Offers scope to evaluate each alternative

Managerial economics provides an opportunity to evaluate each alternative in terms of its costs and revenues. The managerial can decide which is the better alternative to maximize the profits for the firm.

6. Price-Output Decision.

Ans :

Pricing of a product by a business firm is an important decision that has to be made by a manager. Price of a product will determine to a good extent how much quantity of its product it will be able to sell. Price along with cost per unit and output sold will determine its profits. In deciding about price of its product, a firm has to estimate demarid for its product and also to estimate cost-output relationship. Its estimates of demand and production cost will determine how much quantity of output it should produce to maximise its profits. Profit is the difference between revenue and cost. Demand for a product tells the firms the quantities of a product that can be sold at various prices, and cost-output relationship (i.e., cost function) determines the cost per unit that has to be incurred by producing different levels of output. Thus, demand together with cost determines the profit possibilities of producing a product.

It is important to note that price-output decisions made by a firm depends on the type of market structure, that is, the degree of competion prevailing in the market. As seen above, a firm working in perfectly competitive market structure exercises no control over the price of the homogeneous product and is merely a price taker. Firms working in monopoly and monopolistic competition can take to a greater or lesser extent independent price-output decisions keeping in view the degree of competition they are facing in the market. The areas of microeconomics which deals with demand theory, cost theory, and product-pricing are particularly useful for making decisions about wheat price to be charged and what quantity of output to be produced.

7. Investment Decisions.

Ans :

The other type of long-run decisions relates to investment or capital expenditure. Investment expenditure is required to expand the productive capacity, developing and introducing new products. Since they are of long-run nature, investment decisions precedes other decisions. Investment decisions relate to how much investment or capital

expenditure is to be undertaken in a period, what should be the rate of investment over the years, and on what projects capital expenditurre is to be made. It is important to note that investment or capital expenditure on establishing or expanding production capacity yields returns in future periods. The theory of capital budgeting which has been developed in recent years is useful for deciding whether or not to undertake any specific investment or capital expenditure, or whether it is desirable to take over other firms to expand capacity.

Theory of capital budgeting essentially involves evaluating costs of an investment project and returns or profits flowing from it in future years. If the present discounted value (PDV) of expected returns from an investment project exceeds the cost, it is worthwhile to incur the particular capital expenditure.

8. What is firm.

Ans :

A firm is an organisation which transforms the hired inputeinto outputs for sale. Two types of input are used by the firms, human resources (such as labour resource and entrepreneurial resource) and capital resources (such as land, man made capital, forests rivers etc.). The most important task of the firm as to purchase the resources or inputs and transform them into goods or services for sale.

9. Profit maximization theory.

Ans :

Profit maximization is one of the most common and widely accepted objective of a firm. According to the profit maximization theory, the main aim of the firm is to produce large amount of profits. Profit is considered as the internal source of funds and the market value of the firm also rely mainly on the profits earned by the firm. In order to survive in the market, it is very essential for the firms to earn profits.

Profits are obtained by deducting total revenue from the total cost i.e.,

Profit = Total revenue – Total cost

The profit maximisation theory is supported by Nobel Laureate Milton Friedman. He considered it as valid for anticipating future business trends and practise.

10. Behavioural theories.

Ans :

According to the behavioural theories the firm tries to attain a satisfactory behaviour instead of maximisation. These are two important behavioural models, Simon's satisfying model and model developed by Cyest and March.

The Simon's satisfying model states that firms carry out their operations under 'bounded rationality' and can only attain a satisfactory level of profit, sales and growth, Simon carried out a research and found that modem business does not have adequate information and is uncertain about future due to which it is very difficult to attain profit, sales and growth objectives.

The model developed by Cyest and March states that firms should be oriented towards multigoal and multi decisions making. Instead of dealing with uncertainty and inadequate information, the firms should fulfill the conflicting goals of various stakeholders such as shareholders, employees, customers, financiers, government and other social interest groups.

Thus, the above mentioned were the various theories of firm.

11. Objectives of a Firm

Ans :

(i) Profit Maximization Theory

Profit maximization is one of the most common and widely accepted objective of a firm. According to the profit maximization theory, the main aim of the firm is to produce large amount of profits. Profit is considered as the internal source of funds and the market value of the firm also rely mainly on the profits earned by the firm. In order to survive in the market, it is very essential for the firms to earn profits.

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(ii) Baumol's Theory of Sales Revenue Maximisation

The validity of profit maximisation as an objective of firm was questioned by Baumol. According to Baumol, maximisation of sales revenue is the main objective of the firms in the competitive markets. He found that sales volumes helps in finding out the market leadership in competition. According to him, in large organisation, the salary and other benefits of the managers are connected with the sales volumes instead of profits. So, managers try to maximise the total revenue of the firms. The volumes of sales represents the position of the firm in the market. The increase in the sales figures enhances the competitive new of the firm. The managers of firm performs the operations of the firm and their performance is measured on the basis of the attainment of sales target so the management will try to maximise sales and maintain minimum profit. Thus, the main aim of the firm to maximise sales revenue and maintain minimum profits for satisfying shareholders.

12. Explain the differences between economic profit and accounting profit.

Ans :

S.No.	Accounting Profit	Economic Profit
1.	It is the gap between total revenue and accounting cost or explicit costs.	It is the gap between total revenue and economic costs.
2.	Accounting profit does not accounts implicit or opportunity cost in its cost side.	Economic profit includes both explicit as well as implicit cost in its cost side.
3.	Accounting profit can be taken as a part of economic profit.	Economic profit can not be taken as a part of accounting profit.
4.	It is micro concept and based on accounting period.	It is macro concept and based on comprehensive market view.
5.	It is considered for income tax and measure of financial performance of a company or firm.	It is considered to determine the financial situation and basis for knowing whether or not stay in the market.

13. Economic Profit

Ans :

It is the gap between total revenue and economic costs. Economic profit includes both explicit as well as implicit cost in its cost side. Economic profit can not be taken as a part of accounting profit. It is macro concept and based on comprehensive market view. It is considered to determine the financial situation and basis for knowing whether or not stay in the market.

Choose the Correct Answer

1. Which is the application of economic theory and methodlogy of business administration & practice [a]
   (a) Managerial economics (b) Economic analysis
   (c) Financial management (d) None of the above
2. The law of scarcity [d]
   (a) Does not apply to rich, developed countrles
   (b) Applies only to the less developmed countries
   (c) Implies that consumer want will be satisfied in a social system
   (d) Implies that consumer wants will never be completely satisfied
3. Economics is neutral between ends [a]
   (a) Robbins (b) Marshall
   (c) Plagou (d) Adam smith
4. The term economics is derived from [a]
   (a) Greek word olkonomia (b) Latin word olkonomia
   (c) Greek word oklonomus (d) None of the above
5. Father of economics [a]
   (a) Adam smith (b) Alfred marshall
   (c) J.B Say (d) A.C. Digou
6. Managerial economics helps in finding solution to various [a]
   (a) Business problems (b) Financial problems
   (c) Economic problems (d) None
7. Managerial decision making process _____ types [a]
   (a) Six (b) Seven
   (c) Three (d) Four
8. Economic fore casting leads to _____ [a]
   (a) Forward planning (b) Future planning
   (c) both a & b (d) None
9. Decision making is a process of [a]
   (a) Alternative selection (b) Random selection
   (c) both a & b (d) None
10. Management functions are [a]
   (a) Planning, organizing, directing, controlling staffing
   (b) Planning, functioning, paymeny
   (c) Only controlling and staffing
   (d) None of the above

Fill in the blanks

1. _____ is a discipline which deals with the applications of economic theory to business management.
2. _____ is a branch of economics that applies microeconomics analysis to decision methods of businesses or other management units.
3. Managerial Economics indicated certain _____ norms like honesty, responsibility and adjustablity etc.
4. _____ suggest various ways and means for maintaining the growth rates in the developed economics.
5. Expand TR _____ .
6. Expand MR _____ .
7. Expand TC _____ .
8. _____ guides a business manages in making strategic decisions.
9. _____ is also known as fast cycle or rapid bench marking tool.
10. _____ is the primary goal of a firm.

ANSWERS

1. Managerial Economics
2. Managerial Economics
3. Ethical Value
4. Managerial Economics
5. Total Revenue
6. Marginal Revenue
7. Total Cost
8. Managerial Economics
9. Bench Marking
10. Profit Maximization

UNIT II

Demand Analysis :

Demand Theory and Analysis – Individual demand and Market demand – Factors determining demand – Relationship between AR and MR-Consumer Behaviour –utility analysis – indifference curve analysis - Elasticity of demand – Price Elasticity - Income Elasticity – Cross Elasticity – Elasticity and Decision making (including problems). Demand estimation and demand forecasting: Meaning, significance and methods

2.1 Demand Theory and Analysis

Q1. Define demand. What are the objectives of demand?

Ans : **(Dec.-20)**

Introduction

In economic science, the term "demand" refers to the desire, backed by the necessary ability to pay. The demand for a good at a given price is the quantity of it that can be bought per unit of time at the price. There are three important things about the demand :

1. It is the quantity desired at a given price.
2. It is the demand at a price during a given time.
3. It is the quantity demanded per unit of time.

Meaning

Demand is the amount of particular economic goods or services that a consumer or group of consumers will want to purchase at a given price at a particular time.

Therefore, demand means desire backed up by adequate purchasing power to pay for the product when demanded and willingness to spend the money for the satisfaction of that desire.

Demand = Desire to buy + Ability to pay + Willingness to pay.

Definitions

i) **According to Benham,** "The demand for anything, at a given price, is amount of it, which will be bought per unit of time, at that price".

ii) **According to Bobber,** "By demand we mean the various quantities of a given commodity or service which consumers would buy in one market in a given period of time at various prices".

iii) **According to G.L. Thiekettle,** "The demand for any commodity or service is amount that will be bought at any given price per unit of time".

Objectives

1. Demand Forecasting

Forecasting of demand is the art of predicting demand for a product or a service at some future date on the basis of certain present and past behaviour patterns of some related events.

2. Production Planning

Demand analysis is prerequisite for the production planning of a business firm. Expansion of output of the firm should be based on the estimates of likely demand, otherwise there may be overproduction and consequent losses may have to be faced.

3. Sales Forecasting

Sales forecasting is based on the demand analysis. Promotional efforts of the firm should be based on sales forecasting.

4. Control of Business

For controlling the business on a sound footing, it is essential to have a well conceived budgeting of costs and profits that is based on the estimation of annual demand/sales and prices.

5. Inventory Control

A satisfactory control of business inventories, raw materials, intermediate goods, semi-finished product, finished product, spare parts, etc., requires satisfactory estimates of the future requirements which can be traced through demand analysis.

6. Growth and Long-Term Investment Programs

Demand analysis is necessary for determining the growth rate of the firm and its long-term investment programs and planning.

7. Economic Planning and Policy Making

Demand analysis at macro level for the nation as a whole is of a great help to the planners and policy-makers for a better planning and rational allocation of the country's productional resources. The Government can determine its import and export policies in view of the long- term demand forecasting and estimation for various goods in the country.

Q2. Explain the various features of demand.

Ans :

Features

The various features of demand are:

a) Difference between Desire and Demand

Demand is the amount of commodity for which a consumer has the willingness and the ability to buy .These is difference between need and demand. Demand is not only the need, it also implies that the consumer has the money to purchase it.

b) Relationship between Demand and price

Demand is always at a price .unless price is stated, the amount demanded has no meaning. The consumer must know both the price and the commodity and he will tell his amount demanded.

c) Demanded at a point of time

The amount demanded must refer to some period of time such as 10 quintals of wheat per year or six shirts per year of five kilos of sugar per month .not only this, the amount demanded and the price must refer to a particular data.

Q3. What do you understand by demand functions? Explain its types.

Ans :

Meaning

A demand function is a mathematical relationship between the quantity demanded of the commodity and its determinants. A demand function can be represented as,

$Q = f$ (demand determinants)

Where,

Q = Quantity demanded of a commodity.

Types

Generally, a demand function is of two types,

1. Individual Demand Function

Individual demand function is a mathematical relationship between the demand by an individual consumer and the determinants of individual demand. Mathematically, it can be expressed as,

$$Q_x = f(P_x, I, P_1 \ldots P_n, T, A, E_p, E_I U)$$

Where,

Q_x = Quantity demanded of the commodity x

P_1 = Price of the commodity itself

I = Consumer's Income

$P_x \ldots P_n$ = Prices of the related goods

T = Consumer tastes and preferences

A = Advertisement

ε_p = Consumer's expectation about future prices

E_r = Consumer's expectation about his/ her future income

U = Other determinants.

An individual demand function can also be defined as the functional relationship of the quantity demanded by an individual and its determinants.

2. Market/Aggregate Demand Function

Market/Aggregate demand function is the functional relationship between the market demand for a commodity and the determinants of market demand. Mathematically it can be expressed as,

$$Q = f(P_x, I, P_1, ... P_n, T. A, E_p, E_I, P, D, U)$$

Where,

Q_x = Quantity demanded of the commodity x.

P_x = Price of the commodity itself

I = Consumer's Income

$P_1 ... P_n$ = Prices of the related goods

T = Consumer tastes and preferences

A = Advertisement

E_p = Consumer's expectation about future prices

E_I = Consumer's expectation about his/her future income.

P = Population or market size

D = Distribution of consumers in the market according to income, age, gender etc.

U = Other determinants.

Comparison of Individual Demand Function and Market/Aggregate Demand Function

The major difference between the individual demand function and market demand function is that in market demand function, the size and the nature of the consumers in a given market are also considered. Mathematically the terms P-size of the market and D-distribution of consumers in the market are also added in market demand function.

Q4. Define demand curve? What are the characteristics of demand curve?

Ans :

Meaning

The graphical representation of the demand schedule is known as demand curve. The demand curve always slopes downwards from left to right. This negative slope of the demand curve indicates the opposite relationship between the price and the quantity demanded.

Characteristics

The characteristics of demand curve can be summarized as follows:

1. Position of the Curve

A demand curve's position refers to its placement on a graph. Since economic analysts use the same graph to chart both a demand curve and the related, inverse supply curve, the scales representing price and quantity must remain the same. If a demand curve is positioned far to the right, it indicates a high quantity of demand from consumers at a given price. When a demand curve is low on the graph, it indicates that low prices create steady demand.

2. Slope of the Curve

The rate of change in demand over various price points gives a demand curve its slope. Demand curves can be concave, convex or form straight lines. In each case, the rate of change in quantity demanded as price decreases forms the changing angle of the curve. A steep demand curve means that price reductions only increase quantity demanded slightly, while a concave demand curve that flattens as it moves from left to right reveals an increase in quantity demanded when low prices drop even slightly lower.

3. Shifting of Curve

Shift refers to a demand curve's change in position over time. As the demand curve moves to new positions on the graph, it

reveals changing trends in consumer behavior. For example, when a demand curve falls on graph from one measuring period to another, it indicates that lower prices produce the same level of demand as higher prices did during an earlier measuring period. Comparing demand curves over time allows business leaders to make important decisions about changing prices or altering supply levels to maximize profit.

Q5. Why the demand curve slope downwards from left to right ?

Ans : **(Dec.-15)**

According to traditional approach, the cause of the slopping downward trend of demand curve is the application of the law of diminishing marginal utility. Professor Marshall expresses this view. J.R. Hicks, Allen and other modern economist argue that it is due to the income effect and substitution effect. Following are the main causes, which are responsible for this relationship and downward slopping of demand curve:

1. Entry and Exit of Consumer

If the price of a particular commodity falls, some new consumers enter in the market and start purchasing the commodity. The old consumers also start consuming more of the commodity. If the price increases, new consumers withdraw and old consumers start consuming lesser commodity. The result of the consumer's behaviour is the operation of law of demand and the downward of demand curve.

2. Law of Diminishing Marginal Utility

The satisfaction derived from the consumption of successive units goes on falling, because earlier units have partly satisfied our wants. In this way, every additional unit of the commodity will give us lesser utility (satisfaction). So a consumer wants to pay lesser price for additional unit and he only purchases additional unit when the price falls. Therefore demand curve come slopes down wards.

3. Multiple Uses of Goods

If the price of the goods falls, consumers use more of those particular goods for different purpose and quantity demand increases. For example, when the price of electricity falls, consumers use electricity for different purpose.

4. Substitution Effect

When the price of any substitute good falls, the consumer gives up the dearer good and buys additional units of the cheaper good. In the same way, when the price falls, the consumers, who are consuming other goods, are also attracted to the cheaper goods and it makes the demand curve downward slopping.

5. Income Effect

When the price of a commodity falls, the real income (purchasing power of money income) of the consumer increases. This enables the consumer to buy more units. For example, let money income of the consumer be 100, using this consumer wants to buy commodity 'X' whose price is 25 per kg. In that case consumer would buy only 4 kg. On the other hand, assuming money income to be constant (100), if the price of commodity falls to 20, he will be able to buy 5 kg. That is the real income of the consumer increases with the fall in price and vice versa.

2.1.1 Individual Demand and Market Demand

Q6. Explain about Individual Demand.

Ans :

For an individual/household the amount demanded of a commodity is different at different prices. If we put in a tabular form the amount demanded of a commodity at different price levels of the commodity, we get a demand schedule. A demand schedule at any particular time refers to the series of quantities the consumer is prepared to

buy at its different prices. An imaginary demand schedule for oranges for a consumer, say A, is given in Table. This demand schedule is for an individual consumer and is, therefore, known as Individual demand schedule.

In case we have similar demand schedules for all the consumers in the market, we can then add up the quantities demanded of the commodity by these consumers at each price and get a summed up schedule called the market demand schedule.

Price of oranges (Rs.)	10	9	8	7	6
Quantity demanded of oranges (dozen)	1	3	7	11	13

Table: Demand for Oranges by Individual A

Determinants of Individual Demand

The following are the factors as determinants that affect the individual's demand for a product.

a) Price of the Commodity Itself

The price of the product or the commodity is the basic consideration for determining the demand of a commodity with other things remaining the same. Usually, a consumer buys more of a product when its price is low and buys a fewer of it when its price is high. Thus, the demand for a commodity varies inversely with its price. A decrease in price, increases the purchasing power of the consumer, he can therefore buy more of it (Substitute effect) and the demand for the product rises.

An increase in price reduces the purchasing power of the consumer and thereby the demand for the product reduces (Income effect). When the price of the commodity increases, the demand for it decreases and as a result the demand curve slopes downwards. Therefore, an increase in price has the negative effect on demand. The inverse relation between the price and the demand for a commodity is symbolically represented as,

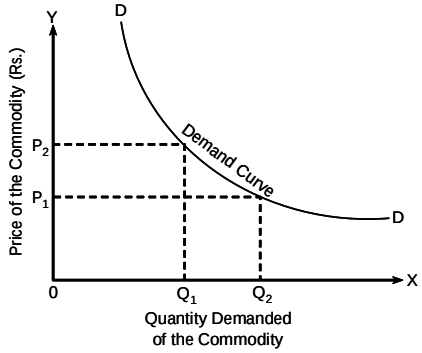
$$D = \frac{1}{P}$$

Where,

D – Demand for the commodity

P – Price of the commodity.

Graphically, it can be represented as,



In the above figure Q_1 Q_2 are the quantities demanded of the commodity at the prices P_2 and P_1 respectively i.e., if the price is P_1 (low), the quantity demanded is Q_2, (high) and if the price is P_2 (high), the quantity demand is Q_t (low).

In a tabular form, it is represented as

Price	Demand
Increases	Decreases
Decreases	Increases

b) Consumer's Income

Individual consumer's income determines his/her purchasing ability. Therefore, consumer's income is an important determinant of demand. An increase in income makes an individual to buy many commodities in his purchase bundle. The effect of income on demand can be analyzed for,

i) Normal Goods

ii) Perishable Goods

iii) Inferior Goods.

i) Normal Goods: Usually, the demand for a normal good goes in the same direction with consumer's income i.e., demand for normal goods is directly related to consumer's income.

Symbolically

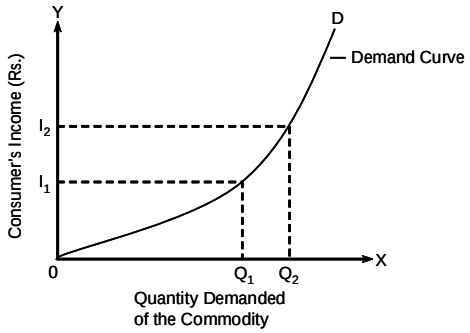
D = t

Where,

D - Demand for the commodity

t - Consumer's income.

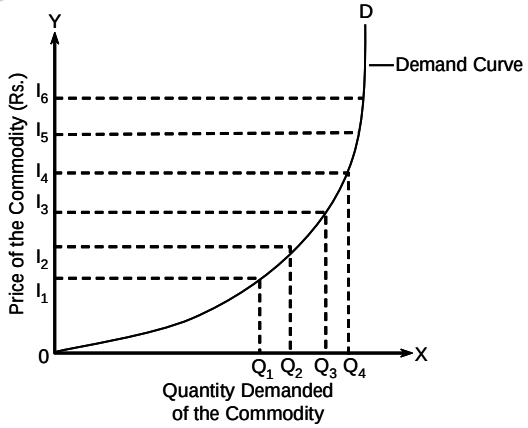
Graphically



In the above figure, Q_1, Q_2, are the quantities demanded of the commodity at the income levels t_1, and t_2 respectively i.e., income and demand increase/decrease in the same direction.

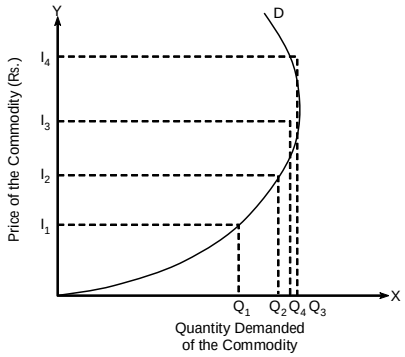
ii) Perishable Goods

For perishable goods like foods, fruits, meat, vegetables etc., the quantity demanded raises with an increase in income, but after a certain level it remains constant even though the income raises. The demand curve for perishable goods is as follows,



In the above figure Q_1, Q_2, Q_3 and Q_4 are the quantities demanded at the income levels I_1, I_2, I_3, I_4, I_5 and I_6. It is observed that the quantity demanded raises to Q_3 as income raises to I_3. But after I_3, even if the income increases to I_4, I_5 and I_6, the quantity demanded remains same at Q_4. This indicates that the demand for perishable goods increases with income, but after a certain point, it remains constant even though the income increases.

iii) Inferior Goods: The goods for which the demand decreases even though the income level increases are 'inferior goods'. The demand curve for inferior goods is as follows,



From the above figure Q_1 Q_2 Q_4, Q_3 are the quantities demanded at the income levels I_1, I_2, I_3 and I_4. It is observed that the quantity demanded raises from Q_1 to Q_2 and then to Q_3 as the income raises from I_1, to I_2, and I_3. But after I_3 i.e., from I_4 as the income level increases, the demand starts decreasing. This indicates that for inferior goods, the demand decreases as the income increases.

The table below gives a clear understanding about the demand income relationship of different goods.

Type of Goods	Income	Demand
Normal Goods	Increases	Increases
Perishable Goods	Increases	Increases to a certain point and then remains constant.
Inferior Goods	Increases	Increases to a certain point and then decreases as the income increases.

c) Consumer's Tastes, Habits and Preferences

Demand for many goods depends upon consumer tastes, preferences and their habits. For example, the demand for goods like chocolates, beverages, ice-creams etc., depend upon individual tastes and preferences, whereas the demand for goods like tea, betel, cigarettes etc., depend upon individual habits. In cases like, a strict vegetarian has no demand for meat at any price, whereas a non-vegetarian will purchase meat at any price. Therefore, it can be said that irrespective of price and income levels, the demand for a commodity depends upon consumer tastes, habits and preferences.

d) Prices of the Related Goods (Substitutes and Complementary Goods)

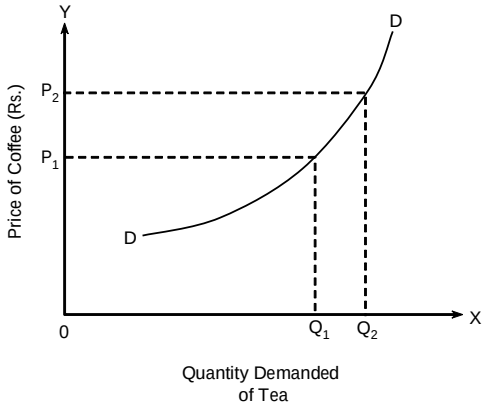
In a given market if the price of one good influences the quantity demanded of another good, these two goods are said to be related goods. Two commodities in a given market are related to each other either as Substitutes or Complementary goods.

(i) Substitutes: When a want can be satisfied by alternative similar goods, they are said to be substitutes to each other. In other words, when the price of one commodity and the quantity demanded of another commodity increase/ decreases in the same direction, they are called as substitutes to each other.

Examples

Tea and Coffee, Apple and Pears, Rail and Road Transport, Peas and Beans, Groundnut oil and til oil, Jowar and Bajra etc.,

The demand curve for substitute goods is as follows,



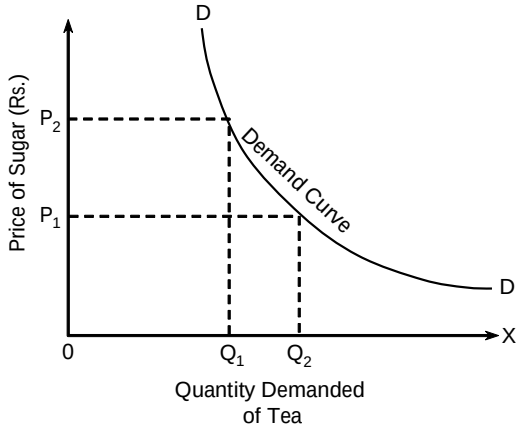
From the above graph, it is observed that as the price of coffee increases, the quantity demanded of tea is increased.

(ii) Complementary : When a want can be satisfied by two or more goods in combination, these goods are termed as complementary goods. In other words, when the price of one commodity and the quantity of demanded of another commodity increase or decrease in the opposite direction, they are called as complementary goods.

Examples

Bread and Butter, Pen and Ink, Car and Petrol, Tea and Sugar, Shoes and Socks, Sarees and Blouses, Gun and Bullets etc.,

Complementary goods are always in joint demand. The demand curve for complementary goods is as follows,



e) Consumer Expectations: A consumer usually makes two kinds of expectations.

i) About his future income

ii) About prices of the given commodity and its related goods.

(i) Future Income

If the consumer expects a higher income in future, he spends more on a commodity in the present and therefore, the demand for the commodity increases. If he expects a low income in future, he spends less on the commodity thereby decreasing the demand for the commodity.

(ii) Future Prices

Similarly, if the consumer expects the future prices of the commodity to increase, he buys more of the commodity at present, increasing the demand for it. If he expects the future prices to fall, he buys less in the present thereby decreasing the demand for the commodity.

The table below gives a clear understanding about the changes in demand due to consumer expectations about his future income and future prices.

Consumer Expectations about Future	Changes in Demand of the the Commodity at Present
Increase in Income	Increases
Decrease in Income	Decreases
Increase in Prices	Increases
Decrease in Prices	Decreases

Table: Changes in Demand due to Consumer

f) Advertisement

In the present scenario, organizations are spending a lot of money on advertisements in order to attract consumer's tastes and preferences towards them. An effective advertisement strategy can help an organization to increase the demand for its product.

Q7. Explain briefly about market demand.

Ans :

Market demand can be defined as the sum of individual demands for a product as a price per unit of time.

The market demand schedule and curve can be obtained by

(i) adding up individual demand at different prices, and

(ii) summing up individual demand functions.

The table shows the quantity demanded of X individually by the three consumers at different prices of commodity X. The last column shows the market demand, i.e., the sum of individual demands for commodity X. The market demand shows the total quantity of commodity X demanded per month by the three consumers at different prices.

Price of X (Rs.)	Quantity of X Demanded by			Market Demand =(A+B+C)
	A	B	C	
25	0	0	0	0
20	5	0	0	5
15	10	5	0	15
10	15	10	5	30
5	20	15	10	45
0	25	20	15	60

Table : Price of Commodity X and Quantity Demanded

Q8. Differentiate between Individual demand and market demand.

(OR)

Distinguish between Individual demand and market demand.

Ans : **(Dec.-20, Dec.-15)**

Difference between individual demand and market demand are as follows,

S.No.	Area	Individual Demand	Market Demand
1.	**Definition**	When the demand for a product arises from an individual consumer, then it is known as individual demand	When the demand of all the individuals and households arises for a product in a given market then it is known as market then it is known as market demand.
2.	**Nature**	It is the demand of a individual	It is the demand of number of individuals
3.	**Individual demand curve V/s Market demand curve**	Individual demand curve shows the maximum price which an individual consumer is willing to pay for the different amounts of the commodity under given conditions of demand.	Market demand curve shows the maximum amount of the commodity which all the consumers in a given market are willing to buy at each possible price of the commodity under given conditions of demand.
4.	**Individual demand schedule V/s market demand schedule**	Individual demand schedule shows the list of quantities of a commodity which was demanded by an individual at various prices.	Market demand schedule shows the list of quantities demanded by all the individuals at various prices in the market
5.	**Individual and market demand function**	Individual demand function is a mathematical relationship between the demand by an individual consumer and the determinants of individual demand.	Market demand function shows the functional relationship between the market demand for a commodity and the determinants of market demand.

2.1.2 Factors Determining Demand

Q9. Explain the factors determining demand?

(OR)

What are the factors determining demand ?

(OR)

Discuss the factors determining demand for a commodity.

Ans : **(Dec.-20, Dec.-15)**

The main factors determining demand are as follows:

1. Price of the Commodity

The law of demand states that if other things remain the same, the demand of the commodity is inversely related to its price. It implies that a rise in price of a commodity brings about a fall in its purchase and vice-versa. This happens because of income and substitution effects.

2. Income of the Consumer

The income of the consumer is another important variable which influences demand. The ability to buy a commodity depends upon the income of the consumer. When the income of the consumers increases, they buy more and when income falls they buy less. A rich consumer demands more and more goods because his purchasing power is high.

3. Tastes and Preferences

The demand for a product depends upon tastes and preferences of the consumers. If the consumers develop taste for a commodity they buy whatever may be the price. A favourable change in consumer preference will cause the demand to increase. Likewise an unfavourable change in consumer preferences will cause the demand to decrease.

4. Prices of Related Goods

The related goods are generally substitutes and complementary goods. The demand for a product is also influenced by the prices of substitutes and complements. When a want can be satisfied by alternative similar goods they are called substitutes, such as coffee and tea. When commodities are complement, a fall in the price of one (other things being equal) will cause the demand of the other to rise such as car and petrol. Thus, the price of one good and the demand for another are inversely related.

5. Advertisement and Sales Propaganda

In modern times, the preferences of consumers can be altered by advertisement and sales propaganda. Advertisement helps in increasing demand by informing the potential consumers about the availability of the product, by showing the superiority of the product, and by influencing consumer choice against the rival products. The demand for products like detergents and cosmetics is mainly caused by advertisement.

6. Consumer's Expectation

A consumer's expectation about the future changes in price and income may also affect his demand. If a consumer expects a rise in prices he may buy large quantities of that particular commodity. Similarly, if he expects its prices to fall in future, he will tend to buy less at present. Similarly, expectation of rising income may induce him to increase his current consumption.

7. Growth of Population

The growth of population is also another important factor that affects the market demand. With the increase in population, people naturally demand more goods for their survival.

8. Weather Conditions

Seasonal factors also affect the demand. The demand for certain items purely depends on climatic and weather conditions. For example, the growing demands for cold drinks during the summer season and the demand for sweaters during the winter season.

9. Tax Rate

The tax rate also affects the demand. High tax rate would generally mean a low demand

for the goods. At certain times the government restricts the consumption of a commodity and uses the tax as a weapon. A highly taxed commodity will have a lower demand.

10. Availability of Credit

The purchasing power is influenced by the availability of credit. If there is availability of cheap credit, the consumers try to spend more on consumer durables thereby the demand for certain products increase.

11. Pattern of Saving

Demand is also influenced by the pattern of saving. If people begin to save more, their demand will decrease. It means the disposable income will be less to purchase the goods and services. On the contrary, if saving is less their demand will increase.

12. Circulation of Money

An expansion or a contraction in the quantity of money will affect demand. When more money circulates among the people, more of a thing is demanded by the people because they have more purchasing power and vice versa.

Q10. Define law of Demand? What are the assumptions of law of demand.

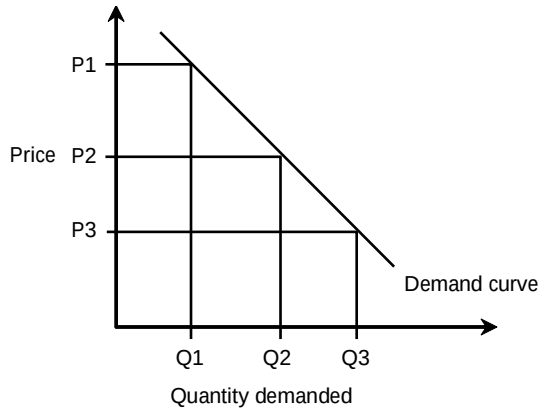
Ans : **(Jan.-18)**

Definition

The law of demand states that other factors being constant (cetris peribus), price and quantity demand of any good and service are inversely related to each other. When the price of a product increases, the demand for the same product will fall.

Description

Law of demand explains consumer choice behavior when the price changes. In the market, assuming other factors affecting demand being constant, when the price of a good rises, it leads to a fall in the demand of that good. This is the natural consumer choice behavior. This happens because a consumer hesitates to spend more for the good with the fear of going out of cash.



The above diagram shows the demand curve which is downward sloping. Clearly when the price of the commodity increases from price p3 to p2, then its quantity demand comes down from Q3 to Q2 and then to Q3 and vice versa.

Assumptions to Law of Demand

The statement of the law of demand, demonstrates that this law operates only when all other things remain constant. These are the assumptions of the law of demand. We can state the assumptions of the law of demand as follows:

1. Income level should remain constant

The law of demand operates only when the income level of the buyer remains constant. If the income rises while the price of the commodity does not fall, it is quite likely that the demand may increase. Therefore, stability in income is an essential condition for the operation of the law of demand.

2. Tastes of the buyer should not alter

Any alteration that takes place in the taste of the consumers will in all probability of the working of the law of demand. It often happens that when tastes or fashions change people revise their preferences. As a consequence, the demand for the commodity which goes down the preference scale of the consumers declines even though its price does not change.

3. Prices of other goods should remain constant

Changes in the prices of other goods often impinge on the demand for a particular

commodity. If prices of commodities for which demand is inelastic rise, the demand for a commodity other than these in all probability will decline even though there may not be any change in its price. Therefore, for the law of demand to operate it is imperative that prices of other goods do not change.

4. No new substitutes for the commodity

If some new substitutes for a commodity appear in the market, its demand generally declines. This is quite natural, because with the availability of new substitutes some buyers will be attracted towards new products and the demand for the older product will fall even though price remains unchanged. Hence, the law of demand operates only when the market for a commodity is not threatened by new substitutes.

5. Price rise in future should not be expected

If the buyers of a commodity expect that its price will rise in future they raise its demand in response to an initial price rise. This behavior of buyers violates the law of demand. Therefore, for the operation of the law of demand it is necessary that there must not be any expectations of price rise in the future.

6. Advertising expenditure should remain the same

If the advertising expenditure of a firm increases, the consumers may be tempted to buy more of its product. Therefore, the advertising expenditure on the good under consideration is taken to be constant.

Q11. Explain the exceptions of law of demand.

Ans :

The law of demand does not apply in every case and situation. The circumstances when the law of demand becomes ineffective are known as exceptions of the law. Some of these important exceptions are as under.

1. Giffen Goods

Some special varieties of inferior goods are termed as Giffen goods. Cheaper varieties of this category like bajra, cheaper vegetable like potato come under this category. Sir Robert Giffen or Ireland first observed that people used to spend more their income on inferior goods like potato and less of their income on meat. But potatoes constitute their staple food. When the price of potato increased, after purchasing potato they did not have so many surpluses to buy meat. So the rise in price of potato compelled people to buy more potato and thus raised the demand for potato. This is against the law of demand. This is also known as Giffen paradox.

2. Conspicuous Consumption

This exception to the law of demand is associated with the doctrine propounded by Thorsten Veblen. A few goods like diamonds etc., are purchased by the rich and wealthy sections of the society. The prices of these goods are so high that they are beyond the reach of the common man. The higher the price of the diamond the higher the prestige value of it. So when price of these goods falls, the consumers think that the prestige value of these goods comes down. So quantity demanded of these goods falls with fall in their price. So the law of demand does not hold good here.

3. Conspicuous Necessities

Certain things become the necessities of modern life. So we have to purchase them despite their high price. The demand for T.V. Sets, automobiles and refrigerators etc. has not gone down in spite of the increase in their price. These things have become the symbol of status. So they are purchased despite their rising price. These can be termed as "U" sector goods.

4. Ignorance

A consumer's ignorance is another factor that at times induces him to purchase more of the commodity at a higher price. This is especially so when the consumer is haunted by the phobia that a high-priced commodity is better in quality than a low-priced one.

5. Emergencies

Emergencies like war, famine etc. negate the operation of the law of demand. At such

times, households behave in an abnormal way. Households accentuate scarcities and induce further price rises by making increased purchases even at higher prices during such periods. During depression, on the other hand, no fall in price is a sufficient inducement for consumers to demand more.

6. Future Changes in Prices

Households also act speculators. When the prices are rising households tend to purchase large quantities of the commodity out of the apprehension that prices may still go up. When prices are expected to fall further, they wait to buy goods in future at still lower prices. So quantity demanded falls when prices are falling.

7. Change in Fashion

A change in fashion and tastes affects the market for a commodity. When a broad toe shoe replaces a narrow toe, no amount of reduction in the price of the latter is sufficient to clear the stocks. Broad toe on the other hand, will have more customers even though its price may be going up. The law of demand becomes ineffective.

Q12. Explain the law which sales the inverse relationship between the price and demand for a product.

Ans : **(Jan.-20)**

There is an inverse relationship between the supply and prices of goods and services when demand is unchanged. If there is an increase in supply for goods and services while demand remains the same, prices tend to fall to a lower equilibrium price and a higher equilibrium quantity of goods and services. If there is a decrease in supply of goods and services while demand remains the same, prices tend to rise to a higher equilibrium price and a lower quantity of goods and services.

The same inverse relationship holds for the demand for goods and services. However, when demand increases and supply remains the same, the higher demand leads to a higher equilibrium price and vice versa.

Supply and demand rise and fall until an equilibrium price is reached. For example, suppose a luxury car company sets the price of its new car model at Rs. 200,000. While the initial demand may be high, due to the company hyping and creating buzz for the car, most consumers are not willing to spend Rs. 200,000 for an auto. As a result, the sales of the new model quickly fall, creating an over supply and driving down demand for the car. In response, the company reduces the price of the car to Rs 150,000 to balance the supply and the demand for the car to reach an equilibrium price ultimately.

2.1.3 Relationship between AR and MR

Q13. Explain the relationship between AR and MR.

Ans :

It had been indicated that in a perfectly competitive market, a firm believes that it can sell as many units of the good as it wants by setting a price less than or equal to the market price. But, if this is the case, surely there is no reason to set a price lower than the market price. In other words, should the firm desire to sell some amount of the good, the price that it sets is exactly equal to the market price.

i) Total Revenue

A firm earns revenue by selling the good that it produces in the market. Let the market price of a unit of the good be p. Let q be the quantity of the good produced, and therefore sold, by the firm at price p. Then, total revenue (TR) of the firm is defined as the market price of the good (p) multiplied by the firm's output (q). Hence,

$$TR = p \times q$$

To make matters concrete, consider the following numerical example. Let the market for candles be perfectly competitive and let the market price of a box of candles be Rs 10. For a candle manufacturer, Table shows how total revenue is related to output. Notice that when no box is sold, TR is equal to zero; if one box of candles is sold, TR is equal to 1 × Rs. 10 = Rs. 10; if two boxes of candles are produced, TR is equal to 2 × Rs. 10 = Rs. 20; and so on.

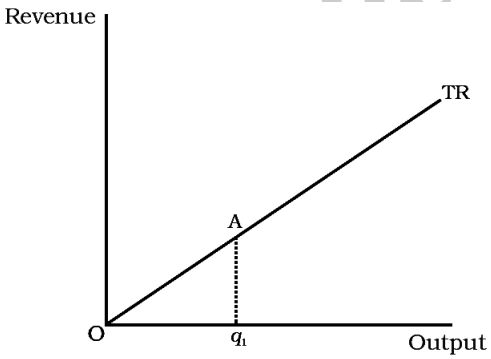
We can depict how the total revenue changes as the quantity sold changes through a Total Revenue Curve.

Boxes sold	TR (in Rs)
0	0
1	10
2	20
3	30
4	40
5	50

Table : Total Revenue

A total revenue curve plots the quantity sold or output on the X-axis and the Revenue earned on the Y-axis. Figure shows the total revenue curve of a firm. Three observations are relevant here. First, when the output is zero, the total revenue of the firm is also zero. Therefore, the TR curve passes through point O. Second, the total revenue increases as the output goes up. Moreover, the equation 'TR = p × q' is that of a straight line because p is constant. This means that the TR curve is an upward rising straight line. Third, consider the slope of this straight line. When the output is one unit (horizontal distance Oq_1 in Figure), the total revenue (vertical height Aq_1 in Figure) is p × 1 = p. Therefore, the slope of the straight line is Aq_1/Oq_1 = p.

The average revenue (AR) of a firm is defined as total revenue per unit of output. Recall that if a firm's output is q and the market price is p, then TR equals p × q.



Total Revenue curve. The total revenue curve of a firm shows the relationship between the total revenue that the firm earns and the output level of the firm. The slope of the curve, Aq_1/Oq_1, is the market price.

Hence

$$AR = \frac{TR}{q} = \frac{p \times q}{q} = p$$

In other words, for a price-taking firm, average revenue equals the market price. Now consider Figure.

Here, we plot the average revenue or market price (y-axis) for different values of a firm's output (x-axis). Since the market price is fixed at p, we obtain a horizontal straight line that cuts the y-axis at a height equal to p. This horizontal straight line is called the price line. It is also the firm's AR curve under perfect competition The price line also depicts the demand curve facing a firm. Observe that the demand curve is perfectly elastic. This means that a firm can sell as many units of the good as it wants to sell at price p.

The marginal revenue (MR) of a firm is defined as the increase in total revenue for a unit increase in the firm's output. Consider Table again. Total revenue from the sale of 2 boxes of candles is Rs. 20. Total revenue from the sale of 3 boxes of candles is Rs. 30.

ii) Marginal Revenue (MR)

$$= \frac{\text{Change in total revenue}}{\text{Change in quantity}} = \frac{30-20}{3-2} = 10$$

Is it a coincidence that this is the same as the price? Actually it is not. Consider the situation when the firm's output changes from q_1 to q_2. Given the market price p,

$$MR = (pq_2 - pq_1)/(q_2 - q_1)$$
$$= [p(q_2 - q_1)]/(q_2 - q_1)$$
$$= p$$

Thus, for the perfectly competitive firm, MR = AR = p

In other words, for a price-taking firm, marginal revenue equals the market price.

Setting the algebra aside, the intuition for this result is quite simple. When a firm increases its output by one unit, this extra unit is sold at the market price.

Hence, the firm's increase in total revenue from the one-unit output expansion – that is, MR – is precisely the market price.

2.2 Consumer Behaviour

2.2.1 Utility Analysis

Q14. Define Utility. Explain the features of utility.

Ans :

Meaning

The term utility in Economics is used to denote that quality in a good or service by virtue of which our wants are satisfied. In, other words utility is defined as the want satisfying power of a commodity.

Definitions

i) According to, Mrs. Robinson, "Utility is the quality in commodities that makes individuals want to buy them."

ii) According to Hibdon, "Utility is the quality of a good to satisfy a want."

Features :

Utility has the following main features :

(1) Utility is Subjective : Utility is subjective because it deals with the mental satisfaction of a man. A commodity may have different utility for different persons. Cigarette has utility for a smoker but for a person who does not smoke, cigarette has no utility. Utility, therefore, is subjective.

(2) Utility is Relative : Utility of a good never remains the same. It varies with time and place. Fan has utility in the summer but not during the winter season.

(3) Utility and usefulness : A commodity having utility need not be useful. Cigarette and liquor are harmful to health, but if they satisfy the want of an addict then they have utility for him.

(4) Utility and Morality : Utility is independent of morality. Use of liquor or opium may not be proper from the moral point of views. But as these intoxicants satisfy wants of the drinkards and opiumeaters, they have utility for them.

Q15. Explain the different concepts of utility.

Ans :

There are three concepts of utility :

1. Initial Utility : The utility derived from the first unit of a commodity is called initial utility. Utility derived from the first piece of bread is called initial utility. Thus, initial utility, is the utility obtained from the consumption of the first unit of a commodity. It is always positive.

2. Total Utility : Total utility is the sum of utility derived from different units of a commodity consumed by a household.

According to Leftwitch, "Total utility refers to the entire amount of satisfaction obtained from consuming various quantities of a commodity." Supposing a consumer four units of apple. If the consumer gets 10 utils from the consumption of first apple, 8 utils from second, 6 utils from third, and 4 utils from fourth apple, then the total utility will be 10+8+6+4 = 28

Accordingly, total utility can be calculated as :

$TU = MU_1 + MU_2 + MU_3 + \text{-----} + MU_n$

(or)

$TU = EMU$

Here TU = Total utility and MU_1, MU_2, MU_3, + MU_n

3. Marginal Utility : Marginal Utility is the utility derived from the additional unit of a commodity consumed. The change that takes place in the total utility by the consumption of an additional unit of a commodity is called marginal utility.

According to Chapman, "Marginal utility is the addition made to total utility by consuming one more unit of commodity. Supposing a consumer gets 10 utils from the consumption of one mango and 18 utils from two mangoes, then. The marginal utility of second .mango will be 18-10=8 utils.

Marginal utility can be measured with the help of the following formula

$$MU_{nth} = TU_n - TU_{n-1}$$

Here MU_{nth} = Marginal utility of nth unit,

TU_n = Total utility of 'n' units,

TU_{n-1} = Total utility of n-1 units,

Marginal utility can be (i) positive, (ii) zero, or (iii) negative.

(i) Positive Marginal Utility : If by consuming additional units of a commodity, total utility goes on increasing, marginal utility will be positive.

(ii) Zero Marginal Utility : If the consumption of an additional unit of a commodity causes no change in total utility, marginal utility will be zero.

(iii) Negative Marginal Utility : If the consumption of an additional unit of a commodity causes fall in total utility, the marginal utility will be negative.

Relationship between total utility and Marginal Utility :

The relationship between total utility and marginal utility may be better understood with the help of a utility schedule and a diagram as shown below :

No. of units Consumed	Total Utility	Marginal Utility
0	0	–
1	10	10
2	18	8
3	24	6
4	26	2
5	26	0
6	24	–2
7	21	–3

The relationship between total utility and marginal utility can be explained with the help of the above table and diagram based thereon.

1. Total utility, initially, increases with the consumption of successive units of a commodity. Ultimately, it begins to fall.
2. Marginal Utility continuously diminishes.
3. As long as marginal utility is more than zero or positive, total utility increases, total utility is maximum when marginal utility is zero. It falls when marginal utility is negative.
4. When marginal utility is zero or total utility is maximum, a point of saturation is obtained.

Q16. Explain about Law of diminishing marginal utility.

Ans :

An important tenet of marginal utility analysis relates to the behaviour of marginal utility. This familiar behaviour of marginal utility has been stated in the Law of Diminishing Marginal Utility according to which marginal utility of a good diminishes as an individual consumes more units of the good. In other words, as a consumer takes more units of a good, the extra utility or satisfaction that he derives from an extra unit of the good goes on falling. It should be carefully noted that it is the marginal utility and not the total utility that declines with the increase in the consumption of a good. The law of diminishing marginal utility means that the total utility increases but at a decreasing rate.

Marshall who was the famous exponent of the marginal utility analysis has stated the law of diminishing marginal utility as follows:

"The additional benefit which a person derives from a given increase of his stock of a thing diminishes with every increase in the stock that he already has."

This law is based upon two important facts. Firstly, while the total wants of a man are virtually unlimited, each single want is suitable. Therefore, as an individual consumes more and more units of a

good, intensity of his want for the good goes on falling and a point is reached where the individual no longer wants any more units of the good. That is, when saturation point is reached, marginal utility of a good becomes zero. Zero marginal utility of a good implies that the individual has all that he wants of the good in question. The second fact on which the law of diminishing marginal utility is based is that the different goods are not perfect substitutes for each other in the satisfaction of various particular wants. When an individual consumes more and more units of a good, the intensity of his particular want for the good diminishes but if the units of that good could be devoted to the satisfaction of other wants and yielded as much satisfaction as they did initially in the satisfaction of the first want, marginal utility of the good would not diminish.

It is obvious from above that the law of diminishing marginal utility describes a familiar and fundamental tendency of human nature. This law has been arrived at by introspection and by observing how people behave.

Example

Consider Table, in which we have presented the total and marginal utilities derived by a person from cups of tea consumed per day. When one cup of tea is taken per day, the total utility derived by the person is 12 utils. And because this is the first cup its marginal utility is also 12. With the consumption of 2nd cup per day, the total utility rises to 22 but marginal utility falls to 10. It will be seen from the table that as the consumption of tea increases to six cups per day, marginal utility from the additional cups goes on diminishing *(i.e.,* the total utility goes on increasing at a diminishing rate). However, when the cups of tea consumed per day increases to seven, then instead of giving *positive* marginal utility, the seventh cup gives *negative* marginal utility equal to -2. This is because too many cups of tea consumed per day (say more than six for a particular individual) may cause him acidity and gas trouble. Thus, the extra cups of tea beyond six to the individual in question gives him disutility rather than positive satisfaction.

Cups of Tea consumed per day	Total utility (utils)	Marginal utility (utils)
1	12	12
2	22	10
3	30	8
4	36	6
5	40	4
6	41	1
7	39	–2
8	34	–5

Table : Diminishing Marginal Utility

We have graphically represented the data of the above table in Figure. We have constructed rectangles representing the total utility obtained from various numbers of cups of tea consumed per day. As will be seen in the figure, the length of the rectangle goes on increasing up to the sixth cup of tea and beyond that length of the rectangle declines, indicating thereby that up to the sixth cup of tea total utility obtained from the increasing cups of tea goes on increasing whereas beyond the 6th cup, total utility declines. In other words, marginal utility of the additional cups up to the 6th cup is positive, whereas beyond the sixth cup marginal utility of tea is negative. The marginal utility obtained by the consumer from additional cups of tea as he increases the consumption of tea has been shaded. A glance at the Figure will show that this shaded area goes on declining which shows that marginal utility from the additional cups of tea is diminishing.

We have joined the various rectangles by a smooth curve which is the curve of total utility which rises up to a point and then declines due to negative marginal utility. Moreover, the shaded areas of the rectangle representing marginal utility of the various cups of tea have also been shown separately in the figure given below. We have joined the shaded rectangles by a smooth curve which is the curve of marginal utility. As will be seen, this marginal utility

curve goes on declining throughout and even falls below the X-axis. Portion below the X-axis indicates the negative marginal utility. This downward-sloping marginal utility curve has an important implication for consumer's behaviour regarding demand for goods. We shall explain below how the demand curve is derived from marginal utility curve. The main reason why the demand curves for goods slope downward is the fact of diminishing marginal utility.

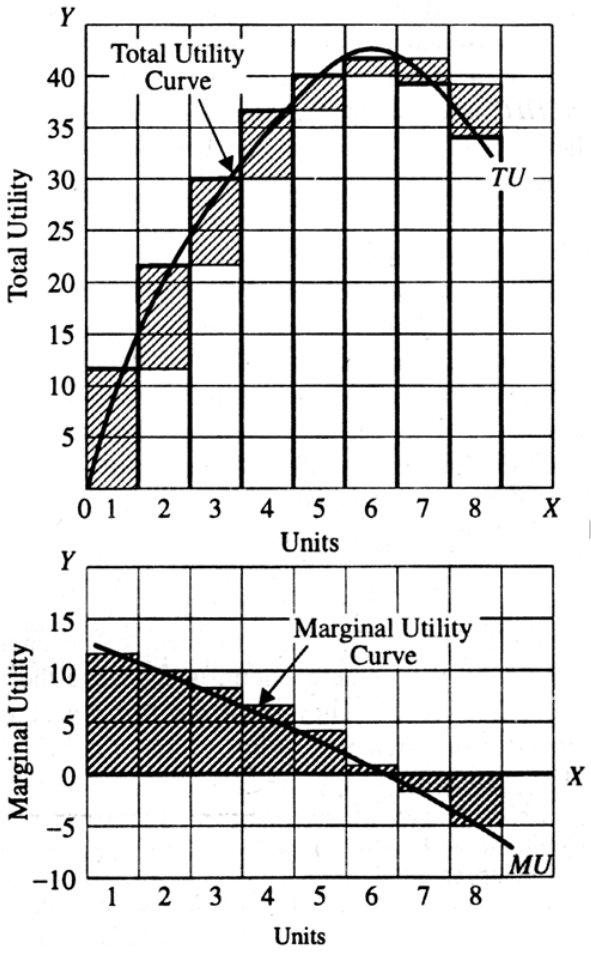


Fig.: Diminishing Marginal Utility

The significance of the diminishing marginal utility of a good for the theory of demand is that the quantity demanded of a good rises as the price falls and *vice versa.* Thus, it is because of the diminishing marginal utility that the demand curve slopes downward. This will be explained in detail later in this chapter.

If properly understood the law of diminishing marginal utility applies to all objects of desire including money. But it is worth mentioning that marginal utility of money is generally never zero or negative. Money represents general purchasing power over all other goods, that is, a man can satisfy all his material wants if he possesses enough money. Since man's total wants are practically unlimited, marginal utility of money to him never falls to zero.

Applications and Uses of Diminishing Marginal Utility

The marginal utility analysis has a good number of uses and applications in both economic theory and policy. We explain below some of its important uses.

1. It explains Value Paradox

The law of diminishing marginal utility is of crucial significance in explaining determination of the prices of commodities. The discovery of the concept of marginal utility has helped to explain the paradox of value which troubled Adam Smith in The Wealth of Nations. Adam Smith was greatly perplexed to know why water which is so very essential and useful to life has such a low price (indeed no price), while diamonds which are quite unnecessary, have such a high price.

This value paradox is also known as water-diamond paradox. He could not resolve this water-diamond paradox. But modem economists can solve it with the aid of the concept of marginal utility. According to the modern economists, the total utility of a commodity does not determine the price of a commodity and it is the marginal utility which is crucially important determinant of price. Now, the water is available in abundant quantities so that its relative marginal utility is very low or even zero. Therefore, its price is low or zero.

On the other hand, the diamonds are scarce and therefore their relative marginal utility is quite high and this is the reason why their prices are high. Prof. Samuelson explains this paradox of value in the following words: "The more there is of a commodity, the less the relative desirability of its last little unit be-comes, even though its total usefulness grows as we get more of the commodity. So, it is obvious why a large amount of water has a

low price. Or why air is actually a free good despite its vast usefulness. The many later units pull down the market value of all units."

This law helps in deriving law of demand. Further, as shall be seen below, with the aid of the law of diminishing marginal utility, we are able to derive the law of demand and to show why the demand curve slopes down-ward. Besides, the Marshallian concept of consumer's surplus is based upon the principle of diminishing marginal utility.

2. Redistribution of Income will Increase Social Welfare

Another important use of marginal utility is in the field of fiscal policy. In the modern welfare state, the Governments redistributes income so as to increase the welfare of the people. This redistribution of income through imposing progressive income taxes on the rich sections of the society and spending the tax proceeds on social services for the poor people is based upon the diminishing marginal utility. The concept of diminishing marginal utility demonstrates that transfer of income from the rich to the poor will increase the economic welfare of the community. As has been pointed out above, law of diminishing marginal utility also applies to the money; as the money income of a consumer increases, the marginal utility of money to him falls. How the redistribution of income will increase the welfare of the community, is illustrated in Figure.

In this Figure, money income is measured along X-axis and marginal utility of income is measured along Y-axis. MU is the marginal utility curve of money which is sloping downward. Suppose OL is the income of a poor person and OH is the income of a rich person. If rich person is subjected to the income tax and amount of money equal to HH' is taken from him and the same amount of money LL' (equal to HH') is given to the poor man, it can be shown that the welfare of the community will increase. As a result of this transfer of income, the income of the rich man falls by HH' and the income of the poor person rises by LL' (HH' = LL'). Now, it will be seen in Figure that the loss of satisfaction or utility of the rich man as a result of decline in his income by HH' is equal to the area HDCH'. Further, it will be seen that the gain in satisfaction or utility by the increase of an equivalent amount of income LL' of the poor man, is equal to LABL'.

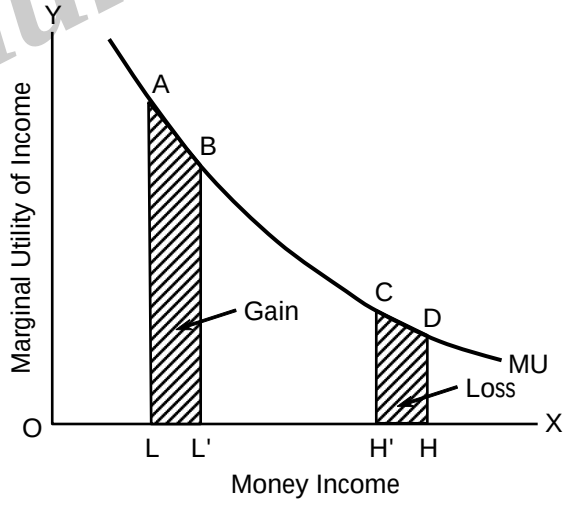


Fig.: Redistribution of Income to Increase Social Welfare

It is thus obvious from the figure that the gain in utility of the poor person is greater than the loss of utility of the rich man. Therefore, the total utility or satisfaction of the two persons taken together will increase through transfer of some income from the rich to the poor. Thus, on the basis of the diminishing

marginal utility of money many economists and political scientists have advocated that Government must re-distribute income in order to raise the economic welfare of the society. However, it may be pointed out that some economists challenge the validity of such redistribution of income to promote the social welfare. They point out that the above analysis of marginal utility is based upon inter-personal comparison of utility which is quite inadmissible and unscientific. They argue that people differ greatly in their preferences and capacity to enjoy goods and, therefore, it is difficult to know the exact shapes of the marginal utility curves of the different persons. Therefore they assert that the losses and gains of utility of the poor and the rich cannot be measured and compared.

2.3 Indifference Curve Analysis

Q17. What are Indifference Curves ? What are the assumptions on which Indifference Curve Analysis of demand is based.

Ans :

Indifference curve which represents all those combinations of goods which give same satisfaction to the consumer. Since all the combinations on an indifference curve give equal satisfaction to the consumer, he will be indifferent between them, that is, it will not matter to him which one he gets.

1. **More of a commodity is better than less:** It is assumed that the consumer will always prefer a larger amount of a good to a smaller amount of that good, provided that the other goods at his disposal remains unchanged. This is a very reasonable and realistic assumption. This assumption implies that the consumer is not over-supplied with any good. When a consumer is over-supplied or over-satiated with one good, he will prefer a smaller quantity of that good to the larger quantity. It is thus assumed that the consumer has not yet reached the point of satiety in the consumption of any good. This assumption is therefore known as non-satiety assumption.

2. **Preferences or indifferences of a consumer are transitive:** Suppose there are three combinations of two goods : A, B and C. If the consumer is indifferent between A and B and also between B and C, it is then assumed that he will be indifferent between A and C too. This condition implies that consumer's tastes are quite consistent. This assumption is known as assumption of transitivity.

3. **Diminishing marginal rate of substitution:** In indifference curve analysis principle of diminishing marginal rate of substitution is assumed. In other words, it is assumed that as more and more units of *X* are substituted for *Y,* the consumer will be willing to give up fewer and fewer units of *Y* for each additional unit of *X,* or when more and more of *Y* is substituted for V he will be willing to give up successively fewer and fewer units of *X* for each additional unit of *Y.* This rule about consumer's behaviour is described as the principle of diminishing, marginal rate of substitution. As seen above, this principle follows as a matter of logical necessity from the assumption that particular wants are satiable and that various goods are not perfect substitutes for one another.

Q18. What is budget line?

Ans :

The knowledge of the concept of budget line is essential for understanding the theory of consumer's equilibrium. A higher indifference curve shows a higher level of satisfaction than a lower one. Therefore, a consumer in his attempt to maximise his satisfaction will try to reach the highest possible indifference curve. But in his pursuit of buying more and more goods and thus obtaining more and more satisfaction he has to work under two constraints: first, he has to pay the prices for the goods and, secondly, he has a limited money income with which to purchase the goods.

Thus, how far he would go in for his purchases depends upon the prices of the goods and the money income which he has to spend on the goods. An indifference map represents consumer's scale of preferences between two goods.

2.4 Elasticity of Demand

Q19. What do you understand by elasticity of Demand?

Ans :

Meaning

The law of demand simply explains the inverse relationship between price and quantity demanded. It doesn't specify how much more is purchased when price falls and how much less is purchased when price rises. In order to understand the rate of change in price and consequent changes in demand, elasticity of demand concept is used.

Elasticity is one of the most important concepts in neoclassical economic theory. It is useful in understanding the incidence of indirect taxation, marginal concepts as they relate to the theory of the firm and distribution of wealth and different types of goods. Elasticity is also crucially important in any discussion of welfare distribution, in particular consumer surplus, producer surplus or government surplus.

Meaning

Elasticity of demand is the responsiveness of demand for a commodity to changes in its determinants.

Elasticity of Demand

$$= \frac{\text{Percentage change in quantity demanded of commodity}}{\text{Percentage change in its price}}$$

Definitions

i) **In the words of Dr. Marshall,** "Elasticity of Demand may be defined as the percentage change in the quantity demanded divided by the percentage change in the price."

ii) **According to Building,** "Price elasticity of demand measures the responsiveness of the quantity demanded to the change in price."

iii) **In the words of Dooley, "**The price elasticity of demand measures the responsiveness of the quantity demanded to a change in its price."

iv) **According to Antol Murad,** "Elasticity of demand is the ratio of relative change in quantity to relative change in price."

Thus, price elasticity of demand is a device to measure the rate of change in the quantity of a product demanded in response to a small change in its price.

Q20. Explain Significance of Elasticity of Demand.

Ans :

Elasticity of demand is a crucial concept in the spheres of trade, commerce and finance. The following are some of the important of elasticity of demand:

1. Price Determination

The doctrine of elasticity of demand plays a vital role in price determination. The sellers increase prices if the demand is less elastic and lower prices if the demand is elastic.

2. Monopoly Market

For a monopolist to optimize his profits, he must know the elasticity of demand for his products. In other words, the degree of monopoly can be measured with the help of elasticity of demand. A monopolist can perform price discrimination only when he is aware of price elasticity for his commodities. A prudent monopolist increases prices in the inelastic market and lowers prices in the elastic market. In addition, the concept of price elasticity of demand plays a vital role in dumping practice as well.

Example

Oil producing countries tend to increase price by cutting down oil production. When the oil production is reduced, an artificial scarcity is created; consequently, the price is increased. This is possible as long as the oil products are price inelastic.

3. Pricing Public Utilities

Many of the public utilities are necessities. For instance, supply of water, electricity, transport and so on is essential for our everyday activities. Therefore, the demand for these

utilities is price inelastic. The concept of elasticity of demand helps the government to rationalize prices for these important utilities. Otherwise, prices for these utilities will be very high, if they are provided by private entities.

4. Prosperity Versus Poverty

Do you agree that even an overwhelming prosperity can cause poverty? It is true in some special cases. One of such special cases is bumper crop. In agriculture when there is bumper crop, the price of the commodity falls because of excessive supply. In this case, if the demand for the commodity is inelastic, it may create disaster because, the farmers will get very low prices for their goods. Therefore, not all properties may alleviate poverty. This scenario can be studied well with the help of the concept of elasticity of demand.

5. Currency Devaluation

The application of elasticity of demand can be extended to the analysis of currency devaluation. Devaluation helps to increase exports. It is possible only when the demand for exported goods is highly elastic. If the demand is inelastic, there will not be any use in currency devaluation.

Q21. Explain Factors affecting Elasticity of Demand.

Ans :

Elasticity is governed by a number of factors. Change in any one of these factors is likely to affect the elasticity of demand. The factors are:

(a) Nature of Product

Based on their nature, the products and services are classified into necessities, comforts and luxuries. Necessaries imply the absolute or basic necessities such as food, clothing, housing. Comforts refer to TV, refrigerator and so on. Luxuries, means sofa sets, marble flooring in a house and such others. The meaning and definition of these necessaries, luxuries and comforts change from person to person, time to time and place to place. For example, a scooter may be a comfort or luxury for a student but when he does a part-time job, it may be a necessity for him.

The nature of product has a significant impact on the elasticity of demand. For instance, if there is an increase in the price of rice, we still buy it because it is a necessity for us. This means that the demand is inelastic to price. Though there is an increase in price, we tend to buy the necessaries such as petrol, diesel and so on. In other words, the demand does not fall because of increase in price. From this, we can say that the necessaries have inelastic demand. For comforts and luxuries, the demand is relatively elastic. It means that any increase in the price of comforts or luxuries will lead to moderate to significant fall in their demand.

(b) Time Frame

The more the time available for the customer, the demand for a particular product will be elastic and vice versa. Take the case of vegetables. When you do not have time, you go to a nearby shop and buy whatever you want at the given price. Had you had little free time, you would have preferred to get the same from a vegetable market at lesser price.

(c) Degree of Postponement

Where the product consumption can be postponed, the product is said to have elastic demand and where it cannot be postponed, it is said to have inelastic demand. The consumption of necessaries cannot be postponed and hence they have inelastic demand.

(d) Number of Alternative uses

If the number of alternative uses are more, the demand is said to be highly inelastic and vice versa. Take the case of power or electricity. It is used for a number of alternative

uses such as running of machines in industries, offices, households, trains, and so on.

(e) Tastes and Preferences of the Consumer

Where the customer is particular about his taste and preferences, the product is said to be inelastic. For the customers who are particular or loyal to certain brands such as Colgate, Tata Tea, Annapurna Atta, and so on, price increases do not matter. They tend to buy that brand inspite of the price changes.

(f) Availability of Close Substitutes

Where there are a good number of close substitutes, the demand is said to be elastic and vice versa. For gold, there is no close and literal substitute and hence the demand for gold is inelastic. If coffee and tea are equally good for me, if there is an increase in price of coffee, I may tend to switch over to tea. But this may not hold good when I am particular about coffee only. I may be prepared to pay higher price for coffee.

(g) In case of Complementaries (or) Joint Goods

In case of complementaries or goods having joint demand, the elasticity is comparatively low.

(h) Level of Prices

If the price is very expensive (such as diamonds) or very cheap (such as salt), then the product is likely to have an inelastic demand. If the price is too high, a fall in it will not increase the demand much. Similarly, if the price is too low, a further fall in its price is not likely to result in more demand. The demand of the relatively poor people is more sensitive to price changes. In order to derive maximum satisfaction from their limited income, they try to plan their purchases in response to changes in prices. The rich may not bother about price changes.

(i) Availability of Subsidies

Subsidy refers to money paid by a government or other public authority in order to help a company financially or to make something cheaper for the public. There is need for subsidies in case of goods with inelastic demand such as LPG, sugar, wheat and so on.

(j) Expectation of Prices

Where people expect a fall in the price, the demand for the product is likely to be inelastic.

(k) Durability of the Product

Where the product is durable in case of consumer durables such as TV, the demand is elastic. In the case of perishable goods such as milk, the demand is inelastic.

(l) Government Policy

Where the government policy is liberal, the product is likely to have elastic demand and vice versa. Government, in the interest of the lower income group consumers, closely monitors the prices of certain products (such as, ration goods as sold in fair price shops are likely to have inelastic demand). Also, another example could be taxes. Government can raise tax collections with a little reduction in the tax rates.

Q22. Explain the managerial applications of elasticity of demand.

Ans :

1. Price Discrimination

A monopolist adopts a price discrimination policy only when the elasticity of demand of different consumers or sub-markets is different. Consumers whose demand in inelastic can be charged a higher price than those with more elastic demand.

2. Public Utility Pricing

In case of public utilities which are run as monopoly undertakings, e.g., electricity, water supply, railways, postal services, price discrimination is generally practiced, charging higher prices from consumers, or users with inelastic demand and lower prices in case of elastic demand.

3. Joint Supply

Certain goods, being products of the same process, are jointly supplied, e.g., wool and mutton. Here if the demand for wool in inelastic compared to the demand for mutton, a higher price for wool can be charged with advantage.

4. Super Markets

Super-markets are a combined set of shops run by a single organization selling a wide range of goods. They are supposed to sell commodities at lower prices than charged by shopkeepers in the bazaar. Hence, price adopted is to charge slightly lower price for goods with elastic demand.

5. Use of Machines

Workers often oppose use of machines out of fear of unemployment. Machines need not always reduce demand for labor as this depends on price elasticity of demand for the commodity produced.

When machines reduce costs and hence price of products, if the product's demand in elastic, the demand will go up, production will have to be increased and more workers maybe employed.

On the contrary, if demand for the product is inelastic, machines will lead to unemployment as lower prices (due to lesser costs) will not increase the demand.

6. Factor Pricing

The factors having price-inelastic demand can obtain a higher price than those with elastic demand. Workers producing products having inelastic demand can easily get their wages raised.

7. International Trade

i) A country benefits from exports of products as have price-inelastic demand for a rise in price and elastic demand for a fall in price.

ii) The demand for imports should be inelastic for a fall in price and elastic for a rise in price.

iii) While deciding whether the devalue a country's currency or not, price elasticity of demand for a country's exports would be an important factor to be taken into consideration.

If the demand is price-elastic, it would lead to an increase in the country' exports and devaluation would be worthwhile. If the demands is price inelastic, devaluation would fail to achieve its objective.

For example, the demand for agricultural products is rather price inelastic and devaluation of a country's products is rather price inelastic and devaluation of a country's currency would not lead to any significant increase in their exports.

8. Shifting of Tax Burden

It is possible for a business to shift a commodity tax in case of inelastic demand to his customers. But if the demand in elastic, he will haves to bear the tax burden himself otherwise demand for his goods will go down sharply.

9. Taxation Policy

Government can easily raise tax revenue by taxing commodities which are price-inelastic.

Q23. Explain different types of elasticity of demand.

Ans :

The Elasticity of demand tells you how much the demand will change with the change in price to demand to the change in any factor.

1. Price Elasticity of Demand
2. Income Elasticity of Demand
3. Cross Elasticity of Demand
4. Advertisement Elasticity of Demand

2.4.1 Price Elasticity of Demand

Q24. What is price elasticity of demand ? Explain different types of price elasticity of Demand?

Ans : **(Jan.-20, Jan.-18, Dec.-16)**

The concept of price elasticity of demand was developed by ***Alfred Marshall.*** Price elasticity of demand is a technical term used by economist to explain the degree of responsiveness of the demand for a product to a change in its price.

"Price elasticity of demand is the responsiveness of quantity demanded of a commodity to a given change in price".

$$\text{Price elasticity of demand} = \frac{\text{Proportionate change in the quantity demanded for product A}}{\text{Proportionate change in the price of B}}$$

The same is expressed as,

$$Edp = \frac{(Q_2 - Q_1)/Q_1}{P_2 - P_1)/P_1}$$

Where,

Q_1 = Quantity demanded before price change

Q_2 = Quantity demanded after price change

P_1 = Price before change

P_2 = Price after change

E > 1 (Elastic Demand)	–	Percentage change in quantity demanded greater than percentage change in revenue price increase.
E = 1 (Unity Elasticity)	–	Percentage change in quantity demanded is equal to percentage change in price revenue remain unchanged.
E < 1 (Inelastic Demand)	–	Percentage change in quantity demanded is less than percentage change in price revenue decreased.

Table : Price Elasticity of Demand

Types of Price Elasticity of Demands

a) Perfectly Elastic Demand

b) Perfectly Inelastic Demand

c) Relatively Elastic Demand

d) Relatively Inelastic Demand

e) Unity Elasticity Demand

a) Perfectly Elastic Demand

When any quantity can be sold at given price, and when there is no need to reduce price, the demand is said to be *perfectly elastic*. In such cases, even a small increase in price will lead to complete fall in demand.

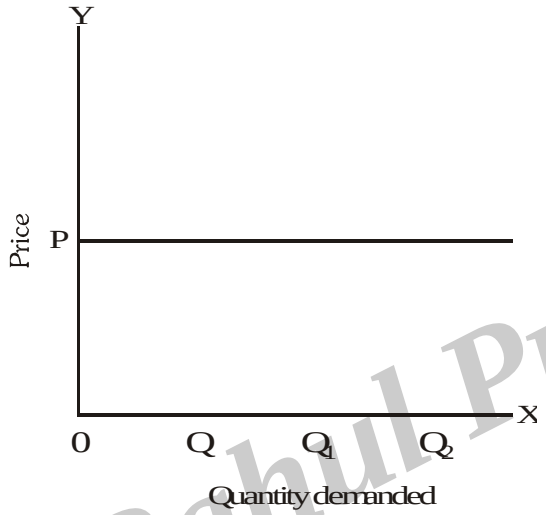


Fig.: Perfectly Elastic Demand

b) Perfectly Inelastic Demand

When a significant degree of change in price leads to little or no change in the quantity demanded, then the elasticity is said to be perfectly inelastic.

In other words, the demand is said to be perfectly inelastic when there is no change in the quantity demanded even though there is a big change (increase or decrease) in price.

Figure below reveals that there is no change in the quantity demanded though there is change in price, say increase or decrease. In other words, despite the increase in price from OP to OP_1, the quantity demanded has not fallen down. Similarly, though there is a fall in the price from OP_3 to OP_2, the quantity demanded remains unchanged.

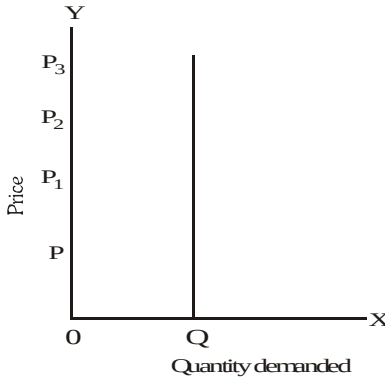


Fig.: Perfectly Inelastic Demand

The concepts of perfectly elastic and perfectly inelastic demand do not manifest in real life.

c) Relatively Elastic Demand

The demand is said to be relatively elastic when the change in demand is more than the change in price. Figure below reveals that the quantity demanded increases from OQ_1 to OQ_2 because of a decrease in price from OP_1 to OP_2. The extent of increase in the quantity demanded is greater than the extent of fall in the price.

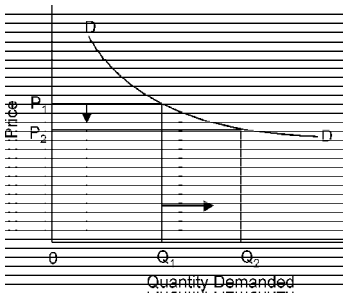


Fig.: Relatively Elastic Demand

d) Relatively Inelastic Demand

The demand is said to be relatively inelastic when the change in demand is less than the change in the price. This is illustrated in fig. below.

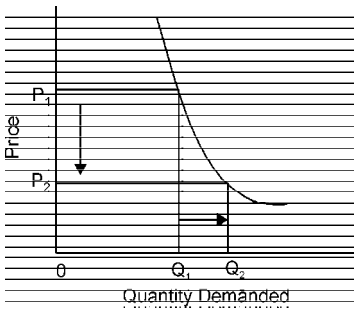


Fig.: Relatively Inelastic Demand

Figure above reveals that the quantity demanded increases from OQ_1 to OQ_2 because of a degree in price from OP_1 to OP_2. The extent of increase in the quantity demanded is lesser than the extent of fall in the price.

e) Unity Elasticity Demand

The elasticity in demand is said to be unity when the change in demand is equal to the change in price. This is illustrated in fig. below.

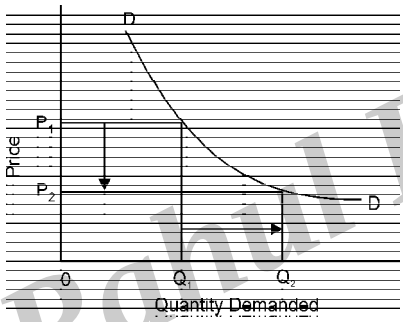


Fig.: Unity Elasticity

Figure above reveals that the quantity demanded increases from OQ_1 to OQ_2 because of a decrease in price from OP_1 to OP_2. The extent of increase in the quantity demanded is equal to the extent of fall in the price.

Q25. Discuss the role of price elasticity of demand in managerial decision making.

Ans : **(June-16)**

The concept of price elasticity of demand has important practical applications in managerial decision-making. A business man has often to consider whether a lowering of price will lead to an increase in the demand for his product, and if so, to what extent and whether his profits would increase as a result thereof. Here the concept of elasticity of demand becomes crucial.

Knowledge of the nature of the elasticity of demand for his products will help a business to decide whether he should cut his price in a particular case. Such knowledge would also help a businessman to determine whether and to what extent the increase in costs could be passed on to the consumer. In general for items those whose demand is elastic it will pay him to charge relatively low prices, while on those whose demand is elastic, it would be better off with a higher price. A monopolist would not be able to increase his price if the demand for his product is elastic.

In practice, an accurate estimate of the probable response of volume of sales to price changes is extremely difficult. Moreover, the cost of the statistical analysis required may in some cases, exceed the benefit especially when uncertainty is great or when the volume is too small to provide a reason also return on the amount spend on research. The subjective judgment of certain managers, beyond on years of experience, sometimes exceeds in accuracy the best of the present statistical techniques. Uses of price elasticity can be point out as below:

1. Price distribution

A monopolist adopts a price discrimination policy only when the elasticity of demand of different consumers or sub-markets is different. Consumers whose demand is inelastic can be charged a higher price than those with more elastic demand.

2. Public utility pricing

In case of public utilities which are run as monopoly undertakings e.g. elasticity of water supply railways postal services, price discrimination is generally practiced, charging higher prices from consumers or users with inelastic demand and lower prices in case of elastic demand.

3. Joint supply

Certain goods, being products of the same process are jointly supplied, e.g. wool and mutton. Here if the demand for wool is

inelastic compared to the demand for mutton, a higher price for wool can be charged with advantage.

4. Super Markets

Super-markets are a combined set of shops run by a single organization selling a wide range of goods. They are supposed to sell commodities at lower prices than charged by shopkeepers in the bazaar. Hence, price policy adopted is to charge slightly lower price for goods with elastic demand.

5. Use of machine

Workers often oppose use of machines out of fear of unemployment. Machines need not always reduce demand for labor as this depends on price elasticity of demand for the commodity produced. When machines reduce costs and hence price of products, if the products demand is elastic, the demand will go up, production will have to be increased and more workers may be employed for the product is inelastic, machines will lead to unemployment as lower prices will not increase the demand.

6. Factor pricing

The factors having price inelastic demand can obtain a higher price than those with elastic demand. Workers producing products having inelastic demand can easily get their wages raised.

7. International trade

(a) A country benefits from exports of products as have price inelastic demand for a rise in price and elastic demand for a fall in price.

(b) The demand for imports should be inelastic for a fall in price and elastic for a rise in price.

(c) While deciding whether to devalue a country's currency or not, price elasticity of demand for a country's exports would be an important factor to be taken into consideration. If the demand is price elastic, it would lead to an increase in the country's exports and devaluation would fail to achieve its objective.

8. Shifting of tax burden

It is possible for a business to shift a commodity tax in case of inelastic demand to his customers. But if the demand is elastic, he will have to bear the tax burden himself, otherwise demand for his goods will go down sharply.

9. Taxation policy

Government can easily raise tax revenue by taxing commodities which are price inelastic.

Q26. What are the determinants of price elasticity of demand ?

Ans :

Determinants

The following are the determinants of price elasticity of demand.

(i) Nature of the Commodity

On the basis of the satisfaction provided by the goods, they are classified into two categories - Luxury goods Comfort goods and necessary goods. Usually, the demand for luxury goods and comfort goods is price elastic, whereas, the demand for necessary goods is price inelastic. For example, the demand for rice, clothes, etc., is inelastic, whereas, the demand for TV, radio, automobiles etc., is elastic.

(ii) Availability of Close Substitutes

The availability of close substitutes for a commodity is the important determinant of price elasticity of demand. If the product has large number of close substitutes under a given price, the demand for that commodity is elastic. If the price of the commodity is increased, consumers buy less of it and buy of its substitutes. Therefore the demand for that commodity tends to be elastic. If the number of substitutes increase, the demand becomes more price elastic. For example, the demand for cigarette is inelastic as there is no other close substitute for it. But the demand for a particular brand of cigarette is elastic as there are many brands available as substitutes in the same price range.

(iii) Number of Uses of the Commodity

A commodity having large number of uses has high elasticity and the commodity with single use has less elasticity. For example, a commodity like coal having a composite demand, has high elasticity.

(iv) Consumer's Income Level

Larger the income level of the consumer, the demand for overall commodities tends to be relatively inelastic. The demand of a millionaire is less-affected even by significant price changes. Similarly, an increase/decrease in the income level of a low-income consumer may tend to make the demand for commodities relatively elastic.

(v) Durables/Durable Goods and Perishables

The demand for durable goods tends to be inelastic. Examples are furniture, bicycle, radio etc., whereas the demand of perishable goods is relatively elastic. Examples are milk, vegetables, fish etc.

(vi) Habits, Traditions and Customs

Some commodities are demanded due to individual habits, traditions and customs. For such commodities, the demand is less elastic. Examples are cigarettes, alcohol etc.

(vii) Complementary Goods

Commodities that are jointly demand or the complementary goods have less elasticity of demand. Examples are petrol, ink etc.

(viii) Share of the Commodity in Consumer's Income

If a less proportion of consumer's income is spent on the commodity, then the demand tends to be inelastic. The examples of such commodities are salt, match boxes, ink etc. There is no appreciable impact of income variations on these products because the household usually spends an insignificant amount of them.

(ix) Time Distribution

Usually the quantity demanded of a commodity is referred to a specific period. Example is the amount of rice demanded in a week, a month and a year. Longer the time period, greater will be the possibility of substituting the commodity under consideration with a cheaper commodity.

Q27. Explain briefly about Measurement of Elasticity of Demand.

Ans :

The proportionate changes in quantity of demand and the proportionate changes prices of commodity functional relation is called price elasticity of demand. It can be derived the following equation.

$$\therefore \quad \eta d = \frac{\Delta Q}{\Delta P}$$

$\therefore$ ηd = Demand elasticity

AQ = Changes in quantity of demand

ΔP = Changes in prices of commodity

There are three types methods are available for estimating the elasticity of demand. They are

1) Total expenditure method
2) Point method
3) Arc method

1) Total Expenditure Method

It has been proposed by "Marshall based on price of commodity, quantity of unit and total expenditure base, he can analyses to estimated greater than 1, equal to 1, less than –1 elasticities of demand is being determined it can illustrated here under schedule.

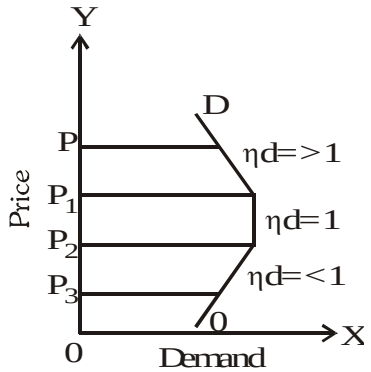
Schedule

Price	Qty	Total expenditure	Determinants of yd
10	100	1000	Relative price yd = >1%
9	120	1080	
8	140	1120	Oxitary price yd = 1
7	160	1120	
6	180	1080	Relative price in yd = <1
5	200	1000	

In the above schedule if the price at Rs.10/- the purchased units are 100/- and the incurring total expenditure is 1000 rupees, if the price is comedown at Rs. 9/- the purchased units are raised at 120 units in order to incurred the total expenditure 1080 rupees which is more than to previous expenditure. Therefore it is equalent to greater than 1 price elasticity of demand.

If the price is at Rs. 8/- the purchased units are 140 and the incurring total expenditure is 1120 rupees, if the price is comedown at Rs. 7/- the purchased units are raised at 160 units in order to incurred the total expenditure 1120 rupees which remains constant. Therefore it is equalent to price elasticity of demand.

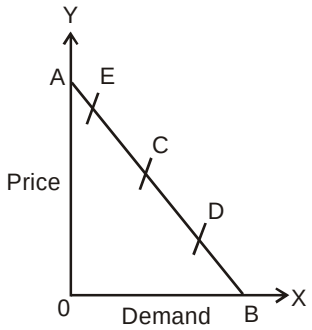
If the price is at rupees 6/- the purchased units. So units in order to incurred the total expenditure is 1080 is the price is comedown at Rs. 5/- the purchased units are raised 200 units in order to incurred. The total expenditure is Rs. 1000/-. Therefore it is equalent less than/price elasticity of demand. Based on the schedule we can illustrated here under diagram.



In the above diagram on y axis we are showing a price and on x-axis quantity of demand, the changes of prices OP to P_1 shows greater than 1 elasticity of demand, the changes of prices of P_1 to P_2 shows equal to 1 price elasticity of demand and the changes of price P_2 to P_3 shows less than 1 elasticity of demand.

2) Point Method

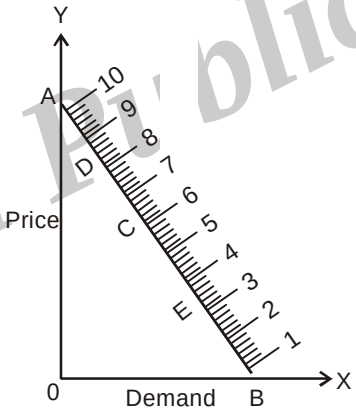
Based on this method on any point of the demand line we can traceout the nature of elasticity of demand it, can illustrated here under example :



On the above diagram the left to right downwards A and B and the demand line, and A, B demand line are plotted C, D, B points are mentioned in respective point the nature of elasticity of demand can we traceout with the help of point method.

Let we know that A, B demand line length.

Example : If the A, B demand line length is above 10 centimeters. Let us assume based on it we can fixed here under a scale of demand line.



The point method of elasticity of demand the following formula.

(Lower segment of a point)

Point method of $\eta d = \frac{L}{U}$

(Upper segment of a point)

Based on above formula (or) equation, for

Example :

At the point of C = $\frac{L}{U} = \frac{CB}{CA} = \frac{5}{5} = 1$, so it equal to = 1 ηd

At the point of D = $\frac{L}{U} = \frac{DB}{DA} = \frac{75}{75} = 3$, so it equal to = Z1 ηd

At the point of E = $\frac{L}{U} = \frac{EB}{EA} = \frac{2.5}{7.5} = \frac{1}{3}$ = 0.33, so it equal to ηd

At the point of A = $\frac{L}{U} = \frac{AB}{A} = \frac{10}{0} = a$ = 0.33, so it equal to ηd

At the point of B = $\frac{L}{U} = \frac{B}{BA} = \frac{0}{10} = a$ = 0.33, so it equal to ηd = 0

3) Arc Method : The method is depends upon the following formula.

Arc method $\eta d = \frac{Q_1 + Q_2}{Q_1 - Q_2} - \frac{P_1 + P_2}{P_1 - P_2} \Big/ 2$

$\therefore$ Q_1 = old demand

Q_2 = new demand

P_1 = old price

P_2 = new price.

2.4.2 Income Elasticity of Demand

Q28. Define Income elasticity of demand.

(OR)

Discuss Income elasticity of demand.

(OR)

What do you understand by Income elasticity of demand.

Ans : **(Dec.-20, Dec.-16, June-16)**

Definition

Consumer's income is one of the important determinants of demand. Income elasticity of demand is the measure of the extent to which a consumer's demand for a commodity changes as a result of changes in his income. Income elasticity of demand is defined as the ratio of proportionate/percentage change in the quantity demanded of a commodity to the proportionate/percentage change in the consumer's income. Mathematically, it is represented as,

$$\varepsilon_1 = \frac{\text{Percentage change in the quanity demanded}}{\text{Percentage change in consumer's income}}$$

$$\varepsilon_1 = \frac{\Delta Q / Q_1}{\Delta I / I_1} = \frac{\Delta Q}{\Delta I} \cdot \frac{I_1}{Q_1}$$

Where,

ε_1 = Income elasticity of demand

Δ_Q = Percentage change in the quantity demand.

Q_1 = Initial quantity demanded of a commodity.

Δ_I = Percentage change in the consumer's income

I = Consumer's initial income.

Income elasticity of demand is also given by,

$$\varepsilon_i = \frac{(Q_2 - Q_1)/Q_1}{(I_2 - I_1)/I_1}$$

Where,

Q_2 – New quantity demanded

I_2 – Consumer's new income.

Consider and example as follows,

I_1 = `6,000 Q_1 = 50 units

I_2 = `7,000 Q_2 = 60 units

$$\therefore \varepsilon_I = \frac{(Q_2 - Q_1)/Q_1}{(I_2 - I_1)/I_1} = \frac{Q_2 - Q_1}{I_2 - I_1}\frac{I_1}{Q_1}$$

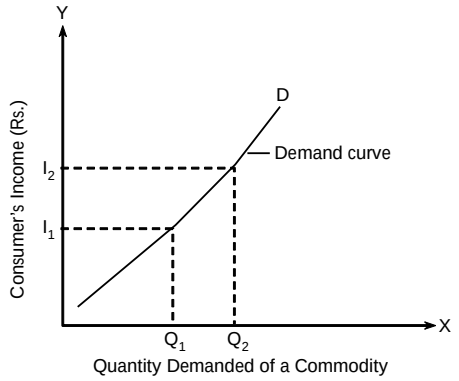
$$= \frac{60 - 50}{7,000 - 6,000}\frac{6,000}{50}$$

$$= \frac{10}{1000} \times \frac{6,000}{50} = 1.2$$

$\therefore$ Income elasticity ε_I = 1.2.

Income elasticity of demand for normal goods is positive, as the consumer's demand for a commodity goes in the same direction with his income. Whereas, income elasticity for inferior goods is negative as the demand for inferior goods varies inversely with consumer's income.

The demand curve for income elasticity of demand is,



Q29. How do you classify goods depending upon the Income Elasticity.

Ans : **(Dec.-20)**

i) Normal Goods (E>0)

These are goods whose consumption increases with an increase in income.

A good example of a normal good is the type of clothes you buy. While you are in college and your income is low, you may shop at Wal-Mart for your clothing. However, after you complete your degree, and you are making a lot of money as an economist, you are more likely to buy more expensive clothes from retailers in a shopping mall. In other words, your consumption increases as your income increases as you buy more expensive clothing.

ii) Necessity (E<1)

These are goods whose consumption increases an amount smaller than an increase in income.

An example of a necessity is drinking water. While you may upgrade to Dasani from Sam's Choice with an increase in income, however, it is unlikely that your consumption of water will increase an amount more than your increase income. For instance, if your income were to increase by 25 percent, you will probably not consume 25 percent more drinking water.

iii) Luxury Good (E>1)

These are goods whose consumption increases an amount larger than an increase in income.

An example of a luxury good is a round of golf. With low income, your consumption of rounds of golf will likely be zero. However, once your income rises enough to afford to play, your increase in rounds of golf will probably be higher than the increase in income. In other words, once you make enough money to play the first round of golf, your increase in round of golf consumption will be 100 percent while the increase in income may have only been 15 percent.

iv) Inferior Good (E<0)

These are goods whose consumption decreases with an increase in income.

A classic example of an inferior good is Ramen Noodles. The idea here is that you will consume fewer Ramen Noodles as your income increases. For example, after you graduate from college, you may have higher quality (more expensive) Chinese takeout instead of Ramen Noodles for some of those quick, late night, meals.

Q30. Discuss various types of income elasticities of demand?

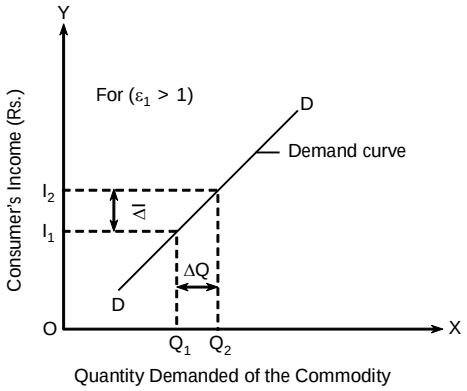
Ans : **(Dec.-16)**

Income elasticity of demand is categorized into five types.

i) High income elasticity of demand
ii) Unitary income elasticity of demand
iii) Low income elasticity of demand
iv) Zero income elasticity of demand
v) Negative income elasticity of demand.

(i) High Income Elasticity of Demand

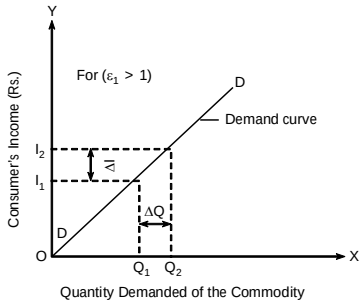
When the percentage change in the quantity demanded of a commodity is greater than the percentage change in the consumer's income, then the income elasticity of demand is high. The elasticity coefficient for high income elasticity is greater than one i.e., ($\varepsilon_1 > 1$). The demand curve is as follows,



(ii) Unitary Income Elasticity of Demand

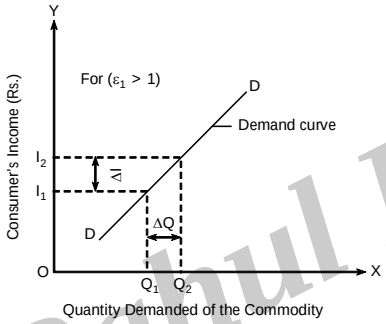
A commodity is said to possess unitary income elasticity of demand, when the percentage change in the quantity demanded of a commodity and the percentage change in the consumer's income are equal. The elasticity coefficient of unitary income elasticity is equal to one i.e.,

(ε_I = 1) and its demand curve is at an angle of 45° as shown below,



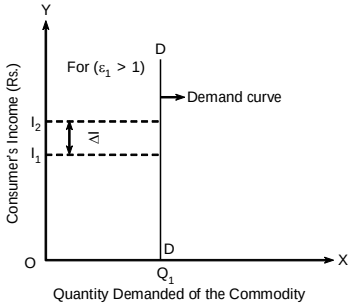
(iii) Low Income Elasticity of Demand

When the percentage change in the quantity demanded of a commodity is less then the percentage change in the consumer's income, it is called as low income elasticity of demand. The elasticity coefficient of low income elasticity is less than one (ε_I < 1) and the demand curve assumes the shane as follows.



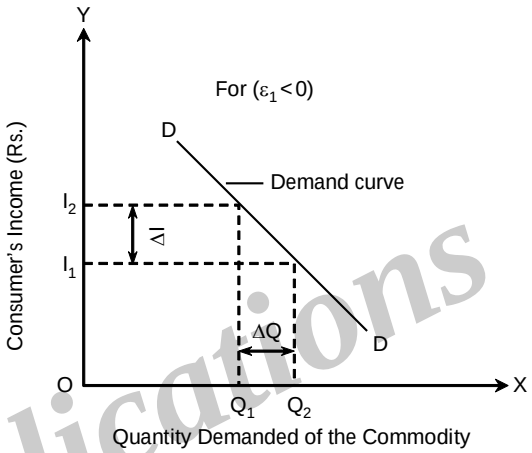
(iv) Zero Income Elasticity of Demand

A commodity is said to have zero income elasticity of demand when a change in consumer's income has no effect on the quantity demanded of a commodity. The elasticity coefficient for zero income elasticity is equal to zero (ε_I = 0). The demand curve is as follows.

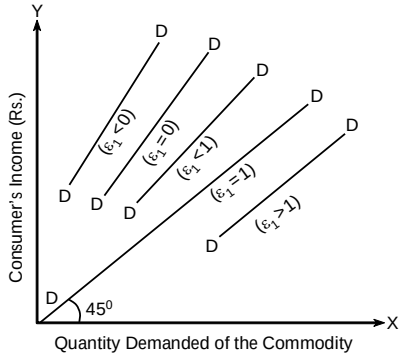


(v) Negative Income Elasticity of Demand

When an increase consumer's income causes a decrease in the quantity demanded of a commodity and vice- versa, then the commodity is said to have negative income elasticity of demand. Example is inferior goods have negative income elasticity with elasticity coefficient less than zero (ε_I < 0). The demand curve is,



The figure below depicts all the income elasticities of demand.



2.4.3 Cross Elasticity of Demand and Decision making

Q31. Explain about cross elasticity of demand.

Ans : **(Jan.-20, Dec.-16)**

The change (increase or decrease) in the demand for one good in response to the change (increase or decrease) in price of the related good is called the cross elasticity of demand. Cross elasticity is always negative for complementary demand.

Example : i) Due to increase in price of sugar, the demand for tea and coffee is decreases. Cross elasticity is positive for substitutes.

Example : ii) The demand for jeans goes up if there is an increase in the price of formal parts.

$$\text{Cross elasticity of demand} = \frac{\text{Proportionate change in quantity demanded for product B}}{\text{Proportionate change in price of product A}}$$

The same is expressed as,

$$Edc = \frac{\frac{(Q_2 - Q_1)}{Q_1}}{\frac{(P_2A - P_1A)}{P_1A}}$$

Where,

Q_1 = Quantity demanded before change.

Q_2 = Quantity demanded after change.

P_2 = Price before change.

P_3 = Price after change in the case of product.

Q32. Explain the Cross Elasticity of demand for decision making.

Ans :

The concept of cross elasticity of demand is of great importance in managerial decision making for formulating proper price strategy. Multiproduct firms often use this concept to measure the effect of change in price of one product on the demand for other products.

For example, "Maruti Udyog Ltd. produces Maruti Vans, Maruti 800 and Maruti Esteem. These products are good substitutes of each other and therefore cross elasticity of demand between them is very high. If Maruti Udyog decides to lower the price of Maruti 800, it will significantly affect the demand for Maruti Vans and Maruti Esteem. So it will formulate a proper price strategy fixing appropriate price for its various products. Further, Gillete Company produces both razors and razor blades which are complements with high cross elasticity of demand. If it decides to lower the price of razors, it will greatly increase the demand for razor blades. Thus there is need for adopting a proper price strategy when it produces products with high positive or negative cross price- elasticity of demand.

Second, the concept of cross elasticity of demand is frequently used in defining the boundaries of an industry and in measuring interrelationship between industries. An industry is defined as a group of firms producing similar products (that is, products with a high positive cross elasticity of demand. For example cross elasticity of demand between Maruti Esteem, Dawoo Ceilo, Opel Astra is positive and quite high. They therefore belong to the same industry (i.e.. automobiles). It should be noted that because of interrelationship of firms and industries between which cross price-elasticity of demand is positive and high, anyone cannot raise the price of its product without losing sales to other firms in the related industries.

Q33. Explain briefly about Advertisement Elasticity of demand.

Ans :

Advertising means the activity by which message are addressed to selected respondents with a view to induce them to buy the product, services or idea. Advertising elasticity is also known as promotional elasticity.

Advertising elasticity may be define as the responsiveness of demand or sales to change in advertising or other promotional expenses.

Advertising elasticity is always positive. In advertising elasticity, due to change in the expenditure it lead to increase in the sales revenue.

$$\text{Advertising elasticity of demand} = \frac{\text{(Proportionate change in the quantity demanded for product X}}{\text{Proportionate change in advertising cost}}$$

The same is expressed as,

$$\text{Eda} = \frac{\frac{(Q_2 - Q_1)}{Q_1}}{\frac{(A_2 - A_1)}{A_1}}$$

Where,

Q_x = Quantity demanded before change.

Q_2 = Quantity demanded after change.

A_1 = Amount spent on advertisement before change.

A_2 = Amount spent on advertisement after change.

Uses

1. It helps the manager to decide the advertisement expense. If the advertisement is more than one, which means incremental revenue exceeds incremental expenses, then increased expenditure on advertisement can be justified.
2. The fire should observe the saturation point, where advertisement pays nothing or does not help in increasing sales revenue.

PROBLEM ON ADVERTISEMENT ELASTICITY OF DEMAND

1. Determine the advertising elasticity of demand given that,

i) The quantity demanded for product S is 10,000 units per day at a monthly advertising budget of ` 1,000.

ii) The monthly advertising budget is slashed to ` 500, the quantity demanded will fall down to 3000 units per day.

Sol :

$$\text{Eda} = \frac{\frac{(Q_2 - Q_1)}{Q_1}}{\frac{(A_2 - A_1)}{A_1}}$$

For identifying the variables such as,

Q_1 = 10,000 units (quantity before change).

Q_2 = 3,000 units (quantity after change).

A_1 = ` 1,000 (advertising budget before change).

A_2 = ` 500 (advertising budget after change).

$$\text{Eda} = \frac{(3000-10,000)/10,000}{(500-1000)/1000}$$

$$= \frac{-0.7}{-0.5}$$

$$= +\ 1.4$$

Since Eda is +1.4, it means that for a 10% decrease in the advertising budget, there is a decrease in demand by 14%. Where the numerical value of elasticity is more than one, the advertising elasticity is relatively elastic.

Q34. What are the differences between Income elasticity of demand and cross Elasticity of demand ?

Ans :

S.No.	Income Elasticity of Demand	Cross Elasticity of Demand
(1)	When the demand for a product undergoes changes i.e., increase or decrease due to change in income is called income elasticity of demand.	The change i.e., increase or decrease in the demand for one good in response to change i.e., increase or decrease in price of the related goods is called to cross elasticity of demand.
(2)	The income elasticity of demand measures the changes in the quantity of demand.	The cross elasticity of demand measures how much demand of one good may change when price of another goods hold constant.
(3)	Income elasticity is calculated as, $= \frac{\text{Proportionate change in quantity}}{\text{Proportionate change in income}}$	Cross elasticity of demand is calculated as, $= \frac{\text{Proportionate change in quantity}}{\text{Proportionate change in price}}$
(4)	If the income elasticity of a good is positive we call them normal goods. It can be between '0' and '1', we call it income inelastic demand for goods such goods are clothing and news paper. If it is above '1', we call it income elastic demand.	If the cross elasticity is negative, then we can call, such goods as complements. Such as, popcorn and soft drinks they are consume together.
(5)	If the income elasticity is negative, it means that the income increases, the quantity demanded for these goods as inferior goods. **Example** : Magi Noodles, Rice, Potatos etc.	If the price elasticity is positive, than we call such goods as substitutes. **Example:** Pizza and burger, usually we canconsume any one.

Q35. What are the differences between Price and income elasticity of demand ?

Ans :

S.No.	Price Elasticity of Demand	Income Elasticity of Demand
(1)	Price elasticity of demand is the responsiveness of quantity demanded of a commodity to a given change in price.	When the demand for a product undergo changes i.e., increase or decrease due to change in income is called income elasticity of demand.
(2)	It mainly depends upon the price of the product.	It mainly depend upon the consumers income.
(3)	It is measured when price of a commodity changes.	The income elasticity of demand is measured with the changes in the quantity of demand.
(4)	Price elasticity of demand is calculated as $= \frac{\text{Proportionate change in quantity}}{\text{Proportionate change in price}}$	Income elasticity of demand is calculated as $= \frac{\text{Proportionate change in quantity}}{\text{Proportionate change in income}}$
(5)	In this type, when any product price the demand of a quantity increases and if the product price increases then the demand of quantity decreases.	In this type any change product de-decreases then mand increases than the consumer income get change i.e., decreases and if the product demand decreases than the consumer income is change i.e., remain unuse or constant.

Q36. What are the differences between Price and Cross Elasticity of Demand ?

Ans :

S.No.	Price Elasticity of Demand	Cross Elasticity of Demand
(1)	Price elasticity of demand is the responsiveness of quantity demanded of a commodity to a given change in price.	The changes i.e., increase or decrease in the demand for one good in response to change i.e., increase or decrease in price of the related goods is called cross elasticity of demand.
(2)	It is used to calculate the proportionate change which results in price and quantity relation.	It is used to calculate the proportionate change in quantity and price relation.
(3)	Price elasticity of demand is calculated as, $= \frac{\text{Proportionate change in quantity of Product A}}{\text{Proportionate change in price of Product B}}$	'Cross elasticity of demand is calculated as, $= \frac{\text{Proportionate change in quantity of Product B}}{\text{Proportionate change in price of Product A}}$
(4)	Price elasticity of demand is basically based on price of a product.	Cross elasticity of demand is basically relay on variation in price of related goods.
(5)	The price elasticity of demand measures the price of a commodity is the rate at which quantity are bought to changes as the prices changes.	The cross elasticity of demand measures the rate of responsiveness of quantity demanded of one commodity due to change in price of another commodity.

2.5 Demand Estimation

2.5.1 Meaning, Significance

Q37. What is Demand Estimation? Explain the importance of Demand Estimation.

Ans : **(Dec.-16)**

Demand estimation tries to find out expected present sales level, given the present state of demand determinants. Usually, demand estimation is done for a short period. Every firm must try to obtain the estimate of demand function for its product. The demand forecasting process begins with demand estimation.

In demand estimation, the relationship between the demand for a product and its determinant variables like price, GNP or GDP, population, price of substitutes and complements, etc., is calculated to make important decisions.

Importance

1. It is necessary for business manager to have information about market demand to develop strategies relating to price, sales and output to overcome the dynamic changes in determinants of demand.
2. Demand estimation helps in identifying the consumer demand behaviour which is useful in making effective business decisions.
3. It helps in ascertaining the effects of changes in excise duties, price and GNP on demand with respect to personal computers.
4. The consequences of increase in excise duties on sales can be known with demand estimation for products like cigarette etc.
5. It helps the manufactures to determine the increase in sales with the increase in their advertisement and publicity.
6. When the government liberalized its import policy, firm can estimate the changes in proportion of demand for domestic and imported goods through demand estimation.

Q38. Explain the various Methods of Demand Estimation.

Ans : **(Dec.-16)**

Demand estimation is done with the help of methods, the important methods of demand estimation are as follows,

1. Market Experimentation
2. Survey of Consumer's Future plans
3. Regression Analysis.

1. Market Experiment

The market experiment method is again classified into two methods. They are,

a) Actual Market Method

In this method, the reactions of consumer is monitored through sales outlets which are set up in different areas. In this experiment, different variables effecting demand are mixed and then reaction of consumers is recorded. Considerably, this experiment gives a clear picture about the market but it is expensive.

b) Market Simulation Method

In this method, consumers are given a specific amount of money to do shopping in simulated market. Then the behaviour of consumer is observed with respect to price and quality of good, its packaging, advertisement, etc. It is more expensive than actual market method and usually consumers do not take it seriously.

2. Survey of Consumer's Future Plans

In this method, businessmen contact with consumers personally to identify their future purchase plans. It can be done with the help of two methods. They are,

a) Census Method

In this method, all the consumers are contacted and their probable demand is reviewed. It is costly and sometimes there will be changes in consumer's demand due to changes in conditions.

b) Samples Survey Method

In this method, demand of selected consumers of a population is considered to be the market demand. This method is cheaper than census method but its reliability depends on sample of the population.

3. Regression Analysis

Regression analysis is a statistical technique which is useful in estimating demand by using independent variables like income, price of commodity, advertisement, etc. Regression analysis is also of two types. They are,

a) Simple Regression Analysis

In simple regression analysis, the quantity demanded is considered to be a function of a single independent variable.

b) Multiple Regression Analysis

In multiple regression analysis, demand is estimated by considering it as a function of two or more independent variables which change at the same time.

2.6 DEMAND FORECASTING

2.6.1 Meaning

Q39. Define Demand Forecasting. What are the factors determining Demand Forecasting?

Ans : **(Jan.-20)**

Meaning

Demand forecasting refers to an estimation of future demand for the product under given conditions.

Demand forecasting is predicting future demand for the product. It is the estimation of the value of a variable (or set of variables) to some future point in time.

Demand forecasting is the estimation of level of demand (amount or quantity) to be expected for goods or services for some period of time in future.

Definition

According to Evan J Donglas, "Demand forecasting may be defined as the process of finding values for demand in future time period".

Thus, demand forecasting means, when, how, where and how much will be the demand for a product or service in the near future.

Factors

The following are the factors determining demand forecasting,

1) Period of Forecasting

Demand forecasting may be short-term or long-term,

i) **Short-term:** A short-term demand may cover a period of three months, six months or one year but not exceeding one year.

ii) **Long-term:** Long-term forecasting covers a period exceeding 5 years.

A business should forecast short-term as well as long-term sales/demand for its products to have a clear view of business activities. An alternative method may be to associate the long-term and short-term forecasting with certain types of decisions.

2) Demand Forecasting Level

Demand forecasting may be undertaken at three different levels,

i) **Industry Level**: This includes the preparation of sales forecasts by different trade association.

ii) **Firm Level**: This includes the estimation of demand for the products which was offered by a individual firm. forecasts their sales.

iii) **Macro-Level**: It is concerned with business conditions over the whole economy measured by an approximate index of industrial production, national income or expenditure. This kind of external data cover the basic assumptions on which the business must have a base for its forecasts.

3) Products are to be Classified

Products are classified into capital goods and consumer durable (or) non-durable goods and services. There are distinctive patterns of. demand for different categories of the products.

4) Forecasts of Established Products (or) New Products

As for as the new products are concerned, methods and problems for forecasting are quite different from products already established in the market as sales trends are know better and the competitive nature is well known. Thus, the methods and problems should be studied accordingly.

5) Degree of Orientation

Demand forecasts has break down into two forecasts they are,

i) General Forecast : General forecasts are resulted with the total sales in the given period of time.

ii) Specific Forecast : Specific forecasts are those which resulted will be product/ service-wise or region or customer segment-wise forecasting sales within a given period of time.

6) Other Factors

There are other factors which influence the demand forecasting are,

i) Political developments

ii) Technology changes

iii) Price level or inflation changes

2.6.2 Significance

Q40. Explain the Significance of demand forecasting.

(OR)

What is the significance of demand forecasting?

Ans : **(Jan.-20, Jan.-18, Dec.-16)**

Significance

Demand plays a crucial role in the management of every business. It helps an organization to reduce risks involved in business activities and make important business decisions. Apart from this, demand forecasting provides an insight into the organization's capital investment and expansion decisions.

(i) Fulfilling objectives

Implies that every business unit starts with certain pre-decided objectives. Demand forecasting helps in fulfilling these objectives. An organization estimates the current demand for its products and services in the market and move forward to achieve the set goals.

For example, an organization has set a target of selling 50, 000 units of its products. In such a case, the organization would perform demand forecasting for its products. If the demand for the organization's products is low, the organization would take corrective actions, so that the set objective can be achieved.

(ii) Preparing the budget

It Plays a crucial role in making budget by estimating costs and expected revenues. For instance, an organization has forecasted that the demand for its product, which is priced at Rs. 10, would be 100,000 units. In such a case, the total expected revenue would be 10* 100000 = Rs. 10, 00, 000. In this way, demand forecasting enables organizations to prepare their budget.

(iii) Stabilizing employment and production

Helps an organization to control its production and recruitment activities. Producing according to the forecasted demand of products helps in avoiding the wastage of the resources of an organization. This further helps an organization to hire human resource according to requirement. For example, if an organization expects a rise in the demand for its products, it may opt for extra labor to fulfill the increased demand.

(iv) Expanding organizations

Implies that demand forecasting helps in deciding about the expansion of the business of the organization. If the expected demand for products is higher, then the organization may plan to expand further. On the other

hand, if the demand for products is expected to fall, the organization may cut down the investment in the business.

(v) Taking Management Decisions

Helps in making critical decisions, such as deciding the plant capacity, determining the requirement of raw material, and ensuring the availability of labor and capital.

(vi) Evaluating Performance

Helps in making corrections. For example, if the demand for an organization's products is less, it may take corrective actions and improve the level of demand by enhancing the quality of its products or spending more on advertisements.

(vii) Helping Government

Enables the government to coordinate import and export activities and plan international trade.

Q41. What is the Need for Demand Forecasting?

Ans :

Forecasting the demand for its product or products is the essential function for an organization irrespective of its nature. Many organizations follow it as a custom to completely and accurately forecast the demand of its products regularly. The need or the necessity for demand forecasting arises due to the following purposes served by it.

i) It serves as a road map for production plans.

ii) It plays a significant role in situations of uncertain production or demand.

iii) The outcomes of demand forecasting facilitate the managers to line up their business activities.

iv) The demand forecasting results from a basis for (EXIM) export and import policy and fiscal policy.

v) In situations of competition, it can help a manager/businessman to take decisions regarding inputs of production process such as labour, capital etc.

Q42. Explain the steps involved in Demand Forecasting ?

Ans :

While undertaking demand forecasting, following steps are involved,

1) Identification of Objectives

The first step is to identify the objectives for forecasting. These objective may be estimated based on many aspects such as quality, composition, price, sales planning etc.

2) Determining the Nature of Goods Under Consideration

The next step is important because different pattern are involved for different category of goods, consumer durable goods and consumer non-durable goods. This step helps to identify the approach of forecasting and determine the variable to be considered for forecasting.

3) Proper Method to be Selection

The next part of process is to select a proper method for forecast. The issue is concern with the objectives of forecasting, type of data available, period for which forecast is to be made, level of forecast etc.

4) Interpretation of Results

The final decision on demand forecasting objective is done on the basis of interpretation of the forecast. Efficiency of forecast mostly depends on efficiency of interpretation of results. Most of the time, the forecast result is based on the factors like business environment, international economic, political conditions, government policy etc. Again their is a need required to revise the forecast in the changing nature of circumstances.

2.6.3 Methods of Demand Forecasting

Q43. What are the various methods of Demand Forecasting.

Ans : **(Jan.-20)**

Forecasting demand is not an easy exercise. It may be easy only in the case of a very few products or services, where the demand for the product does not change from time to time or

competition is not significant, it may be relatively easy to forecast demand for a particular product or service. In a majority of the cases, market demand in general and company demand in particular change from year to year. In such a case, the determining factor for marketing success is only a good forecasting technique. The more the demand is sensitive, the more important it is to forecast it accurately. This calls for an elaborate forecasting process.

There are many methods of forecasting demand. To forecast demand, we need to build a certain base of information. To build such an information base, we need to consider what the customers say, what the customers do, and how the customers behaved in a given marketing situation.

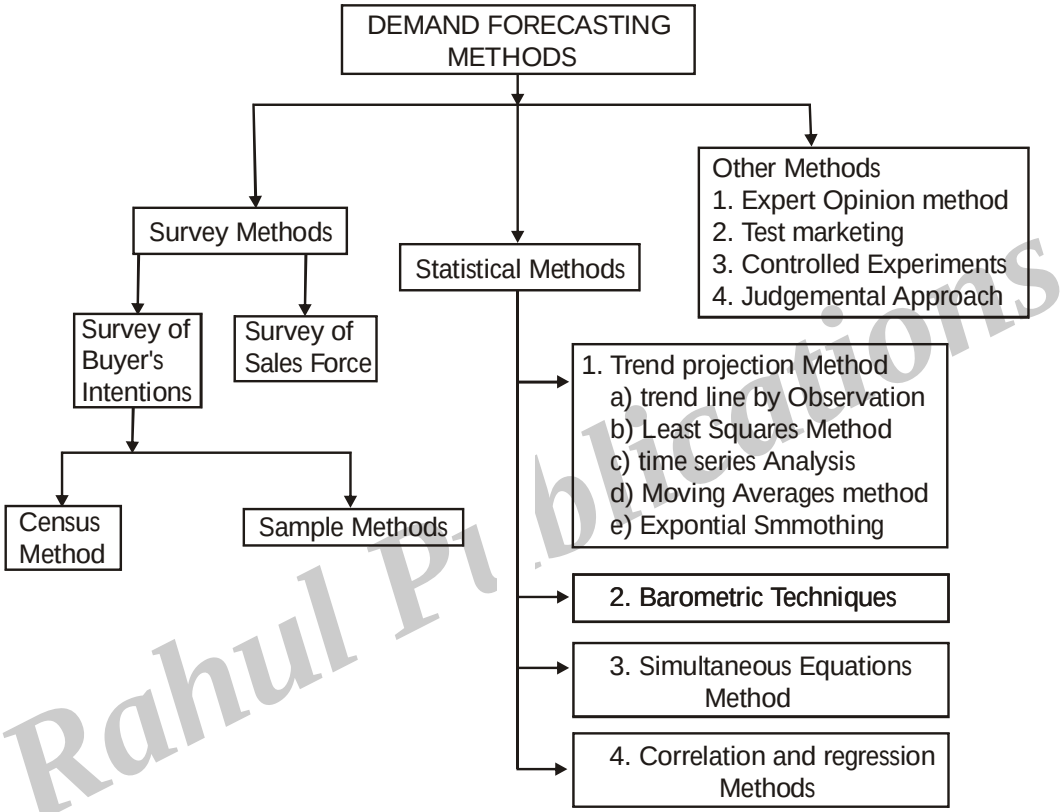


Fig.: Methods of Demand Forecasting

2.6.3.1 Survey Method

Q44. Explain briefly about Survey Method.

(or)

Elucidate the Survey Method of Demand Forecasting ?

Ans : **(Jan.-20, Jan.-18)**

a) Survey of Buyers' Intentions

To anticipate what buyers are likely to do under a given set of circumstances, a most useful source of information would be the buyers themselves. It is better to draw a list of all potential buyers, approach each buyer to ask how much does he plans to buy of the given product at a given point of time under particular conditions. This is the most effective method because the buyer is the ultimate decision-maker and we are collecting the information directly from him.

The survey of buyers can be conducted either by covering the whole population (or) by selecting a sample group of buyers. Suppose there are 10,000 buyers for a particular product. If the company wishes to elicit the opinion of all the buyers, this method is called *census method* (or) *total enumeration method.* This method is not only time-consuming, but also costly. On the other hand, the firm can select a group of buyers who can represent the whole population. This method is called the *sample method.* A survey of buyers based on sample basis can be completed faster with relatively lower costs.

Advantages

i) where the product is new on the market for which no data previously exists

ii) when the buyers are few and they are accessible

iii) when the cost of reaching them is not significant

iv) when the consumers stick to their intentions

v) when they are willing to disclose what they intend to do.

Disadvantages

They are:

i) Surveys may be expensive

Quite often the value of information supplied by the customer is not worth the cost of gathering it.

ii) Sample size and timing of survey.

Sample size should be large enough to yield meaningful results on the desired aspects of study. Also the sample should be selected in such a way that it represent the whole population under the study. This increases the cost and also the time needed to undertake the analysis.

The forecast results can deeply be influenced by the timing of the survey. For ex-ample, the number of residents preferring to stay in multi-storied apartments soon after the news about an earthquake may drastically come down when compared to the normal times.

Where the surveys are conducted by a group of firms, these costs can be shared.

iii) Methods of sampling

The survey should be based on appropriate method of sampling. The method so selected should be capable of providing results with no bias. For instance, the surveys conducted on the internet will have an built-in bias towards those in the higher socio-economic groups who have access to internet.

iv) Inconsistent buying behaviour

The buyers also may not express their intentions freely. Even the buyers do not act upon the way they express. Most of the buyers are susceptible to the advertisement strategies and are emotional when it really comes to the question of buying the product or service

b) Sales Force Opinions

Another source of getting reliable information about the possible level of sales or demand for a given product or service is the group of people who sell the same. Thus, we can control the limitations of cost and delays in contacting the customers.

The sales people are those who are in constant touch with the main and large buyers of a particular market, and hence they constitute another valid source of information about the likely sales of a product. The sales force is capable of assessing the likely reactions of the customers of their territories quickly, given the company's marketing strategy. It is less costly as the survey can be conducted instantaneously through telephone, fax or video-conferencing, and so on. The data, thus collected, forms another valid source of reliable information.

Here also, there is a danger that salesmen may sometimes become biased in their views. The sales people are paid based on their results. Where the targets are set based on the results of the survey of the sales force, and the payment is linked to achievement of these targets, incentive is paid to those who achieve

more than their targets. To prevent the company from fixing higher targets, it is quite likely that they understate or overstate the demand to eventually get low or high sales quota set for them.

This method is appropriate when

- Sales persons are likely to be most knowledgeable sources of information
- The salesmen are cooperative
- Bias factor can be corrected by means of growth factor. Where the company finds that the sales position is forecast lower, it may correct it by adding to it the estimated difference.

2.6.3.2 Statistical Methods

Q45. "Statistical and mathematical techniques complicate the process of demand forecasting". Do you agree? Support your answer.

Ans : **(Jan.-20, Jan.-18)**

For forecasting the demand for goods and services in the long-run, statistical and mathematical methods are used considering the past data.

a) Trend Projection Methods

These are generally based on analysis of past sales patterns. These methods dispense with the need for costly market research because the necessary information is often already available in company files interms of different time periods, that is, a time series data. There are five main techniques of mechanical extrapolation. In extrapolation, it is assumed that existing trend will maintain all through.

i) Trend line by observation: This method of forecasting trend is elementary, easy and quick as it involves merely the plotting the actual sales data on a chart and then estimating just by observation where the trend line lies. The line can be extended towards a future period and corresponding sales forecast read from the graph.

ii) Least Squares Method: Certain statistical formulae are used here to find the trend line which 'best fits' the available data. The trend line is the basis to extrapolate the line for future demand for the given product or service on graph. Here it is assumed that there is a proportional (linear) change in sales over a period of time. In such a case, the trend line equation is in linear form. Where this assumption does not hold good, the equation can be in non-linear form.

The estimating linear trend equation of sales is written as :

or $S = x+y(T)$

Where x and v have been calculated from past data S is sales and T is the year number for which the forecast is made. To find the values of x and y, the following normal equations have to be stated and solved :

$$\Sigma S = Nx + y\,\Sigma T$$

$$\Sigma ST = x\Sigma T + y\Sigma T^2$$

Where S is the sales; T is the year number, n = number of years.

iii) Time series analysis: Where the surveys or market tests are costly and time-consuming, statistical and mathematical analysis of past sales data offers another method to prepare the forecasts, that is, time series analysis. One major requirement to administer this technique is that the product should have actively been traded in the market for quite sometime in the past. In other words, considerable data on the performance of the product or service over significantly large period should be available for better results under this method. Time series emerge from such a data when arranged chronologically. Given significantly large data, the cause and effect relationships can be discovered through quantitative analysis.

The following are the four major components analysed from time series while forecasting the demand:

iv) **Trend (T):** It is also called the long-term trend, is the result of basic developments in the population, capital formation and technology. These developments relate to over a period of long time say five to ten years, not definitely overnight.

The trend is considered statistically significant when it has reasonable degree of consistency. A significant trend is central and decisive factor considered while preparing a long-range forecast.

v) **Cyclic Trend (C):** It is seen in the wave like movement of sales. The sales data is quite often affected by swings in the levels of general economic activity, which tend to be somewhat periodic. These could be related to the business cycles in the economy such as inflation or recession. For instance, during the period of inflation, prices of the products go up and hence the demand slows down.

vi) **Seasonal Trend (S):** It Refers to a consistent pattern of sales movements within the year. More goods are sold during the festival seasons. The seasonal component may be related to weather factors, holidays, and so on.

vii) **Erratic Trend (E):** It results from the sporadic occurrence of strikes, riots, and so on. These erratic components can even damage the impact of more systematic components, and thus make the forecasting process much more complex.

Classical time series analysis involves procedures for decomposing the original sales series (Y) into the components T, C, S, I. There are different models in the time series analysis. While one model states that these components interact linearly, that is, Y = T + C + S + E, another model states that Y is the product of all these components that is,

$$Y = T \times C \times S \times E$$

viii) **Moving average method:** This method considers that the average of past events determine the future events. In other words, this method provides consistent results when the past events arc consistent and unaffected by wide changes. As the name itself suggests, under this method, the average keeps on moving depending up on the number of years selected. Selection of the number of years is the decisive factor in this method. Moving averages get updated as new information flows in.

This method is easy to compute. One major advantage with this method is that the old data can be dispensed with, once the averages are computed. These averages, not the original data, are further used as the forecast for next period.

The main shortcoming of this method is that it gives equal weightage to data both in the recent past and the earlier one.

ix) **Exponential smoothing:** This is a more popular technique used for short run forecasts. This method is an improvement over moving averages method. Unlike in moving averages method, all time periods (ranging from the immediate past to distant past) here are given varying weights, that is, the values of the given variable in the recent times are given higher weights and the values of the given variable in the distant past are given relatively lower weights for further processing. The reason is obvious: it is assumed that the nearest future is more or less based on the recent past. This method proves more realistic when the data is consistent all through the year, unaffected by wide seasonal fluctuations.

The formula used for exponential smoothing is :

$$S_t + 1 = S_t + (1 - c)\, Sm_t$$

Where

S_{t+l} = Exponentially smoothed average for new year

S_t = Actual data in the most recent past

Sm_t = Most recent smoothed forecast

c = Smoothing constant.

If the smoothing constant 'c' is higher, higher weight is given to the most recent information. The value of 'c' varies between 0 and 1 inclusive and the exact value of c is determined by the magnitude of random variations. If the magnitude of random variations is large, lower value to c is assigned and vice versa. However, it is considered that a value between 0.1 and 0.2 is more appropriate in most of the cases.

b) Barometric Techniques

Where forecasting based on time series analysis or extrapolation may not yield significant results, barometric techniques can be made use of. Under the barometric technique, one set of data is used to predict another set. In other words, to forecast demand for a particular product or service, use some other relevant indicator (which is known as a barometer) of future demand.

c) Simultaneous Equation Method

In this method, all variables are simultaneously considered, with the conviction that every variable influences the other variables in an economic environment. Hence, the set of equations equal the number of dependent (controllable) variable which is also called endogenous variables. In other words, it is a system of 'n' equations with 'n' unknowns. It can be solved, the moment the model is specified because it covers all the unknown variables, it is also called complete systems approach to demand forecasting.

Like two least squares, where regression of investment (I) is found on all the predetermined variables such as government policy, competition, level of technology and so on, which are beyond the control of the management. These include the exogenous variables such as government policy and logged endogenous variables such as S_{t-1}.

This method is more practical in the sense that it requires to estimate the future values of only predetermined variables. It is an improvement over regression method whereas in regression equation, the value of both exogenous and endogenous variables have to be predicted. It is no better than regression method. It inherits all the limitations of regression method.

It is difficult to compute where the number of equations is larger.

d) Correlation and Regression Methods

Correlation and regression methods are statistical techniques. Correlation describes the degree of association between two variables such as sales and advertisement expenditure. When the two variables tend to change together, then they are said to be correlated. The extent to which they are correlated is measured by correlation coefficient. Of these two variables, one is a dependent variable and the other is an independent. If the high values of one variable are associated with the high values of another, they are said to be positively correlated.

For example, if the sales have gone up as a result of increase in advertisement expenditure, we can say that the sales and advertisement are positively correlated. Similarly, if the high values of one variable are associated with the low values of another, then they are said to be negatively correlated. For example, if the price of a product has come down; and as a result, there is increase in its demand, the demand and the price are negatively correlated. In other words, where the functional relationship is analysed with the independent variable, it is simple correlation. It is likely that there could be several

independent variables, and in such a case, it is called multiple correlation. Correlation coefficient ranges between +1 and –1. It does not exceed this range. Where the correlation coefficient is zero, it indicates that the variables under study are not related at all.

In *regression* analysis, an equation is estimated which best fits in the sets of observations of dependent variables and independent variables. The best estimate of the true underlying relationship between these variables is thus generated. The dependent (unknown) variable is then forecast based on this estimated equation, for a given value of the independent (known) variable. The method of least squares is applied in most regressions. As the regression coefficients estimated from the sample observations are merely the best estimate of true population parameters, the regression equation cannot exactly predict the dependent variable for a given value of the independent variable. In cases of more than one independent variable having significant effect upon the dependent variable, multiple linear regression is employed.

2.6.3.3 Other Methods

Q46. Define :

(a) Expert opinion

(b) Test marketing

(c) Control experiments

(d) Judgemental approach

Ans : **(Jan.-20)**

a) Expert Opinion

Well-informed persons are called experts. Experts constitute yet another source of information. These persons are generally the outside experts and they do not have any vested interests in the results of a particular survey.

An expert is good at forecasting and analyzing the future trends in a given product or service at a given level of technology. The services of an expert could be advantageously used when a firm uses general economic forecasts or special industry forecasts prepared outside the firm. It may be easy to administer this method where there are parameters clearly defined to make forecasts. These act as guidelines.

This method also has certain advantages and disadvantages.

Advantages

i) Results of this method would be more reliable as the expert is unbiased, has no direct commercial involvement in its primary activities.

ii) Independent demand forecasts can be made relatively quickly and cheaply.

iii) Where there are different points of view among different experts, consensus can be arrived through an objective analysis. The experts can be asked to explain the reasons why the forecasts are out of line with the consensus. These can be taken into account before taking the final decisions. Sorting out the differences in the estimates in this way is called Delphi Technique.

iv) This method constitutes a valid strategy particularly in the case of new products, in respect of which there is no other alternative or source of information.

Disadvantages

The main disadvantage is that an expert cannot be held accountable if his estimates are found incorrect.

b) Test Marketing

It is likely that opinions given by buyers, salesmen or other experts may be, at times, misleading. This is the reason why most of the manufacturers favour to test their product or service in a limited market as test-run before they launch their products nationwide. Based on the results of test marketing, valuable lessons can be learn on how consumers react to the given product and necessary changes can be introduced to gain wider acceptability. To forecast the sales of a new product or the likely sales of an established product in a new channel of distribution or territory, it is customary to find test marketing in practice.

Automobile companies maintain a panel of consumers who give feedback on the style and design and specifications of the new models. Accordingly these companies make necessary changes, if any, and launch the product in the wider markets.

In test marketing, the entire product and marketing programme is tried out for the first time in a small number of well-chosen and authentic sales environment. The primary objective, here, is to know whether the customer will accept the product in the present form or not.

Advantages

i) The acceptability of the product can be judged in a limited market

ii) Before it is too late, the corrections can be made to the product design, if necessary. Thus, major catastrophy, in terms of failure, can be avoided.

iii) The customer psychology is more focussed in this method and the product and services are aligned or redesigned accordingly to gain more customer acceptance.

Disadvantages

- It reveals the quality of the product to the competitors before it is launched in the wider market. The competitors may bring about a similar product or often misuse the results of the test marketing against the given company.
- It is not always easy to select a representative audience or market.
- It may also be difficult to extrapolate the feedback received from such a test market, particularly where the chosen market is not fully representative.

c) Controlled Experiments

Controlled experiments refer to such exercises where some of the major determinants of demand are manipulated to suit to the customers with different tastes and preferences, income groups, and such others. It is further assumed that all other factors remain the same. In this method, the product is introduced with different packages, different prices in different markets or same markets to assess which combination appeals to the customer most. Regression equation can be built upon these price-quantity relationships of different markets. This method can not provide better results, unless these markets are homogeneous in terms of, tastes and preferences of the customers, their income and so on.

This method is used to gauge the effect of a change in some demand determinant like price, product design, advertisement, packaging, and so on.

This method is still in the infancy stage and not much tried because of the following reasons:

- It is costly and time consuming
- It involves elaborate process of studying different markets and different permutations and combinations that can push the product aggressively
- If it fails in one market, it may affect other markets also

d) Judgemental Approach

When none of the above methods are directly related to the given product or service, the management has no alternative other than using its own judgement. Even when the above methods are used, the forecasting process is supplemented with the factor of judgement for the following reasons :

- Historical data for significantly long period is not available
- Turning points in terms of policies (or) procedures (or) causal factors cannot be precisely determined
- Sales fluctuations are wide and significant
- The sophisticated statistical techniques such as regression and so on. May not cover all the significant factors such as new technologies and so on, affecting demand
- The results of statistical methods are more reliable at the national level rather than firm or industry level. In such a case, the management has to rely more on its judgement to assess the validity of such results.

PROBLEMS

2. Determine the price elasticity of demand given that,

(i) The quantity demanded for product S is 10,000 units at a price of ` 1000.

(ii) The price declines to ` 900 and the quantity demanded increases to 15,000 units.

Sol :

$$Edp = \frac{\frac{(Q_2 - Q_1)}{Q_1}}{\frac{(P_2 - P_1)}{P_1}}$$

For identifying the variables such as,

Q_1 = 10,000 units (quantity before change).

Q_2 = 15,000 units (quantity after change).

= ` 1000 (price before change).

P_2 = ` 900 (price after change).

$$Edp = \frac{\frac{(15,000 - 10,000)}{10,000}}{\frac{(900 - 1000)}{1000}}$$

$Edp = -5$

As the Edp is –5, it means that for a 10% change in price, there is a change in demand by 50%. Where the numerical value of elasticity is more than one, the demand is elastic. In other words, the percentage of increase in quantity demanded is more than the percentage of decrease in price.

3. Determine the price elasticity of demand given that,

i) The quantity demanded for product S is 10,000 units at a price of ` 1000.

ii) The price declines to ` 700 and the quantity demanded increases to 11,000 units.

Sol :

$$Edp = \frac{\frac{(Q_2 - Q_1)}{Q_1}}{\frac{(P_2 - P_1)}{P_1}}$$

For indentifying the variables such as,

Q_1 = 10,000 units (quantity before change).

Q_2 = ` 11,000 units (quantity after change).

P_1 = 1000 (price before change).

P_2 = ` 700 (price after change).

$$Edp = \frac{\frac{(11,000 - 10,000)}{10,000}}{\frac{(700 - 1000)}{1000}}$$

$Edp = -0.33$

As the Edp is -0.33, it means that for a 10% fall in price, there is a change in demand by 3.3%. Where the numerical value of elasticity is less than one, the price demand is inelastic. In other words, the percentage of increase in quantity demanded is less than the percentage of decrease in price.

4. Determine the price elasticity of demand given that,

i) The quantity demanded for product S is 10,000 units at a price of ` 1,000.

ii) The price declines to ` 500 and the quantity demanded increases to 15,000 units.

Sol :

$$Edp = \frac{\frac{(Q_2 - Q_1)}{Q_1}}{\frac{(P_2 - P_1)}{P_1}}$$

For indentifying the variables such as,

Q_1 = 10,000 units (quantity before change).

Q_2 = 15,000 units (quantity after change).

P_1 = ` 1,000 (price before change).

P_2 = ` 500 (price after change).

$$Edp = \frac{\frac{(15,000-10,000)}{10,000}}{\frac{(500-1,000)}{1,000}} = -1.0$$

As the Edp is -1.0, it means that for a 50% fall in price, there is an increase in demand by 50%. Where the numerical value of elasticity is equal to one, the price demand is unitary elasticity. In other words, the percentage of increase in quantity demanded is equal to the percentage of decrease in price.

5. Determine the income elasticity of demand given that,

i) The quantity demanded for product Q is 10000 units at a daily income of `1000.

ii) The daily income declines to ` 800 and the quantity demanded decreases to 7000 units.

Sol :

$$Edi = \frac{\frac{(Q_2-Q_1)}{Q_1}}{\frac{(I_2-I_1)}{I_1}}$$

For identifying the variables such as,

Q_1 = 10,000 units (quantity before change)

Q_2 = 7,000 units (quantity after change).

I_1 = ` 1,000 (Income before change).

I_2 = ` 800 (Income after change).

$$Edi = \frac{\frac{(7,000-10,000)}{10,000}}{\frac{(800-1,000)}{1000}} = \frac{-0.3}{-0.2} = 1.5$$

Edi is 1.5, which means that for a 10% fall in income, there is a decrease in demand by 15%. Where the numerical value of elasticity is more than one, the price demand is relatively elastic.

6. Determine the cross elasticity of demand given that,

i) The quantity demanded for product S is 10,000 units at a price of ` 2,000.

ii) The price declines to 200 and the quantity demanded increases to 12,000 units.

Sol :

$$Edc = \frac{\frac{(Q_2-Q_1)}{Q_1}}{\frac{(P_2A-P_1A)}{P_1A}}$$

For identifying the variables such as,

Q_1 = 10,000 kg (quantity of coffee demanded before change).

Q_2 = 12,000 units (quantity of coffee demanded after change).

P_2 = ` 200 (price of sugar per kg. before change).

P_2 = ` 300 (price of sugar per kg. after change).

$$Edc = \frac{\frac{(12,000-10,000)}{10,000}}{\frac{(300-200)}{200}} = \frac{0.2}{0.5} = 6.4$$

Since Edc is 0.4, it means that for a 10% increase in the price of sugar, there is an increase in demand by 4%. Where the numerical value of elasticity is less than one, the cross demand is relatively inelastic.

7. Suppose that the demand curve for video rentals has been estimated to be Q = 2500 – 250P. Further your average costs of supplying videos is equal to 2 AC = 8 – 006 Q + 0.000002Q . Calculate your optimal price, quantity and profits.

Sol :

Calculation of Optimal Price and Quantity

Given,

$Q = 2500 - 250\ P$

Dividing the equation with 250

$$\frac{Q}{250} = \frac{2500}{250} = \frac{250P}{250}$$

$0.004\ Q = 10 - P$

$P = 10 - 0.004Q$

$TR = PQ = (10 - 0.004\ Q)\ Q$

$= (10Q - 0.004Q)\ Q$

$= 10 - 0.004\ Q^2$

$$MR = \frac{d}{dQ}(PQ)$$

$= 10 - (0.004 \times 2)\ Q$

$= 10 - 0.008\ Q$

Calculation of Total Cost (TC)

Multiplying average cost (AC) with quantity (Q)

$AC = 8 - 0.006Q + 0.000002Q$

$= 8 - 0.006002Q$

$TC = 8Q - 0.006002Q \times Q$

$= 8Q - 0.006002Q^2$

Applying $\frac{d}{dx}(x^n) = n.x^{n-1}$ to get MC

$MC = 8 - (0.006002 \times 2)Q$

$MC = 8 - 0.012\ Q$

Now, setting (Marginal Revenue) MR = MC (Marginal Cost)

$MR = MC$

$10 - 0.008\ Q = 8 - 0.012Q + 0.008Q$

$10 = 8 - 0.012Q + 0.008Q$

$10 = 8 - 0.004Q$

$10 - 8 = -0.004Q$

$2 = -0.004Q$

$$\frac{2}{-0.004} = Q$$

$Q = -500$

Substituting 'Q'value in equation

$P = 10 - 0.004Q$

$P = 10 - 0.004\ (-500)$

$P = 12$

Calculation of Profit/Loss

Profit/loss = Total revenue – Total cost

$TR = PQ$

$= 12 \times (-500) = -6000$

$TC = 8Q - 0.006002(-500)^2$

$= -2499.50$

Profit/Loss = $-6000 - (-2499.50)$

Profit/Loss = -3500.50

8. Suppose that you are a monopoly faced with a demand curve given by Q = 100 – 2P. You have a constant marginal cost equal to $10. Calculate your optimal price and quantity. Show that your price adheres to the optimal markup rule based on demand elasticity.

Sol :

Calculation of Optimal Price and Quantity

Given that,

$Q = 100 - 2P$, $MC = \$\ 10$

Dividing equation by 2

$$\frac{Q}{2} = \frac{100}{2} - \frac{2P}{2} \text{ (or) } Q\frac{1}{2} = \frac{100}{2} - \frac{2P}{2}$$

$$Q\frac{1}{2} = 50 - P$$

$P = 50 - 0.5\ Q$

$TR = PQ$

$= (50 - 0.5\ Q)Q$

$= 50Q - 0.5Q^2$

$$MR = \frac{d}{dQ}(PQ)$$

$$= 50 - (0.5 \times 2)\,Q$$

$$= 50 - Q = MC = 10$$

$$Q = 50 - 10$$

$$Q = 40$$

$$= 50 - 0.5\,(40)$$

$$= 50 - 20$$

$$P = 30$$

Calculating of Elasticity

$$\varepsilon = \frac{dQ}{DP}\frac{P}{Q}$$

$$= 2\left(\frac{30}{40}\right)$$

$$= 1.5$$

Optimal Markup rule

$$P = \frac{MC}{1+\frac{1}{\varepsilon}}$$

$$= \frac{10}{1+\frac{1}{1.5}} = \$\,60$$

9. An economic research centre published data on GDP and demand for refrigerators as given below.

Year	1990	1991	1992	1993	1994	1995	1996
GDP (Billion `)	20	22	25	27	30	33	35
Refrigerators (Million Units)	5	6	8	8	9	10	12

(a) Estimate regression equation R = a + bY

Where R = Refrigerator and Y = GDP

(b) Forecast demand for refrigerators for the years 1997 and 1998. The research centre has projected GDP for 1997 and 1998 at ` 38 billion and ` 40 respectively.

Sol :

(a) Given regression equation is Y = a + bY

Where,

Y = GDP

a, b = Coefficients to be estimated.

Parameters 'a' and 'b' can be estimated by solving the two linear equations as follows,

$$\Sigma R_t = na + b\Sigma Y$$

$$\Sigma Y_t.R_t = a\Sigma Y_t + bY_t^2$$

Year	GDP (Y) (Million `)	Refrigerators (R) (Million Units)	Y^2	RY
1900	20	5	400	100
1991	22	6	484	132
1992	25	8	625	200
1993	27	8	729	216
1994	30	9	900	270
1995	33	10	1089	330
1996	35	12	1225	420
$\Sigma n = 7$	$\Sigma Y_t = 192$	$\Sigma R_t = 58$	$Y_t^2 = 5452$	$\Sigma R_t Y_t = 1668$

Substitute the values from the above table into the equations (1) and (2),

$$\Sigma R_t = na + b\Sigma Y_t$$

$$58 = 7a + b\ 192$$

$$\Sigma Y_t.R_t = a\Sigma Y_t + bY_t^2$$

$$1668 = a\ (192) + b\ (5452)$$

Solving the equations (3) and (4), we get the values of a and b

$$27.43\ (7a + 192b = 58)$$

$$1591 = 192a + 5267b$$

$$1668 = 192a + 5452b$$

$$-77 = -185b$$

$$b = \frac{-77}{-185} = 0.4162 \cong 0.41$$

$$58 = 7a + 192\ (0.41)$$

$$58 = 7a + 78.72$$

$$7a = -78.72 + 58$$

$$7a = -20.72$$

$$a = \frac{-20.72}{7} = -2.96 \cong -3$$

$$R = a + bY$$

$$= -3 + 0.41\ Y$$

(b) When GDP is Rs. 38 billion, the demand for refrigerators would be,

$$R = -3 + 0.4\ Y$$

$$= 3 + 0.41(38)$$

$$= -3 + 15.58$$

$$R_{1997} = 12.58$$

When GDP is Rs. 40 billion, the demand for refrigerators would be,

$$R = -3 + 0.41\,Y$$
$$= -3 + 0.41(40)$$
$$= -3 + 16.4$$
$$R_{1998} = 13.4$$

10. Give the following supply and demand equations.

$Q_0 = 200 - P$ and $Qs = 20 + 5P$. determine the equilibrium price and quantity.

Sol : **(Jan.-20)**

$$Q_D = 200 - P$$
$$Q_S = 20 + 5P$$

Equilibrium price and quantity = $Q_d = Q_S$

$$= 200 - P = 20 + 5P$$
$$= 200 - 20 - P - 5P = 0$$
$$= 180 - 6P = 0$$
$$= 180 = 6P$$
$$= P = \frac{180}{6} = 30$$

Substitute the P value in the demand function

$$Q_D = 200 - 30 = 170$$

Sr, Equilibrium Price P = 30

Quantity = Q = 170

11. For each of the following equations, determine whether demand is elastic, inelastic or unitary elastic at the given prices.

Q = 100 – 4P and P = Rs. 20

Q = 1500 – 20 P and P = Rs. 5

P = 50 – 0.1Q and P = Rs. 20

Sol : **(Jan.-20)**

(a) Q = 100 = 4P where P = 0

$$= 100 - 4(2) = 100 - 20$$

Q = 20

where

Q = 20, the price elasticity

$$E_P = \frac{dQ}{dP} \times \frac{P}{Q}$$

$$= -4 \times \frac{20}{20} = -4.0$$

–4.0 is $-1 < E_p \leq 0$.

So it is inelastic

(b) Q = 1500 – 20P, where P = 5

$$= 1500 - 20(5) = 1500 - 100 = 1400$$

$$\frac{dQ}{dP}\ 1500 - 20P = -20$$

$$EP = \frac{dQ}{dP} \times \frac{P}{Q} = -20 \times \frac{20}{1400} = -0.07$$

It is also in inelastic range

(c) P = 50 – 0.1Q first we need to do inverse function

i.e., P = 50 – 0.1Q = 0.1Q = 50 – P =

$$Q = \frac{50 - P}{0.1} = 0$$

Q = 500 – 10P, where P = 2

$$= 500 - 10(20) = 300$$

$$\frac{dQ}{dP} = -10$$

$$E_P = \frac{dQ}{dP} \times \frac{P}{Q}$$

$$= -10 \times \frac{20}{300} = -0.67$$

It is also inelastic range.

12. Given the Demand Equation :

Q = 9,000 – 1.5 P

(a) What is Q when P = Rs. 1,200

(b) Calculate the Total Revenue when P = Rs. 1,200.

Sol : **(Dec.-20)**

Given that

$Q = 9000 - 1.5P$

(a) Where $P = 1200$ $Q = 1$

$Q = 9000 - 1.5\ (1200) = 9000 - 1800$

$= 7,200$

(b) $TR = P \times Q$

$= 1200 \times 7200$

$= 86,40,000.$

13. If the quantity demanded of rice is 4 kgs at an income of Rs. 1000 p.m. and 5 kgs at an income of Rs. 1,500 p.m. Find the income Elasticity of Demand.

Sol : **(Dec.-20)**

Given that

$I_1 = 1000$ P.M $I_2 = 1500$ P.M.

$Q_1 = 4$ $Q_2 = 5$

$$= \frac{5-4}{1500-1000} \times \frac{1500+1000}{5+4}$$

$$= \frac{1}{500} \times \frac{2500}{9}$$

$= 0.002 \times 277.78$

$= 0.56$

14. If the Q_D of rice is 40 kgs at an income of Rs. 10,000 p.m. and 50 kgs at an income of Rs. 15000 p.m. find the income elasticity of demand.

Sol : **(Dec.-16)**

$$\text{Income elasticity demand} = \frac{\Delta Q}{\Delta y} \times \frac{Y}{Q}$$

Change in demand (ΔQ) $= 50 - 40 = 10$

Change in Income (ΔM) $= 15000 - 10,000$

$= 5,000$

$$e_1 = \frac{\Delta Q}{QM} \times \frac{M_2 + M_1}{Q_2 + Q_1}$$

$$= \frac{10}{5000} \times \frac{15000 + 10,000}{50 + 40}$$

$$= \frac{10}{5000} \times \frac{25000}{90}$$

$$= \frac{50}{90}$$

$e_1 = 0.556$

15. Suppose demand for car in Bombay as a function of income is given by the following equation:

Q = 20000 + 5M. Find out the income elasticity of demand when per capita level of income (M) is Rs. 15,000.

Sol : **(June-16)**

$$\text{Income elasticity } (e_i) = \frac{\Delta Q}{\Delta M} \cdot \frac{M}{Q}$$

Inorder to obtain income elasticity, we have to first find out quantity demanded(Q) at income level of `15000. Thus

$Q = 20000 + 5 \times 15000 = 95,000$

It will seen from the given income demand function that coefficient of income (M) is equal to 5.

This implies that $\frac{\Delta Q}{\Delta M} = 5$

with this information we can calculate income elasticity.

$$e_i = \frac{\Delta Q}{\Delta M} \times \frac{M}{Q} = 5 \times \frac{15,000}{95,000} = 0.8.$$

16. The demand function equation faced by HCL for its personal computer is given by P = 50000 – 4Q

Write the marginal revenue equation a what price and quantity marginal revenue will be zero.

Ans : **(June-16)**

To obtain total revenue function, we multiply the given demand equation by Q.

$TR = PQ = 50,000\ Q - 4Q^2$

Taking the first derivative of the total revenue function would give us marginal revenue equation. Thus,

$$MR = \frac{d(TR)}{dQ} = \frac{d(PQ)}{dQ} = 50,000 - 8\ Q$$

Setting Marginal Revenue equation equal to zero would give us the quatity at which MR. is zero. Thus,

$50,000 - 8Q = 0$

$8Q = 50,000$

$Q = 6,250$

To obtain the price associated with the quantity (6,250), we substitute the value of Q into the demand function.

$P = 50,000 - 4Q$

$= 50,000 - 4(6,250)$

$= 50,000 - 25,000$

P = `25,000

17. Assume a firm has the following total revenue of total cost functions:

TR = 320 Q + 2Q2

TC = 1800 + 5Q + 3Q2

Find :

(A) The level at output at which firm will be maximizing profit.

(B) The level at output at which total revenue will be maximum.

Sol : **(Dec.-15)**

$TR = 320\ Q + 2Q2$

$TC = 1800 + 5Q + 3Q2$

Profit maximising output can be found by obtaining MR and MC from the given total revenue and total cost function respectively.

Marginal revenue and marginal cost are measured by the slopes at a point on these curves.

$$MR = \frac{\Delta TR}{\Delta Q} = 320 - 4Q$$

Taking the first derivative of the total cost function

$$MC = \frac{\Delta TC}{\Delta Q} = 50 + 6Q$$

Setting MR = MC, we have

$320 - 4Q = 50 + 6Q$

$10Q = 320 - 50 = 270$

$10Q = 270$

$Q = 27$

Thus profit maximising level of output = 27

Profit (π) = TR – TC

$\pi = (320\ Q - 2\ Q^2) - (1800 + 50\ Q + 3Q^2)$

$= 320\ Q - 2\ Q^2 - 1800 - 50\ Q - 3\ Q^2$

$= 270\ Q - 5\ Q^2 - 1800$

$$\frac{d\pi}{dQ} = 270 - 10\ Q$$

Now profits will be maximised when the first derivative of total profit function is zero.

Thus $\frac{d\pi}{dQ} = 0$

$270 - 10\ Q = 0$

$10\ Q = 270$

$Q = 27.$

18. The following is the demand function for a product.

Q = 40 – 2P where

P = Rs. 5

Determine :

(A) Price elasticity of demand

(B) What effect a rise in price would have on total revenue

Sol : **(Dec.-15)**

$Q = 40 - 2P$

$P = Rs.\ 5$

$Q = 40 - 2 \times 5$

$Q = 30$

Price elasticity of demand

$$e_p = b \cdot \frac{P}{Q}$$

where $Q = a - bp$

$\therefore$ $b = 2$, $Q = 30$, $P = 5$

$$e_p = 2 \times \frac{5}{30}$$

$$e_p = 0.33$$

Thus price elasticity demand at price ` 5 is 0.33 and quantity demanded is 30 units.

Total revenue = TR = PQ

$$R = 40 - 2P \Rightarrow 2P = 40 - Q$$

$$P = \frac{40 - Q}{2}$$

$$TR = PQ$$

$$TR = Q\left[40 - \frac{Q}{2}\right]$$

$$TR = 40Q - \frac{Q^2}{2}$$

Taking first derivative of TR Function

$$\frac{d(TR)}{dQ} = 40 - \frac{2}{2}Q = 40 - Q$$

In order to find the quantity sold at which TR is maximised, we set first derivative of TR equal to zero.

$$40 - Q = 0$$

$$Q = 40 \text{ units}$$

Substitute the value of Q into the demand equation.

$$P = 40 - \frac{1}{2} .40$$

$$P = 20 \text{ Rs.}$$

Thus, the quantity at which total revenue is maximised is 40 units and the associated price is Rs. 20.

Short Question and Answers

1. Define Demand.

Ans :

In economic science, the term "demand" refers to the desire, backed by the necessary ability to pay. The demand for a good at a given price is the quantity of it that can be bought per unit of time at the price. There are three important things about the demand :

1. It is the quantity desired at a given price.
2. It is the demand at a price during a given time.
3. It is the quantity demanded per unit of time.

Meaning of Demand

Demand is the amount of particular economic goods or services that a consumer or group of consumers will want to purchase at a given price at a particular time.

Therefore, demand means desire backed up by adequate purchasing power to pay for the product when demanded and willingness to spend the money for the satisfaction of that desire.

Demand = Desire to buy + Ability to pay + Willingness to pay.

Definition of Demand

According to Benham, "The demand for anything, at a given price, is amount of it, which will be bought per unit of time, at that price".

According to Bobber, "By demand we mean the various quantities of a given commodity or service which consumers would buy in one market in a given period of time at various prices".

According to G.L. Thiekettle, "The demand for any commodity or service is amount that will be bought at any given price per unit of time".

2. Individual Demand.

Ans :

For an individual/household the amount demanded of a commodity is different at different prices. If we put in a tabular form the amount demanded of a commodity at different price levels of the commodity, we get a demand schedule. A demand schedule at any particular time refers to the series of quantities the consumer is prepared to buy at its different prices. An imaginary demand schedule for oranges for a consumer, say A, is given in Table. This demand schedule is for an individual consumer and is, therefore, known as Individual demand schedule.

In case we have similar demand schedules for all the consumers in the market, we can then add up the quantities demanded of the commodity by these consumers at each price and get a summed up schedule called the market demand schedule.

Price of oranges (Rs.)	10	9	8	7	6
Quantity demanded of oranges (dozen)	1	3	7	11	13

Table : Demand for Oranges by Individual A

3. Explain briefly about market demand.

Ans :

Market demand can be defined as the sum of individual demands for a product as a price per unit of time. We may recall that the quantity demanded of a commodity - an individual per unit of time, at a given price, is known as 'individual demand' for that commodity.

Individual demand schedules or individual demand functions are known, the market demand schedule and curve can be obtained by (i) adding up individual demand at different prices, and (ii) summing up individual demand functions.

If individual demand schedules or individual demand functions are known, the market demand schedule and market demand curve can easily be derived. The market demand curve can be derived by adding up (i) the individual demand schedules, and (ii) the individual demand functions. In this section, we illustrate the derivation of market demand curve by using these two methods.

The table shows the quantity demanded of X individually by the three consumers at different prices of commodity X. The last column shows the market demand, i.e., the sum of individual demands for commodity X. The market demand shows the total quantity of commodity X demanded per month by the three consumers at different prices.

Price of X (Rs.)	Quantity of X Demanded by			Market Demand =(A+B+C)
	A	B	C	
25	0	0	0	0
20	5	0	0	5
15	10	5	0	15
10	15	10	5	30
5	20	15	10	45
0	25	20	15	60

Table : Price of Commodity X and Quantity Demanded

4. Define law of Demand

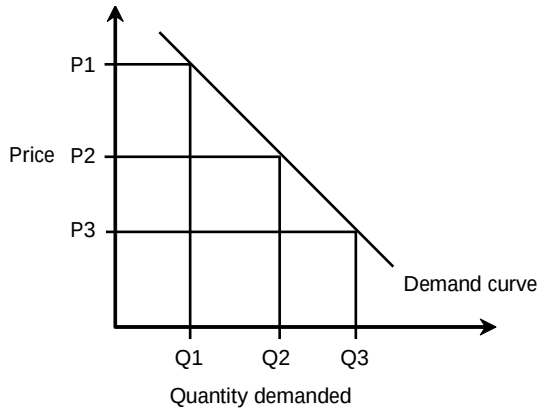
Ans :

Definition

The law of demand states that other factors being constant (cetris peribus), price and quantity demand of any good and service are inversely related to each other. When the price of a product increases, the demand for the same product will fall.

Description

Law of demand explains consumer choice behavior when the price changes. In the market, assuming other factors affecting demand being constant, when the price of a good rises, it leads to a fall in the demand of that good. This is the natural consumer choice behavior. This happens because a consumer hesitates to spend more for the good with the fear of going out of cash.



The above diagram shows the demand curve which is downward sloping. Clearly when the price of the commodity increases from price p3 to p2, then its quantity demand comes down from Q3 to Q2 and then to Q3 and vice versa.

5. Exceptions of law of demand.

Ans :

The law of demand does not apply in every case and situation. The circumstances when the law of demand becomes ineffective are known as exceptions of the law. Some of these important exceptions are as under.

i) Giffen Goods

Some special varieties of inferior goods are termed as Giffen goods. Cheaper varieties of this category like bajra, cheaper vegetable like potato come under this category. Sir Robert Giffen or Ireland first observed that people used to spend more their income on inferior goods like potato and less of their income on meat. But potatoes constitute their staple food. When the price of potato increased, after purchasing potato they did not have so many surpluses to buy meat. So the rise in price of potato compelled people to buy more potato and thus raised the demand for potato. This is against the law of demand. This is also known as Giffen paradox.

ii) Conspicuous Consumption

This exception to the law of demand is associated with the doctrine propounded by Thorsten Veblen. A few goods like diamonds etc., are purchased by the rich and wealthy sections of the society. The prices of these goods are so high that they are beyond the reach of the common man. The higher the price of the diamond the higher the prestige value of it. So when price of these goods falls, the consumers think that the prestige value of these goods comes down. So quantity demanded of these goods falls with fall in their price. So the law of demand does not hold good here.

iii) Conspicuous Necessities

Certain things become the necessities of modern life. So we have to purchase them despite their high price. The demand for T.V. Sets, automobiles and refrigerators etc. has not gone down in spite of the increase in their price. These things have become the symbol of status. So they are purchased despite their rising price. These can be termed as "U" sector goods.

iv) Ignorance

A consumer's ignorance is another factor that at times induces him to purchase more of the commodity at a higher price. This is especially so when the consumer is haunted by the phobia that a high-priced commodity is better in quality than a low-priced one.

v) Emergencies

Emergencies like war, famine etc. negate the operation of the law of demand. At such times, households behave in an abnormal way. Households accentuate scarcities and induce further price rises by making increased purchases even at higher prices during such periods. During depression, on the other hand, no fall in price is a sufficient inducement for consumers to demand more.

vi) Future Changes in Prices

Households also act speculators. When the prices are rising households tend to purchase large quantities of the commodity out of the apprehension that prices may still go up. When prices are expected to fall further, they wait to buy goods in future at still lower prices. So quantity demanded falls when prices are falling.

6. Define Utility.

Ans :

The term utility in Economics is used to denote that quality in a good or service by virtue of which our wants are satisfied. In, other words utility is defined as the want satisfying power of a commodity.

According to, Mrs. Robinson, "Utility is the quality in commodities that makes individuals want to buy them."

According to Hibdon, "Utility is the quality of a good to satisfy a want."

Features

Utility has the following main features :

(i) Utility is Subjective : Utility is subjective because it deals with the mental satisfaction of a man. A commodity may have different utility for different persons. Cigarette has utility for a smoker but for a person who does not smoke, cigarette has no utility. Utility, therefore, is subjective.

(ii) Utility is Relative : Utility of a good never remains the same. It varies with time and place. Fan has utility in the summer but not during the winter season.

(iii) Utility and usefulness : A commodity having utility need not be useful. Cigarette and liquor are harmful to health, but if they satisfy the want of an addict then they have utility for him.

(iv) Utility and Morality : Utility is independent of morality. Use of liquor or opium may not be proper from the moral point of views. But as these intoxicants satisfy wants of the drinkards and opiumeaters, they have utility for them.

7. What is budget line?

Ans :

The knowledge of the concept of budget line is essential for understanding the theory of consumer's equilibrium. A higher indifference curve shows a higher level of satisfaction than a lower one. Therefore, a consumer in his attempt to maximise his satisfaction will try to reach the highest possible indifference curve. But in his pursuit of buying more and more goods and thus obtaining more and more satisfaction he has to work under two constraints: first, he has to pay the prices for the goods and, secondly, he has a limited money income with which to purchase the goods.

Thus, how far he would go in for his purchases depends upon the prices of the goods and the money income which he has to spend on the goods. Indifference map represents consumer's scale of preferences between two goods. Now, in order to explain consumer's equilibrium there is also the need for introducing into the indifference diagram the budget line which represents the prices of the goods and consumer's money income.

8. Elasticity of Demand

Ans :

The law of demand simply explains the inverse relationship between price and quantity demanded. It doesn't specify how much more is purchased when price falls and how much less is purchased when price rises. In order to understand the rate of change in price and consequent changes in demand, elasticity of demand concept is used.

Elasticity is one of the most important concepts in neoclassical economic theory. It is useful in understanding the incidence of indirect taxation, marginal concepts as they relate to the theory of the firm and distribution of wealth and different types of goods. Elasticity is also crucially important in any discussion of welfare distribution, in particular consumer surplus, producer surplus or government surplus.

Meaning of Elasticity of Demand

Elasticity of demand is the responsiveness of demand for a commodity to changes in its determinants.

$$\text{Elasticity of Demand} = \frac{\text{Percentage change in quantity demanded of commodity}}{\text{Percentage change in its price}}$$

Definition of Elasticity of Demand

In the words of Dr. Marshall, "Elasticity of Demand may be defined as the percentage change in the quantity demanded divided by the percentage change in the price."

According to Building, "Price elasticity of demand measures the responsiveness of the quantity demanded to the change in price."

In the words of Dooley, "The price elasticity of demand measures the responsiveness of the quantity demanded to a change in its price."

According to Antol Murad, "Elasticity of demand is the ratio of relative change in quantity to relative change in price."

Thus, price elasticity of demand is a device to measure the rate of change in the quantity of a product demanded in response to a small change in its price.

9. Cross elasticity of demand.

Ans :

The change (increase or decrease) in the demand for one good in response to the change (increase or decrease) in price of the related good is called the cross elasticity of demand. Cross elasticity is always negative for complementary demand.

Example ; Due to increase in price of sugar, the demand for tea and coffee is decreases.

Cross elasticity is positive for substitutes.

Example : The demand for jeans goes up if there is an increase in the price of formal parts.

$$\text{Cross elasticity of demand} = \frac{\text{Proportionate change in quantity demanded for product B}}{\text{Proportionate change in price of product A}}$$

The same is expressed as,

$$Edc = \frac{\frac{(Q_2 - Q_1)}{Q_1}}{\frac{(P_2A - P_1A)}{P_1A}}$$

Where,

Q_1 = Quantity demanded before change.

Q_2 = Quantity demanded after change.

P_2 = Price before change.

P_2 = Price after change in the case of product.

10. What is Demand Estimation.

Ans :

Demand estimation tries to find out expected present sales level, given the present state of demand determinants. Usually, demand estimation is done for a short period. Every firm must try to obtain the estimate of demand function for its product. The demand forecasting process begins with demand estimation.

In demand estimation, the relationship between the demand for a product and its determinant variables like price, GNP or GDP, population, price of substitutes and complements, etc., is calculated to make important decisions.

Importance of Demand Estimation

1. It is necessary for business manager to have information about market demand to develop strategies relating to price, sales and output to overcome the dynamic changes in determinants of demand.
2. Demand estimation helps in identifying the consumer demand behaviour which is useful in making effective business decisions.
3. It helps in ascertaining the effects of changes in excise duties, price and GNP on demand with respect to personal computers.
4. The consequences of increase in excise duties on sales can be known with demand estimation for products like cigarette etc.
5. It helps the manufactures to determine the increase in sales with the increase in their advertisement and publicity.
6. When the government liberalized its import policy, firm can estimate the changes in proportion of demand for domestic and imported goods through demand estimation.

11. Define Demand Forecasting.

Ans :

Demand forecasting refers to an estimation of future demand for the product under given conditions.

Demand forecasting is predicting future demand for the product. It is the estimation of the value of a variable (or set of variables) to some future point in time.

Demand forecasting is the estimation of level of demand (amount or quantity) to be expected for goods or services for some period of time in future.

According to **Evan J Donglas,** "Demand forecasting may be defined as the process of finding values for demand in future time period".

Thus, demand forecasting means, when, how, where and how much will be the demand for a product or service in the near future.

12. Need for Demand Forecasting.

Ans :

Forecasting the demand for its product or products is the essential function for an organization irrespective of its nature. Many organizations follow it as a custom to completely and accurately forecast the demand of its products regularly. The need or the necessity for demand forecasting arises due to the following purposes served by it.

i) It serves as a road map for production plans.

ii) It plays a significant role in situations of uncertain production or demand.

iii) The outcomes of demand forecasting facilitate the managers to line up their business activities.

iv) The demand forecasting results from a basis for (EXIM) export and import policy and fiscal policy.

v) In situations of competition, it can help a manager/businessman to take decisions regarding inputs of production process such as labour, capital etc.

13. Define demand curve

Ans :

The graphical representation of the demand schedule is known as demand curve. The demand curve always slopes downwards from left to right. This negative slope of the demand curve indicates the opposite relationship between the price and the quantity demanded.

14. Differentiate between Individual demand and market demand.

Ans :

Difference between individual demand and market demand are as follows,

Sl.No.	Area	Individual Demand	Market Demand
1.	**Definition**	When the demand for a product arises from an individual consumer, then it is known as individual demand	When the demand of all the individuals and households arises for a product in a given market then it is known as market then it is known as market demand.
2.	**Nature**	It is the demand of a individual	It is the demand of number of individuals
3.	**Individual demand curve V/s Market demand curve**	Individual demand curve shows the maximum price which an individual consumer is willing to pay for the different amounts of the commodity under given conditions of demand.	Market demand curve shows the maximum amount of the commodity which all the consumers in a given market are willing to buy at each possible price of the commodity under given conditions of demand.
4.	**Individual demand schedule V/s market demand schedule**	Individual demand schedule shows the list of quantities of a commodity which was demanded by an individual at various prices.	Market demand schedule shows the list of quantities demanded by all the individuals at various prices in the market
5.	**Individual and market demand function**	Individual demand function is a mathematical relationship between the demand by an individual consumer and the determinants of individual demand.	Market demand function shows the functional relationship between the market demand for a commodity and the determinants of market demand.

Choose the Correct Answers

1. Which is the application of economic theory and methodlogy of business administration & practice [a]
   (a) Managerial economics (b) Economic analysis
   (c) Financial management (d) None of the above
2. The law of scarcity [d]
   (a) Does not apply to rich, developed countrles
   (b) Applies only to the less developmed countries
   (c) Implies that consumer want will be satisfied in a social system
   (d) Implies that consumer wants will never be completely satisfied
3. Economics is neutral between ends [a]
   (a) Robbins (b) Marshall
   (c) Plagou (d) Adam smith
4. The term economics is derived from [a]
   (a) Greek word olkonomia (b) Latin word olkonomia
   (c) Greek word oklonomus (d) None of the above
5. Father of economics [a]
   (a) Adam smith (b) Alfred marshall
   (c) J.B Say (d) A.C. Digou
6. Managerial economics helps in finding solution to various [a]
   (a) Business problems (b) Financial problems
   (c) Economic problems (d) None
7. Managerial decision making process _____ types [a]
   (a) Six (b) Seven
   (c) Three (d) Four
8. Economic fore casting leads to _____ [a]
   (a) Forward planning (b) Future planning
   (c) both a & b (d) None
9. Decision making is a process of [a]
   (a) Alternative selection (b) Random selection
   (c) both a & b (d) None
10. Management functions are [a]
   (a) Planning, organizing, directing, controlling staffing
   (b) Planning, functioning, paymeny
   (c) Only controlling and staffing
   (d) None of the above

Fill in the blanks

1. _____ could be defined as the quantity of goods and services that a consumer is willing to purchase.
2. _____ can be defined as the sum of individual demands for a product.
3. The demand for a commodity is essentially _____ and reaction 40 wards the product.
4. _____ refers to the various queantities of commodity purchased by consumer at different prices.
5. _____ refers to various quantities of a good at a commodity that a consumer purchase at different levels of income.
6. _____ is once whose demand increase as people incomes or the economy rise.
7. Demand for _____ goods decreases as income increases or economy improves.
8. _____ is the degree of responsiveness of quantity demanded of commodity due to the change in price of another commodity.
9. _____ goods like foods, fruits, meat, vegetables etc.
10. _____ refers to the quantities of commodity that consumer are able to buy.

ANSWERS

1. Demand
2. Market demand
3. Consumer's altitude
4. Price demand
5. Income demand
6. Normal Goods
7. Interior goods
8. Cross elasticity
9. Perishable Goods
10. Demand

UNIT III

Production Analysis :
Meaning of Production function – Cobb Douglas Production Function – Production with one variable input – Law of Diminishing marginal returns – Optimal employment to a factor of production - Production with two variable inputs – Production iso-quant – Production iso-cost – Optimal employment of two inputs – Expansion path – Returns to scale and economies of scope.

3.1 PRODUCTION ANALYSIS

Q1. What do you understand by production? What are the factors of production?

Ans :

Meaning

Production is an activity of transforming the inputs into output. It involves step-by-step conversion of one form of materials into another form through chemical (or) mechanical processing in order to create or enhance the utility or usability of the products or services.

Economics view production is as an activity through which utility for a product is created (or) enhanced.

Definition

According to E.S. Buffa, "Production is an process by which goods and services are created". In economics, the term production means a process in which the resources are transformed or converted into a different and more useful commodity (or) service. In general production means transforming inputs into an outputs. The term production is however limited to "manufacturing organizations" only.

Production i.e., transformation of inputs into output can be any of the three forms change in form, change in phase and change in time. The output produced can be either the final product (like a PC) or an intermediate product (like a semiconductor used in manufacturing a PC). The output goods or services may be either tangible or intangible. Production of a chair from wood is a tangible output whereas medical service by a doctor is an intangible output. The figure indicates the production process.

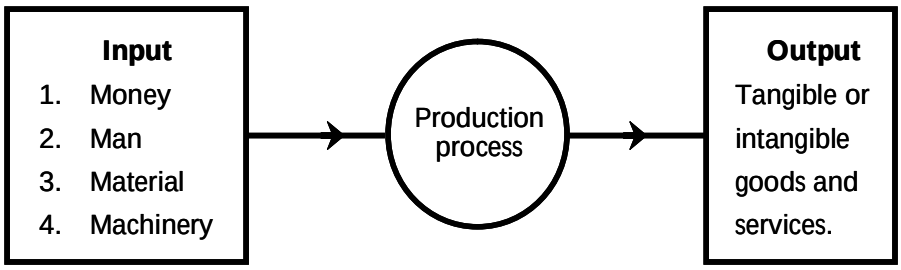


Fig.: Production Process

Factors of Production

Factors of production are the inputs available to supply goods and services in an economy.

Factors of production are the inputs available to supply goods and services in an economy are shown in Figure.

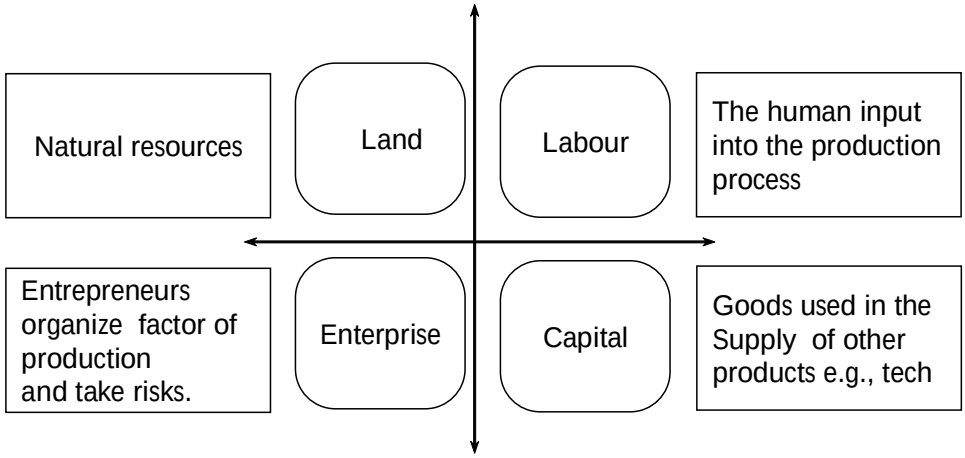


Fig.: Factors of Production (Factor Inputs)

1. Land

(i) Land includes all natural physical resources e.g., fertile farm land, the benefits from a temperate climate (or) the harnessing of wind power and solar power and other forms of renewable energy.

(ii) Some nations are richly endowed with natural resources and then specialize in the their extraction and production.

Example

The high productivity of the vast expanse of farm land in the United States and the oil sands in Alberta, Canada. Other countries Such as Japan are heavily reliant on importing these resources.

2. Labour

(i) Labour is the human input into production e.g., the supply of workers available and their productivity.

(ii) An increase in the size and the quality of the labour force is vital if a country wants to achieve growth. In recent years the issue of the migration of labour has become important. Can migrant workers help to solve labour shortages? What are the long-term effects on the countries who suffer a drain or loss of workers through migration?

3. Capital

(i) Capital goods are used to produce other consumer goods and services in the future.

(ii) Fixed capital includes machinery, equipment, new technology, factories and Other buildings.

(iii) Working capital means stocks of finished and semi-finished goods or components that will be either consumed in the near future or will be made into consumer goods.

(iv) New items of capital machinery, buildings or technology are used to boost the productivity of labour.

Example

Improved technology in farming has vastly increased productivity and allowed millions of people to move from working on the land into more valuable jobs in other industries.

4. Entrepreneurship

(i) Regarded by some as a specialized form of labour input.

(ii) An entrepreneur is an individual who supplies products to a market to make a profit.

(iii) Entrepreneurs will usually invest their own financial capital in a business and take on the risks. Their main reward is the profit made from running the business.

Q2. Explain the concept of theory of production?

Ans :

In economics, production theory explains the principles in which the business has to take decisions on how much of each commodity it sells and how much it produces and also how much of raw material ie., fixed capital and labor it employs and how much it will use. It defines the relationships between the prices of the commodities and productive factors on one hand and the quantities of these commodities and productive factors that are produced on the other hand.

Concept

Production is a process of combining various inputs to produce an output for consumption. It is the act of creating output in the form of a commodity or a service which contributes to the utility of individuals.

In other words, it is a process in which the inputs are converted into outputs.

Function

The Production function signifies a technical relationship between the physical inputs and physical outputs of the firm, for a given state of the technology.

$$Q = f(a, b, c, \ldots\ldots z)$$

Where a,b,c ....z are various inputs such as land, labor ,capital etc. Q is the level of the output for a firm.

If labor (L) and capital (K) are only the input factors, the production function reduces to,

$$Q = f(L, K)$$

Production Function describes the technological relationship between inputs and outputs. It is a tool that analysis the qualitative input – output relationship and also represents the technology of a firm or the economy as a whole.

Production Analysis

Production analysis basically is concerned with the analysis in which the resources such as land, labor, and capital are employed to produce a firm's final product. To produce these goods the basic inputs are classified into two divisions.

Variable Inputs

Inputs those change or are variable in the short run or long run are variable inputs.

Fixed Inputs

Inputs that remain constant in the short term are fixed inputs.

Cost Function

Cost function is defined as the relationship between the cost of the product and the output. Following is the formula for the same:

$$C = F[Q]$$

Cost function is divided into namely two types

Short Run Cost

Short run cost is an analysis in which few factors are constant which won't change during the period of analysis. The output can be changed ie., increased or decreased in the short run by changing the variable factors.

Following are the basic three types of short run cost

Short run fixed cost	Variable cost	Short run total cost
• Fixed cost is a cost which won't change with the changes in the output.	Variable cost is the cost which changes with the change in the output.	The total actual cost that is supposed to be incurred to produce a Given output is short run total cost
• For example, Building rent, Insurance charges, etc.	For example, Cost of raw material, wages, Electricity, Telephone charges, etc.	Total cost = Total Fixed cost + Total variable Cost

Long Run Cost

Long-run cost is variable and a firm adjusts all its inputs to make sure that its cost of production is as low as possible.

Long run cost = Long run variable cost

In the long run, firms don't have the liberty to reach equilibrium between supply and demand by altering the levels of production. They can only expand or reduce the production capacity as per the profits. In the long run, a firm can choose any amount of fixed costs it wants to make short run decisions.

3.2 MEANING OF PRODUCTION FUNCTION

Q3. Define production function?

(OR)

What do you understand by production function.

Ans : **(Dec.-20, Dec.-16, Dec.-15, Dec.-14)**

Meaning

The production function is purely a relationship between the quantity of output obtained or given out by a production process and the quantities of different inputs used in the process. Production function can take many forms such as linear function or cubic function etc.

Definitions

(i) According to Michael R Baye, "Production Function" is that function which defines the maximum amount of output that can be produced with a given set of inputs.

(ii) According to Samuelson, "Production Function" is the technical relationship, which reveals the maximum amount of output capable of being produced by each and every set of inputs, under the given technology of a firm.

From the above definitions, it can be concluded that the production functions is more concerned with physical aspects of production, which is an engineering relation that expresses the maximum amount of output that can be produced with a given set of inputs.

Production function enables production manager to understand how better he can make use of technology to its greatest potential.

Mathematically, a production function is represented as,

$$Q = f(L, C, M,)$$

Where,

Q = Quantity of the output produced

f = Function of L, C, M

L = Labour units

C = Capital employed

M = Machinery raw materials.

In the above production function, the inputs considered are labour, capital and raw materials. But an empirical production function is very complex with a wide range of inputs like land, labour, capital, materials time and technology. With these inputs, the production function is expressed as,

$$Q = f\{L_d, L, C, M, T, t)$$

Where,

Q = Quantity of the output produced

f = Function of L_d, L, C, M, T, t

L_d = Land and buildings

L = Labour units

C = Capital employed

M = Materials

T = Technology

t = Time period of production

In order to reduce the complexity, economists have considered the three main inputs - labour, capital and machinery for indicating a production function. Therefore, with these inputs the production function can be expressed as,

$$Q = f(L, C, M).$$

Q4. Explain the significance of production function.

Ans :

1. Production function shows the maximum output that can be produced by a specific set of combination of input factors.
2. There are two types of production function, one is short-run production function and the other is long-run production function. The short-run production explains how output change is relation to input when there are some fixed factors. Similarly, long run production function explains the behaviors of output in relation to input when all inputs are variable.
3. The production function explains how a firm reaches the most optimum combination of factors so that the unit costs are the lowest.
4. Production function explains how a producer combines various inputs in order to produce a given output in an economically efficient manner.
5. The production function helps us to estimate the quantity in which the various factors of production are combined.

Q5. Explain the managerial Use of production function.

Ans :

The production function is of great help to a manager or business economist. The managerial uses of production function are outlined as below :

1. It helps to Determine Least Cost Factor Combination

The production function is a guide to the entrepreneur to determine the least cost factor combination. Profit can be maximized only by minimizing the cost of production. In order to minimize the cost of production, inputs are to be substituted. The production function helps in substituting the inputs.

2. It Helps to Determine Optimum Level of Output

The production function helps to determine the optimum level of output from a given quantity of input. In other words, it helps to arrive at the producer's equilibrium.

3. It Enables to Plan the Production

The production function helps the entrepreneur (or management) to plan the production.

4. It Helps in Decision-making

Production function is very useful to the management to take decisions regarding cost and output. It also helps in cost control and cost reduction.

In short, production function helps both in the short run and long run decision-making process.

3.3 COBB DOUGLAS PRODUCTION FUNCTION

Q6. What do you understand by Cobb Douglas production function.

(OR)

Explain Cobb Douglas production function.

Ans : **(Dec.-20, June-16)**

Cobb and Douglas put forth a production function relating output in American manufacturing industries from 1899 to 1922 to labour and capital inputs. They used the following formula:

$$P = bL^a C^{1-a}$$

Where P is total output,

L = The index of employment of labour in manufacturing

C = Index of fixed capital in manufacturing

The exponents a and 1-a are the elasticities of production. These measure the percentage response of output to percentage changes in labour and capital respectively.

The function estimated for the USA by Cobb and Douglas is

$$P = 1.01L^{0.75} C^{0.25}$$

$$R^2 = 0.9409$$

The production function shows that one percent change in labour input, capital remaining the same, is associated with a 0.75 percent change in output. Similarly, one percent change in capital, labour remaining the same, is associated with a 0.25 percent change in output. The coefficient of determination (R^2) means that 94 percent of the variations on the dependent variable (P) were accounted for by the variations in the independent variables (L and C). It indicates constant returns to scale which means that there are no economies or diseconomies of large scale of production. On an average, large or small scale plants are considered equally profitable in the US manufacturing industry, on the assumption that the average and marginal production costs were constant.

Though Cobb-Douglas production function was based on macro-level study, it has been very useful for interpreting economic results. Later investigations revealed that the sum of the exponents might be very slightly larger than unity, which implies decreasing costs. But the difference was so marginal that constant costs would seem to be a safe assumption for all practical purposes.

Q7. Explain the importance of Cobb-Douglas production function.

Ans :

Cobb-Douglas production function is most popular in empirical research. The reasons for this are many :

1. The Cobb-Douglas function is convenient for international and inter-industry comparisons. Since a and P (which are partial elasticity coefficients) are pure numbers (i.e., independent of units of measurement) they can be easily used for comparing results of different samples having varied units of measurement.
2. Another advantage is that this function captures the essential non-linearities of production process and also has the benefit of the simplification of calculations by transforming the function into a linear form with the help of logarithms. The log-linear function becomes linear in its parameters, which is quite useful to a managerial economist for his analysis.

3. In addition to being elasticities, the parameters of Cobb-Douglas function also possess other attributes.

   For example, the sum of (a + P) shows the returns to scale in the production process; a and (3 represent the labour share and capital share of output respectively, and so on.

4. This function can be used to investigate the nature of long-run production function, viz., increasing, constant and decreasing returns to scale.

5. Although in its original form, Cobb-Douglas production function limits itself to handling just two inputs (e.g., L and K), it can be easily generalized for more that two inputs, like

$$Q = AX_1^a . X_2^b . X_3^c ..... X_n^p$$

Where, Q = Output

$X_1, X_2, ... X_n$ = Different inputs.

Q8. What are the criticisms of Cobb-Douglas production function.

Ans :

1. The function includes only two factors and neglects other inputs.
2. The function assumes constant returns to scale.
3. There is the problem of measurement of capital which takes only the quantity of capital available for production.
4. The function assumes perfect competition in the factor market which is unrealistic.
5. It does not fit to all industries.
6. It is based on the substitutability of factors and neglects complementarily of factors.
7. The parameters cannot give proper and correct economic implication.

3.3.1 Law of Diminishing Marginal Returns

Q9. Explain the Law of Diminishing marginal returns with suitable examples and graphs.

(OR)

Describe the various stages of a total production function with the help of a diagram.

Ans : **(Jan.-20, Dec.-16)**

Law of variable proportions has a great significance in economic theory. This law examines the production function with one factor (input) variable by keeping the other factors (inputs) fixed. In the true sense, it refers to the relation between input and the output when the output is increased by varying the quantity of one input.

The Law of Variable Proportions is the new name for the famous 'Law of Diminishing Returns' of classical economics which played a vital role in the history of economic thought and occupies an equally important place in modern economic theory.

Definitions

The following are the various definitions of Law of Variable Proportion or Law of Diminishing Returns as given by different economists.

i) **According to G. Stigler,** "as equal increments of one input are added, the inputs of other productive services being held constant, beyond a certain point the resulting increments of product will decrease i.e., the marginal products will diminish".

ii) **According to Marshall defines the law as,** "an increase in the capital and labour applied in the cultivation of land causes in general is less than proportionate increase in the amount of product raised unless it happens to coincide with an improvement in the arts of agriculture".

iii) **According to Paul A.Samuelson says** "an increase in some inputs relative to other fixed inputs, in a given state of technology, cause output to increase, but after a point the extra output resulting from the same addition of extra inputs will become less".

From the above definitions, it is clear that the law of variable proportions refers to the behaviour of output as the quantity of one input is increased, keeping the quantity of other inputs as fixed. It also states that the Marginal Product (MP) and Average Product (AP) will eventually decline.

Assumptions

The law of variable proportions is based on the following assumptions.

(i) The technology used in the production process should be constant. If the state of the technology used is increased, the Marginal Product (MP) and Average Product (AP) will rise instead of diminishing.

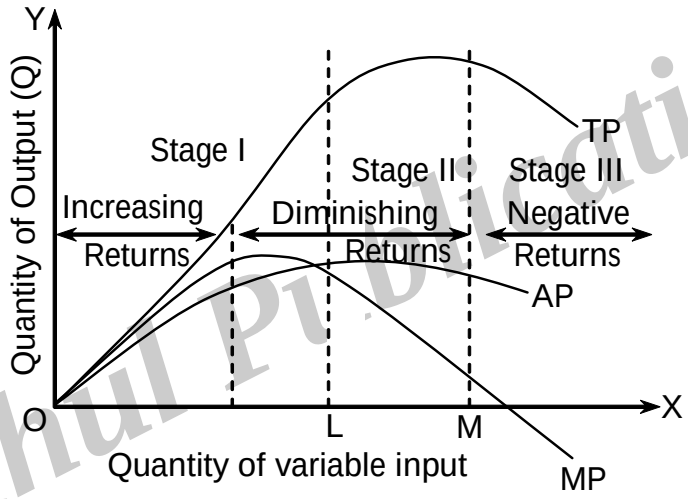
(ii) The quantity of some of the inputs should be fixed. By doing so, the input proportions can be altered and their effect on the output can be known.

(iii) The law does not hold in the situation where all the inputs are proportionately varied.

(iv) The law is based on the possibility of varying the proportion in which various inputs can be combined to produce a product. The law is not applicable to those cases where the inputs must be used in fixed proportions to yield a product.

Stages of Law of Variable Proportions

The behaviour of output when the varying quantity of one input is combined with a fixed quantity of the other can be categorized into three different stages.



TP = Total product

MP = Marginal product

AP = Average product

B = Point of inflection

Variable Product (VP)	Total Product (TP)	Marginal Product (MP)	Average Product (AP)
0	0	-	-
1	4	4	4
2	15	11	7.50
3	37	22	12.33
4	48	11	2.75
5	45	-3	9

In the above graph, quantity of variable input is taken on .x-axis and quantity of output is taken on y-axis and the Total Product (TP) Average Product (AP) and Marginal Product (MP) are measured. The behaviour of these three curves is as follows,

TP - Goes on increasing to a point and after that it starts declining

AP = Increases initially and later it declines

MP = Increases initially and then decreases up to a negative value.

The behaviour of these curves is generally divided into three stages.

(i) Stage I : Increasing returns.

(ii) Stage II : Decreasing returns.

(iii) Stage III: Negative returns,

(i) Stage I: Increasing Returns

In this stage, the Total Product curve (TP) increases at an increasing rate upto point B indicating that the marginal product of the variable input (say labour (L)) is rising. From point B the total product curve rises but at a diminishing rate indicating the fall of marginal product but positively. The reason for the increase of total product curve both at an increasing rate and at a decreasing rate during *stage I* because the slope of *TP* upto B increases and after B it declines. The shape of *TP* upto *B* is concave upwards and after B it is concave downwards.

The point B where *TP* stops increasing at an increasing rate and starts increasing at a decreasing rate is called 'point of inflation'. At the point of inflation, the Marginal Product curve (MP) is maximum and after that it starts decreasing. When the marginal product curve decreases, it exceeds the average product curve causing the average product curve to increase. *Stage I* ends where the average product curve reaches its maximum value. *Stage I* is known as the stage of increasing returns because average product of a variable input increases throughout the stage.

(ii) Stage II: Decreasing Returns

In *stage* II, the total product continues to increase at a diminishing rate until it reaches a maximum value and marginal product and average product of the variable input decrease but positively. At the end of second stage, the marginal product of the variable input is zero and the total product is maximum. *Stage II* is very important because in this stage the firm will seek to produce in its range. *Stage II* is known as the stage of diminishing returns because both the average product and the marginal product of the variable inputs fall continuously during this stage.

(iii) Stage III: Negative Returns

In stage III the Total Product curve (TP) declines with an increase in the quantity of variable input. As a result, the marginal product of the variable input is negative and the Marginal Product curve (MP) falls below x-axis. *Stage III* is called as the stage of negative returns because all the three curves *TP, MP* and AP decline and *MP* declines to a negative value.

The below table gives a clear understanding of three stages of law of variable proportions.

Stage of Production	I	II	III
Total Product (TP)	Initially increases at an increasing rate an later increases at a decreasing rate.	Increases at a decreasing rate and becomes maximum	Decreases
Average Product (AP)	Increaes and reaches maximum	Decreases	Continues to decrease
Marginal Product (MP)	Increases and reaches a maxmum and starts fulling.	Continues to fall and become zero	Becomes negative

Assumptions

1. **Constant technology :** If technology changes, marginal and average product may rise instead of diminishing.
2. **Short Run :** The law operates in the short run because it is here that some factors are fixed and others are variable. In the long run, all factors are variable.
3. **Homogeneous Input :** The variable input as applied unit by unit is homogeneous or identical in amount and quality.
4. It is possible to use various amounts of a variable factor on the fixed factors of production.

3.4 Optimal Employment to a Factor of Production

Q10. Explain the concept of Optimal employment to a factor of production.

(OR)

Explain how the optimal employment of a variable factor is achieved in the short-run.

Ans : **(Jan.-18)**

Whatever the firm chooses to produce, it wishes to produce it at the least possible cost. Or, whatever expenditure the entrepreneur wishes to make, the highest output with that expenditure is desired. To accomplish either of the two tasks, production must be organized in the most efficient manner, *i.e.,* the resources must be used in an optimal combination. We discuss these two cases below.

a) Production of Given Output at Minimum Cost: Suppose that a road transport company wants to fulfil a certain demand for its passenger and cargo services per year. This company is confronted with the following combinations of vehicles and mechanics for producing the desired level of output (Table). Per year costs of a vehicle and a mechanic are Rs. 1,25,000 and Rs. 3,000 respectively.

Combination number	No. of Vehicles	No. of machines
1	10	1000
2	11	900
3	12	820
4	13	770
5	14	730
6	15	700
7	16	680

Table : Cost Data of Firm X

Let us begin with combination 2. An additional vehicle would cost Rs. 1,25,000, but 100 mechanics could be reduced which would save Rs. 3,00,000. So combination 2 is better than combination 1. Similarly, moving from combination 2 to 3 and from combination 3 to 4 would result in some savings. The firm would not move to combination 5 as it does not result in cost reduction, the firm would save Rs. 1,20,000 in mechanics' salaries but add Rs. 1,25,000 in vehicle expenses.

The above analysis can also be shown graphically. Suppose that the firm wishes to choose an output level X,, represented by an isoquant in the figure. Given prices of capital and labour (the two inputs) K_0 L_0, K_1 L_1 and K_2 L_2 are the different isocost curves at different levels of expenditure. Obviously, to minimise its expenditure the firm will like to produce the desired level of output X_1 on the lowest possible isocost curve.

In the figure, output level X_i is produced at least cost on the isocost curve A", L_x. At any expenditure below K_1L_1 (e.g., that represented by K_0 L_0) it is not possible to produce the desired output level. The resource combinations, represented by K_0 L_n and K_2 L_2, are sub-optimal as they do not produce the given level of output at least cost.

Equilibrium of the producer is reached at point £ in Fig., where the isoquant representing the chosen output is just tangent to the isocost line. The tangency means the slope of the isoquant (viz., the marginal rate of technical substitution) equals the slope of the isocost line (viz., the ratio of price of labour to price of capital) at that point.

The price ratio of inputs tells the producer about the rate at which one input can be substituted for another in purchasing, while marginal rate of technical substitution telfe about the rate at which these inputs can be substituted in production. Thus, to minimize cost subject to a given level of output (given input prices), the firm must purchase those amounts of the two inputs which equalise the $MRTS_{LK}$ of the inputs to their relative price (w/r), as shown at point E in Fig. 10.11. As discussed earlier, the $MRTS_{L\,K}$ also equals the ratio of the marginal productivities of the two inputs (viz., MP_L/ MP_K). Therefore,

$$MRTS_{L,K} = \frac{w}{r} = \frac{MP_L}{MP_K} \quad \text{or} \quad \frac{MP_L}{w} = \frac{MP_k}{r}.$$

The optimal combination of inputs which minimizes the cost for a given level of output is L* of labour and *K** of capital, as given by the equilibrium point *E* in Fig.

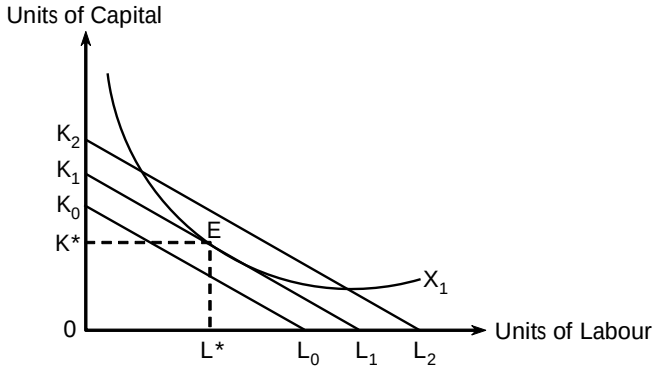


Fig.: Minimizing cost, given output

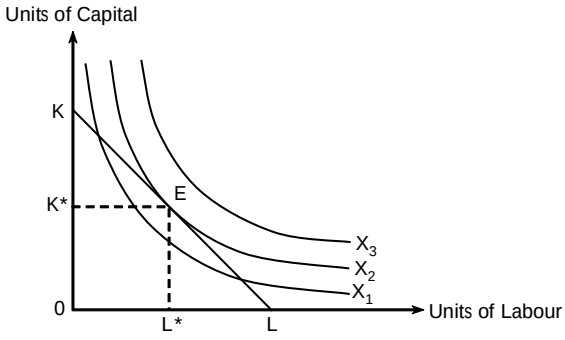
b) Production of Maximum Output with a Given Level of Cost. Alternatively, the firm may first decide about the available expenditure on the production of the commodity and then try to maximize output consistent with that amount of expenditure. Such a situation is depicted with the help of Figure. Given the budgeted expenditure and the input prices, the firm gets an isocost curve KL.

The firm wants to maximise output, subject to given resources as represented by the isocost line KL. This can be achieved where the isoquant is tangent to the isocost line. In Fig. output level X_z is not possible to attain, while X_1 output level would not be chosen as a higher level of output X_2 can be reached with the given level of cost. All equilibrium level E, OL* of labour and OK* capital are used to produce X_2 output.

Thus, in order to maximise output subject to a given cost, the firm must employ inputs in such amounts are to equate the marginal rate of technical substitution and the input price ratio. That is,

Condition I : $E = wL + rK$

Condition II : $MRTS_{L,K} = \frac{w}{r} = \frac{MP_L}{MP_k}$



3.5 Production with two Variable Inputs

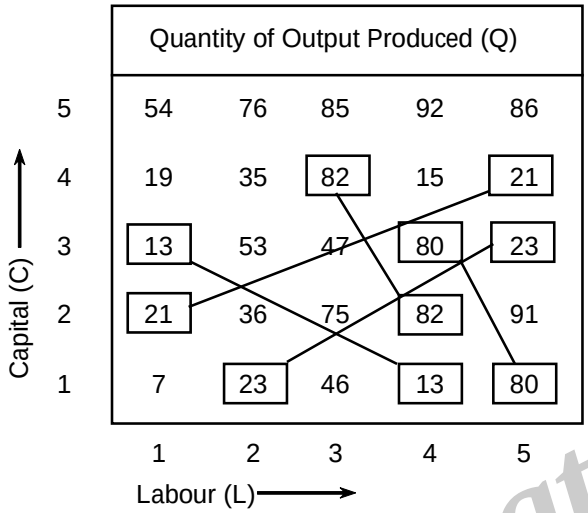
Q11. Explain production function with two variable inputs with an illustration.

Ans :

Production function with two variable inputs is a more general case where the firm increases its output by using more of two inputs that are substitutes to each other. The two-variable input case may be

taken either as a short-run or a long-run analysis of production process on the basis of the assumptions made about the nature of inputs used. If the firm utilizes only two inputs and both of them are variables, it is long-run analysis. If the firm uses more than two inputs and if only two of them are variable and others are fixed, it is the case of short-run analysis.

Production function with two-variable-inputs is illustrated as follows,



From the above table, if the firm wants to produce an output of 80 units, the input combina-ions (labour, capital) it can use are (3, 4) and (1,5).

Output	Combinations
82 units	(4, 3), (2, 4)
13 units	(3, 1), (1, 4)
23 units	(1. 2), (3, 5)
21 units	(2, 1), (4, 5)

If a graph is drawn by representing the different combinations of inputs used to produce the same amount of output, it is known as an 'isoquant'. A production function with two variable inputs can be represented by a family of isoquants or isoproduct curves or product indifference curves.

The production function with two variable inputs can be represented as,

Q = f(L, C)

Where,

Q = Quantity of output produced

L = Labour units

C = Capital employed.

Assumptions upon which the production function with two variable inputs is based are as follows.

(i) Two factors can be substituted for each other.

(ii) No change in the technology used for the production process.

3.5.1 Production iso-quant

Q12. Define isoquant. Explain how isoquants are used to represent a production function with two variable inputs.

(OR)

What do you understand by iso-quants?

Ans : **(Dec.-20, Jan.-20)**

Meaning

The term isoquant has its origin from two words 'iso' and 'quantus'. 'iso' is a Greek word meaning 'equal' and 'quantus' is a Latin word meaning 'quantity'. An isoquant curve is therefore called as 'iso-product curve' or 'equal-product curve' or 'production indifference curve'.

Definitions

(i) According to Peterson "An Iso-quant curve may be defined as a curve showing the possible combinations of two variable factors that can be used to produce the same total product."

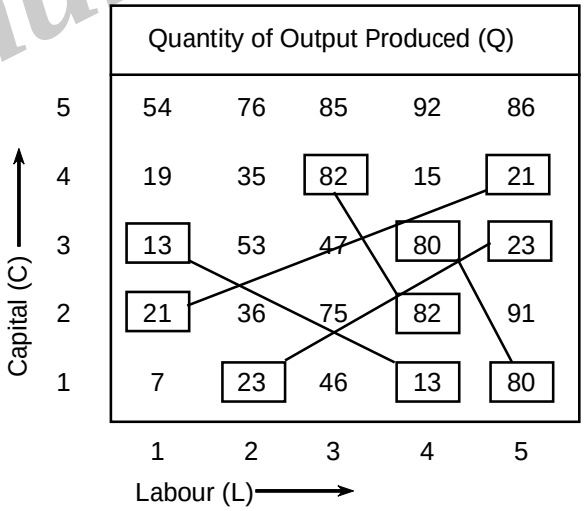
(ii) According to Ferguson "An Iso-quant is a curve showing all possible combinations of inputs physically capable of producing a given level of output."

An isoquant is defined as the curve or locus of points representing various combinations of two inputs [say Labour (L) and Capital (C)] that yield the same level of output.

In other words, an isoquant is a line joining different combinations of two inputs (L and C) which result in the same quantity of output.

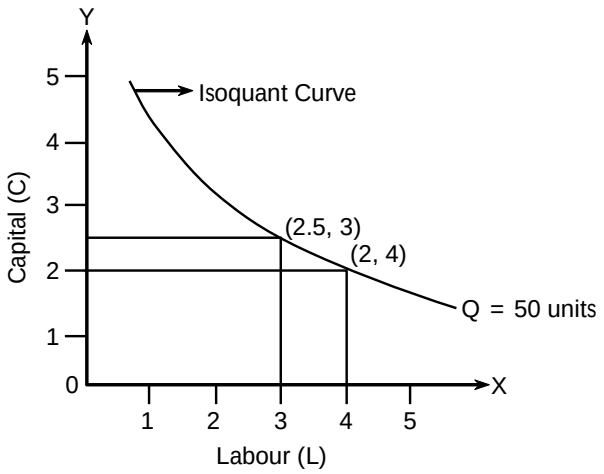
Isoquants are used to represent a production function with two variable inputs.

For example, let us consider a production function with the quantities of output produced by using different combinations of two inputs Labour (L) and Capital (C).



In the above table there are different quantities of outputs that are produced by various combinations of inputs labour and capital. For example the output '21' is produced by two combinations (2, 1) and (4, 5). The line joining these two outputs of same level produced by different (two) combinations of two inputs is called an 'isoquant'. Thus, the definition of isoquant holds.

Graphically an isoquant curve pan be constructed conveniently for two inputs of production. The below graph gives a clear idea.



The above graph reveals that an output of Q-50 units is produced by two different combinations of capital and labour respectively i.e., (2.5, 3) and (2,4) and the curve joining these two combinations is an isoquant curve.

An isoquant curve is similar to an indifference curve with two distinctions.

(i) An isoquant curve is constructed by two producer goods (labour and capital) whereas an indifference curve is made of two consumer goods.

(ii) An isoquant curve measures 'output', an indifference curve measures 'utility'.

Q13. List down the assumptions of Isoquant curves.

Ans :

Assumptions

An isoquant curve is generally drawn on the basis of the following assumptions.

(a) An isoquant curve has only two inputs say labour (L) and capital (C) to produce an output (Q).

(b) The two inputs are perfectly substitutable to each other but at a diminishing rate i.e., L is perfectly substitutable to C and vice-versa.

(c) The technology applied in the production process is given or constant.

(d) The substitution of one input for the other leaves the output unaffected.

Q14. Explain the characteristics of an isoquants.

Ans :

1. Downward sloping

Isoquants are downward sloping curves because, if one input increases, the other one reduces. There is no question of increase in both the inputs to yield a given output. A degree of substitution is assumed between the factors of production. In other words, an isoquant cannot be increasing, as increase in both the inputs does not yield same level of output. If it is constant, it means that the output remains constant though the use of one of the factors is increase-ing, which is not true. Isoquants slope from left to right.

2. Convex to origin

Isoquants are convex to the origin. It is because the input factors are not perfect substitutes. One input factor can be substituted by other input factor in a 'diminishing marginal rate'. If the input factors were perfect substitutes, the isoquant would be a falling straight line. When the inputs are used in fixed proportion, and substitution of one

C input for the other cannot take place, the isoquant will be L shaped.

3. Do Not Intersect

Two isoproducts do not intersect with each other. It is because, each of these denote a particular level of output. If the manufacturer wants to operate at a higher level of output, he has to switch over to another isoquant with a higher level of output and vice versa.

4. Do not touch axes

The isoquant touches neither X-axis nor Y-axis, as both inputs are required to produce a given product.

Q15. Discuss about the various types of isoquants.

Ans :

From the properties of isoquants it is clear that the shape of an isoquant is convex to the origin. The shape of an isoquant however depends upon the degree of substitutability between the inputs in a production function. Economists observed that the convex shape of an isoquant is due to continuous substitutability between labour and capital but at the diminishing rate and said that the degree of substitutability between L and C gave rise to other three types of isoquants.

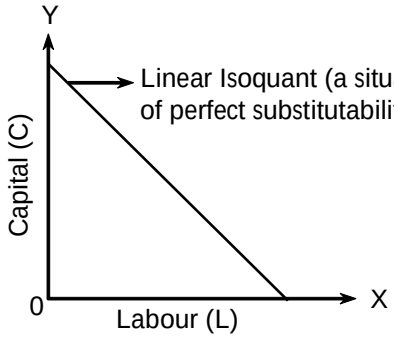
(i) Linear isoquant.

(ii) Fixed input-proportion/L-shaped/Input-output/ Leontief isoquant.

(iii) Kinked/Linear programming isoquant.

(i) Linear Isoquant

An isoquant is said to be a linear isoquant when there exists prefect substitutability between two inputs Labour (L) and Capital (C). This case of an isoquant indicates that a given quantity of output is produced by using capital only or only labour or by using a larger number of combinations of both labour and capital. A linear isoquant also implies that the Marginal Rate of Technical Substitution (MRTS) between L and C is constant. The following figure gives the shape of a linear isoquant.



Figure

The mathematical form of a production function exhibiting perfect substitutability is as follows.

The production function,

$Q = f(L, C)$

Where,

Q = Quantity of output produced

L = Labour units

C = Capital employed.

Then production function exhibiting perfect substitutability is,

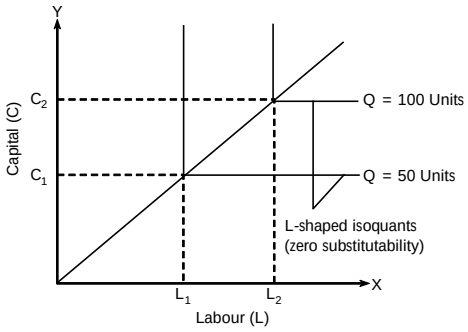
$Q = aC + bL$

Where,

a, b = Attributes The slope of isoquant from this production function is (– b/a).

(ii) Fixed input-proportion/L-shaped/Input-output/ Leontief isoquant.

When there is a fixed proportion between the inputs labour (L) and capital (C) then the production function takes 'L' shape. Such an isoquant implies zero substitutability between the inputs or perfect complementarily between the inputs. The state of perfect complementary/zero substitutability means that a given quantity of output can be produced by one and only one combination of labour and capital and that the proportion of input is fixed. This also mean that if the quantity of one inputs is increased and the quantity of the other input is kept constant, there is no change in the output. The output can be increased by increasing both the inputs proportionately. The figure shows a L-shaped isoquant.



Figure

A L-shaped isoquant is also called as a Leontief function which is given by,

Q = min (aC, bL)

Where,

Q = Quantity of the output produced

a,b = Attributes

C = Capital employed

L = Labour units

min = Refers that output (Q) equals the least value of the two terms aC and bL.

Note

(a) If aC > bL, Q = bL and if bL > aC then Q = aC.

(b) If aC = bL, it means that both the inputs L and C are fully utilized.

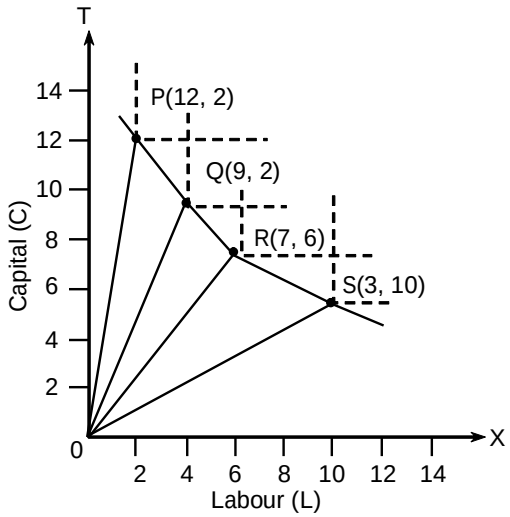
(c) Fixed capital total ratio K/L = b/a.

(iii) Kinked/Linear programming isoquant.

An isoquant is said to be a kinked isoquant when there is a limited substitutability between the inputs, labour (L) and capital (C). As there are only few production techniques for producing a commodity or a product, substitutability of inputs is possible at only kinks. For example, let us consider four different production techniques for producing an output (Q). Each techniques uses a fixed- input proportion as shown below.

S.No.	Production Technique	Capital (C)	Labour (L)	Capital/Labour ratio (C/L)
1.	OP	12	2	2:2
2.	OQ	9	4	9:4
3.	OR	7	6	7:6
4.	OS	3	10	3 : 10

The above four production techniques (OP, OQ, OR and OS) are represented graphically as,



Figure

In the figure the ray 'OP' represents the production technique with input proportion 12C: 2L. Similarly the other three techniques (OQ, PR, OS have the input proportion as 9C:4L, 7C:6L and 3C:10L respectively. By joining the points P, Q, R, S we get a kinked isoquant, PQRS. Each point on the kinked isoquant represents a combination of Capital (C) and Labour (L) required to produce an output (Q).

The kinked isoquant is basically used in linear programming and therefore, it is also called as 'linear programming isoquant' or 'activity analysis isoquant'.

3.5.2 Production iso-cost

Q16. Define iso-cost curve.

(OR)

What do you understand by iso-cost?

Ans : **(Dec.-20, Jan.-20)**

Isocost refers to that cost curve which will show the various combinations of two inputs which can be purchased with a given amount of total money.

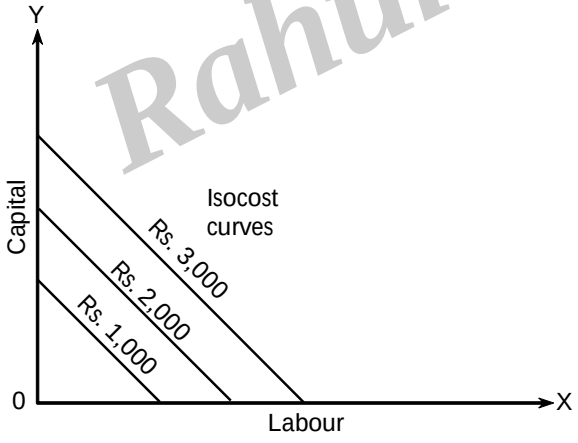


Figure (1): Isocosts Each Showing Different Level of Total Cost

In the above figure (1) it can be seen that as the level of production changes. The total cost will change and automatically the isocost curve moves upward.

We can easily super impose the isocost diagram on the isoquant diagram (as the axes in both the cases represent the same variable) with the help of the following figure (2).

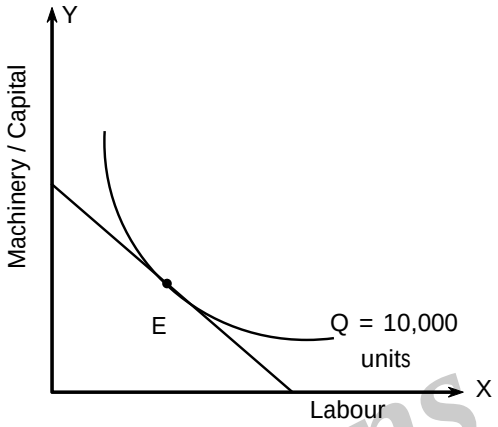


Figure (2): Super imposition of Isocost and Isoquant Curve

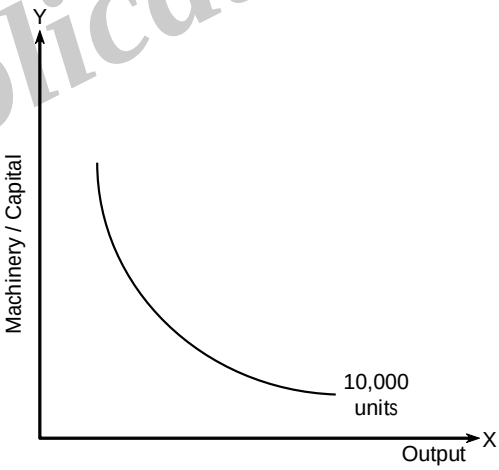


Figure (3): Isoquant Showing 10,000 Units of Production

We can ascertain the maximum output for a given outlay, say 1000. This maximum output which is possible with this outlay cost, is represented by the isoquant tangent to the isocost curve. The optimum combination of inputs is represented by the point of intersection E.

The point of tangency E on the isoquant curve represents the least-cost combination of inputs, yielding maximum level of output.

3.6 Optimal Employment of Two Inputs

Q17. Explain briefly about Optimal employ-ment of two inputs.

(OR)

Explain how the optimal employment of a variable factor is achieved in short-run.

Ans : **(Jan.-18, June-16, Dec.-15)**

Variable techniques of production enables the producer to choose various capital-labour (k - L) combinations all of which yield the same output. Thus, simply by changing the proportion of factors 'k' and 'L', producer may be able to decrease total costs without affecting the total revenue and thus increases profits.

Whatever the firm wants to produce, producer needs to focus only on the achievement of economics of scale as its principals objective i.e., to produce high level of goods at considerably low cost objective. To achieve these optimal combinations factors of production is required which can be studied under,

(a) The production of given level of output at minimum cost (cost minimization).

(b) The production of maximum output with a given level of cost (profit maximization),

(a) Production of Given Level of Output at Minimum Cost: This is a technique wherein a producer is able to produce a given (desired) level of output at a lowest possible cost. This can be explained with the help of an example, suppose a transportation company wants to satisfy the demand of its passengers and provides cargo services per year.

The company is having a wide combination of vehicles and workers for producing the desired level of output as depicted in the table. The annual cost of a vehicle and labour charges are found to be Rs. 1,50,000 and Rs. 4,000 respectively. The company has to optimally decide the combination that could yield the desired production at reduced cost.

Cost Data of Company A

Alternative Number	No. of Vehicles	No. of Vehicles	Total Cost
1	6	1500	69,00.000
2	7	1400	66,50,000
3	8	1320	64,80,000
4	9	1270	64,30,000
5	10	1240	64,60,000

Consider an alternative 2 where, an additional vehicle would cost Rs. 1,50,000, but the firm has a choice of reducing the number of workers from 1500 to 1400 (i.e., 100) which would save Rs. 4,00,000. Hence alternative '2' is found to be optimal than '1'. In the same manner, moving from combination 2 to 3 and then from combination 3 to 4 would result in some savings.

The firm would not move to alternative 5 as it doesn't results in cost reduction, the firm would save Rs. 1,20,000 in case of workers salaries but it has to incur Rs. 1,50,000 as vehicle expenses. Which is Rs. 30,000 more than alternative 4.

Graphical Representation

The above analysis can also be represented graphically, suppose if the firm selects y_t as an output level as represented by an isoquant in the figure. Different isocost curves at different levels of expenditures can be used to show the price levels of capital and labour as K_0 L_0, K_1 L_1 and K_2 L_2.

In the figure, output level Y_l is produced at least cost on the isocost curve K_y L_1 and K_2 L_2. At any expenditure level below K_l L_1 (eg : which is represented as K_0 L_0) it is not possible to produce the desired level of output.

The following combination of resources such as K_0 L_0 and K_2 L_2 are found to be suboptimal as they are incapable of producing the given level of output by keeping the cost at minimum level. Equilibrium point is represented by 'E" where the isoquant showing the desirable output is represented by tangent to the isocost.

The term tangency refers to the slope of the isoquant (i.e., marginal rate of technical substitution) which is equal to the slope of isocost line i.e., the ratio of inputs (price of labour, to capital) at any point of time.

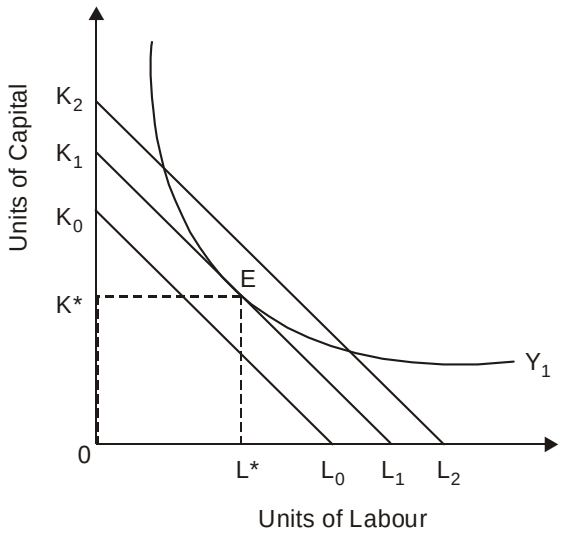
Thus, to minimize cost subject to a given level of output (at a given input prices), the firms must purchase those amounts of the 2 inputs which equalize the $MRTS_{L\,K}$ (Marginal Rate of Technical Substitution) of the inputs to their relative price ($^w/_l$)

Thus,

$MRTS_{L,\,K}$ = Ratio of marginal productivities

$$MRTS_{L,\,K} = \frac{w}{r} = \frac{MP_L}{MP_K} or$$

$$\frac{MP_L}{w} = \frac{MP_K}{r}$$



Equilibrium point 'E represents the optimal combination of inputs which minimizes the cost for the given level of output where L* is used for labour and k* for capital.

(b) Production of Maximum Output with a Given Level of Cost: This alternative is used for deriving more benefit (output) from the existing level of expenditure. Such a situation is represented with the help of figure (2). At the available expected (budgeted) expenditure and the input prices, the. firm gets an isocost curve KL.

The firm's desire to maximize the output, subjected to the given level of resources are represented by the isocost line KL. This can be achieved if the isoquant is tangent to the isocost line. In figure "(2).curve Y_3 is non-attainable. Whereas, F, output level couldn't be chosen as the higher level of output Y_2 can be achieved with the minimum level of cost.

At an equilibrium point '£", OL* of labour and OK* capital are used to produce Y_2 output. Thus, in order to maximise output at a given level of cost, the firm fnust select those inputs that helps in equalizing the marginal rate of technical substitution and the input price ratio i.e.,

Alternative I

E = wL + rK.

3.7 EXPANSION PATH

Q18. Explain the determining the Expansion path of a firm.

Ans : **(Dec.-20, Jan.-20)**

Suppose the prices of the two factors, labour and capital, are such that are represented by the slope of the iso-cost line AB. In Figure, four iso-cost lines, AB, CD, UF, and GH are drawn which show different levels of total cost or outlay. All iso-cost lines are parallel to one another indicating that prices of the two factors remain the same. If the firm wants to produce the output level de-noted by <2, (= 100 units of output), it will choose the factor combination E_1 which mini-mizes cost of production; E_1 being the point of tangency between the isoquant Q_x and the iso-cost line AB. Now, if a firm wants to pro-duce a higher level of output denoted by the isoquant Q_2 (= 200), it will the choose the factor combination E_2 which is the least-cost combination for new output. Likewise, for still higher output levels denoted by Q_3 and Q_4, the firm will respectively choose tangency combination E_3 and E_4 which minimize cost for the given outputs.

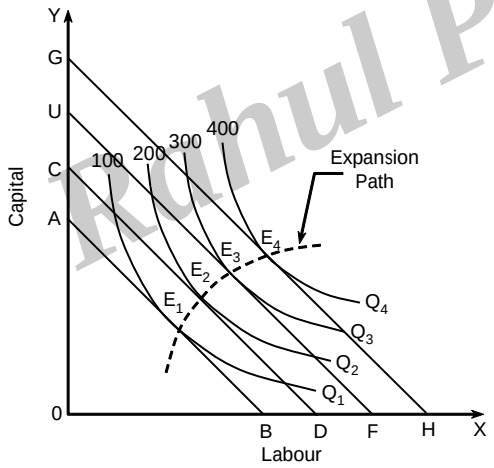


Fig.: Expansion Path

The line joining the minimum cost combinations such as E_1 E_2, E_3, E_4 is called the expansion path because it shows how the factor combination with which the firm produces will alter as the firm expands its level of output. Thus the expansion path may be defined as the locus of the points of tangency between the iso-product curves (i.e., isoquants) and the iso-cost lines. The expansion path is also known as scale-line because it shows how the entrepreneur will change the quantities of the two factors when it increases the level of output. The expansion path can have different shapes and slopes depending upon the relative prices of the productive factors used and the shape of the isoquants. When the production function exhibits constant returns to scale, the expansion path will be a straight line through the origin. Further, for a given isoquant map there will be different expansion paths for different relative prices of the factors.

Since an expansion path represents the minimum-cost combinations for various levels of output, it shows the cheapest way of producing each level of output, given the relative prices of the factors. When two factors are variable, the entrepreneur will choose to produce at some point on the expansion path. One cannot say exactly at which particular point on the expansion path the entrepreneur will in fact be producing unless one knows either the output which he wants to produce or the size of the cost or outlay it wants to incur. But this is certain that when both factors are variable and the prices of factors are given, a rational entrepreneur will seek to produce at one point or the other on the expansion path.

3.8 RETURNS TO SCALE

Q19. Define the law of returns to scale and explain its relevance in production management.

(OR)

Discuss the law of returns to scale with the help of a suitable example.

(OR)

Explain the laws of returns to scale.

(OR)

Write about economies of scale.

Ans : **(Dec.-16, Dec.-15)**

The law of returns to scale refers to the relationship between inputs and the output in the long-run when all the inputs (both fixed and variable) are varied in the same proportion. Economists use the phrase "Returns to Scale" to describe the behaviour in the long-run in relation to the variations in inputs.

The law of returns to scale can be defined as the per-centage 'increase in the output where all the inputs vary in the same proportion.

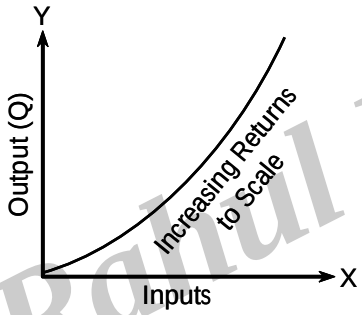
Types

Returns to scale are of three types. They are as follows,

1. Increasing Returns to Scale

If a proportionate increase in the output is larger than the proportionate increase in inputs, then a situation of increasing returns to scale occurs. In other words, increasing returns to scale occurs when a percentage increase in inputs lead to a greater percentage increase in the output. For example if a 5% increase in inputs result in 10% increase in the output, an organization is said to attain increased returns.

The below graph depicts a clear understanding about the behaviour of increasing returns to scale.



Generally, increasing returns to scale occur due to following reasons.

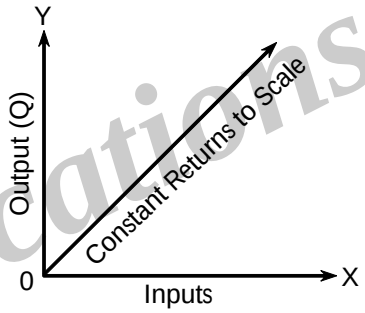
(i) In industries where the possibility to undertake production at a small scale, their a situation of increasing returns occur.

(ii) In cases where the increased size of operation gives a chance of some dimensional advan-tages. This is important in chemical industries and dairies where storage is an important activity.

(iii) In case of large scale industries where work is divided into fragments and as a result each individual attains specialization.

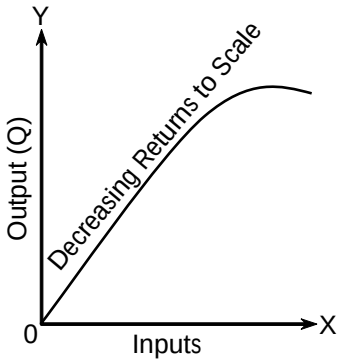
2. Constant Returns to Scale

If the proportionate increase in all the inputs is equal to the proportionate increase in output, then a situation of constant returns to scale occurs. In other words constant returns to scale occurs when the percentage increase in out-put is equal to the percentage increase in input. According to Marshall, the law of constant returns operates when the advantages and disadvantages of large scale production are exactly balanced over a range of output. For example if the inputs are increased at 10% and if the resultant output also increases at 10% then the organization is said to achieve constant returns to scale.



3. Decreasing Returns to Scale

If the proportionate increase in output is less than the proportionate increase in input, then a situation of decreasing returns to scale occurs. For example if the inputs increase by 10% and the resultant output increase by only 5% then the organization is said to achieve decreasing returns to scale. The graph below depicts decreasing returns to scale.



Decreasing returns to scale occur due to the following reasons,

(i) When a firm continues to expand its size beyond a particular point.

(ii) Increasing inefficiency in production.

(iii) After the maximum capacity of the indivisible input has reached the limit to specialization.

Relevance of Law of Returns to Scale in Production Management

The law of returns to scale is very important in production management.

The law of returns to scale plays a key role in production management decisions. The production management decisions of law of returns to scale includes,

(a) Factor product decisions

(b) Factor factor decisions and

(c) Product product decisions

(a) The factor-product type of decisions deal with determination of optimum input level for producing a product.

(b) The factor-factor type of decisions deals with the determination of suitable input-mix and its effects in order to produce a given level of output.

(c) In product-product type of decisions, the managers focus on for determining the optimal product-mix within the available resources. The law of returns to scale in production management focuses on the level of output in order to maximize the level of profit margins in the long-run by considering the average and marginal cost of production.

Production theory is more suitable to "Micro Theory of Distribution", so it analyses the key enables of marginal productivity for factors of production which in turn leads to demand analysis for 'factor of production'.

Production theory is also applicable to "Macro Theory of Distribution". This implies that the total share for different factors of production rests on "elasticity of substitution".

Elasticity of substitution is given by the formula,

$$= \frac{\% \text{ Change in capital - Labour ratio}}{\% \text{ Change in factor - Prices ratio}}$$

Percentage change in factor-price ratio is also called as "Marginal Rate of Substitution (MRS)".

Thus, law of returns to scale in production management helps in determining the relationship existing between costs and output and also in the determination of firm's demand pertaining to factor inputs.

The following table shows the combined Marginal Revenue Product (MRP) with Marginal Labour Cost (MLC) of a firm operating in a perfectly competitive market for both input and output during production process

Working Notes

Assumed values:

Taken P = Product price = ` 3

= Cost per unit of labour

= ` 5000

$MRP = MP \times P$

$TLC = (X) \times (L)$

$MLC = \Delta TLC / \Delta X$

For total product the values are assumed average product = $\frac{TP}{X}$

Marginal product = Value of TP (2) is deducted from value of TP (1) and so on for all other values.

Combining Marginal Revenue Product (MRP) with Marginal Labour Cost (MLC)

Labour Unit (X)	Total Product (TP)	Average Product (AP)	Marginal Product (MP)	Total Revenue Product (TRP)	Marginal Revenue Product (MRP)	Total Labour Cost (TLC)	Marginal Labour Cost (MLC)	TRP –TLC	MRP-MLC
0	0		0	0		0		0	0
1	5,000	5,000	5,000	15,000	15,000	5,000	5,000	10,000	10,000
2	15,000	7,500	10,000	45,000	30,000	10,000	5,000	35,000	25,000
3	35,000	11,667	20,000	1,05,000	60,000	15,000	5,000	90,000	55,000
4	45,000	11,250	10,000	1,35,000	30,000	20,000	5,000	1,15,000	25,000
5	55,000	11,000	10,000	1,65,000	30,000	25,000	5,000	1,40,000	25,000
6	58,000	9,667	3,000	1,74,000	9,000	30,000	5,000	1,44,000	4,000
7	60,000	8,571	2,000	1,80,000	6,000	35,000	5,000	1,45,000	1,000
8	61,000	7,625	1,000	1,83,000	3,000	40,000	5,000	1,43,000	-2,000

The above table indicates that till point '7', the firm can hire labour because marginal labour cost is Marginal Revenue Product (MRP). But beyond that point MLC > MRP and the firm cannot hire labour which involves huge loss to the firm.

Q20. Distinguish between Law of variable proportions and Returns to scale.

Ans :

S.No.	Particulars	Law of Variable Proportions	Returns to Scale
1	**Nature of inputs**	It studies the effect of change in one input on output i.e., the quantities of some inputs are fixed while other quantities vary.	Returns so scale studies the effect of change in all inputs on outputs i.e., all the inputs are variable.
2	**Time element**	Considered as short-run production function	Considered as long - run production function
3	**Homogenity**	Non-homogenous production function	Homogeneous production function.
4	**Relationship**	It is related "returns to a factor". Returns to a factor refers to a condition where there is a change in physical output due to the variations in one input.	It is related to "scale of production".It refers to a conditions where there is a change in physical output when the quantity of all factors is increased simultaneously in the same proportions.

5	**Factor proportions**	Change with the level of inputs	Remains constant
6	**Law of diminishing returns**	Non -linear non - homogeneous production function	Non - linear homogeneous production function
7	**Law of constant returns**	Linear non-homogeneous production function	Linear homogeneous production function
8	**Example**	In case of law of variable proportions, say if we increased the labour hours (only one factor) the increase in production is dependent on the working hours of labour only hence, it is unifactorial.	Linear homogeneous production function. Whereas in returns to scale, all the factors (land, labour, capital, raw material) must undergo changes in order to bring changes in the level of output, hence it is multifactorial.

3.9 ECONOMIES OF SCOPE

Q21. Explain briefly about Economies of scope.

(OR)

Write about Economies of scope.

Ans : **(Jan.-18, Dec.-16)**

In business parlance, the concept of economies of scope is often used somewhat differently than the concept of economies of scale. It refers to the reduction in unit cost realized then the firm produces two or more products jointly rather than separately. That is to say, a multi product firm often experiences economies of scope leading to the lowering of costs.

The degree of economies of scope can be measured in terms of the difference in the costs of production jointly and separately. The following formula is used to measure the degree of economies of scope.

$$DES = \frac{TC(An)+TC(Bn)-TC(An+Bn)}{TC(An+Bn)}$$

Where,

DES = Degree of economies of scope

TC (An) = Total cost of producing An units of product A separately

TC (Bn) = Total cost of producing Bn units of product B separately

TC(An + Bn) = Total cost of producing products A and B jointly.
i.e., producing An units product A and Bn units of product B together.

The economies of scope, has a close relationship with the economies of scale. A multi-product firm usually tends to have a scale of operation than a single product firm. So the former reaps the benefits of the economies of scale. This may be attributed to the fact that a multi-product firm uses common infrastructure such as business office, factory plant, vehicles, managerial staff, etc.

Furthermore, a multi-product firm can reap the economy of by-product under the economies of scope. For instance, a sugar factory can use its molasses - by product( ) for producing liquor by starting its

own distillery units. In practice, Motorola may be cited as a multi-product firm-producing two-way radios, cellular phones, pagers, semiconductors and other electronic gadgets - experiencing economies of scope and economies of scale to the limit.

PROBLEMS

1. Consider production function $Q = 5L^{0.5} K^{0.3}$. Does it represent increasing, decreasing or constant return to scale.

Sol : **(June-16)**

Increasing both labour and capital inputs by m, we have

$$Q' = 5(mL)^{0.5} . (mk)^{0.3}$$

$$Q' = m^{0.5} m^{0.3} . 5 L^{0.5} k^{0.3}$$

$$Q' = m^{0.5} m^{0.3} . 5 L^{0.5} k^{0.3}$$

$$Q' = m^{0.8} Q.$$

That is, by increasing labour and capital by m, output increase by $m^{0.8}$, that is, less than m, thus, in this case decreasing return to scale occurs.

2. The production function of a firm is given by $Q = 100 K^{0.5} L^{0.5}$, find out the efficient combination of inputs to produce 100 units when r = Rs. 1/- and w = Rs. 1/-.

Sol : **(June-16)**

$$Q = 100.k^{0.5} L^{0.5}$$

$$MP_L = \frac{\partial Q}{\partial L} = 100 \times 0.5\, k^{0.5} L^{-0.5}$$

$$= 50\, k^{0.5} L^{-0.5}$$

$$MP_K = \frac{\partial Q}{\partial K} = 100 \times 0.5 \times K^{-0.5} L^{0.5}$$

$$= 50\, k^{0.5} L^{-0.5}$$

$$\frac{MP_L}{MP_K} = \frac{50 \times K^{0.5} L^{-0.5}}{50\, K^{-0.5} L^{0.5}} = \frac{k}{L}$$

In equilibrium, $MRS_{LK} = \frac{MP_L}{MP_K} = \frac{w}{r}$. Thus, in optimal input combination, $\frac{k}{L} = \frac{w}{r}$ or $k = \frac{w}{r} . L$

To obtain the value of L, we substitute $k = \frac{w}{r} . L$ in the production function with Q = 100 units.

$$100 = 100\, K^{0.5} L^{0.5}$$

$$= 100 \left[\frac{w}{r} . L\right]^{0.5} L^{0.5}$$

$$100 = 100\, L \left[\frac{w}{r}\right]^{0.5}$$

Substitute w = 1 and r = 1

$$100 = 100\, L \left[\frac{1}{1}\right]^{0.5}$$

$$100 = 100\, L\, (1)$$

$$L = \frac{100}{100} = 1$$

$$K = \frac{1}{1} \times 1 = 1.$$

3. Give the following MP_L function, a fixed capital stock of 64 units, wage rate of Rs. 10 and an output price of Rs. 5, determine the optimal combination of inputs $MP_L = 100 (K^{0.5}/L^{0.5})$.

Sol : **(Dec-16)**

Capital (k) = 64 units

Wage rate (L) = 10

Output price = 5

$$MP_L = 100 (k^{0.5}/L^{0.5})$$

$$= 100(64^{0.5}/10^{0.5})$$

$$= 100 (2^{4 \times 0.5} / 10^{5/10})$$

$$= 100\ (4/3.162)$$

$$MP_L = 126.5.$$

4. The following production function is given:

$Q = 40\ K^{0.5}\ L^{0.5}$.

Find marginal product at labour and capital find out whether the firm is recurring increasing or decreasing or constant returns to scales.

Sol : **(Dec.-15)**

$Q = 40.\ k^{0.5}\ .\ L^{0.5}$

Marginal Product at labour :

$$MP_L = \frac{\partial Q}{\partial L} = 40.\ k^{0.5}\ L^{0.5} = 40\left(\frac{k}{L}\right)^{0.5}$$

$$MP_K = \frac{\partial Q}{\partial k} = 40.\ L0.5\ K0.5 = 40\left[\frac{L}{k}\right]^{0.5}$$

---

5. Given the production function $f = 1000K^{0.5}\ L^{05}$, find out the efficient input combination of Capital (K) and Labour (L) for producing 1000 units of output.

Sol : **(Dec.-14)**

Given – $\phi = 100.K^{0.5}\ L^{0.5}$

$y = A,\ y = A.K^{\alpha}.\ L^{1-\alpha}$

Here $A = 100$

$$\alpha = 0.5 = \frac{1}{2}$$

K = capital

L = Labour

$$I - a = 1 - 0.5 = 0.5 = 0.5 = \frac{1}{2}$$

$y = 1000$

$1000 = 100.K^{1/2}\ .\ L^{1/2}$

$$\Rightarrow \quad K^{1/2}\ L^{1/2} = \frac{1000}{100} = 10$$

$$\Rightarrow \quad (KL)^2 = 10$$

$$\Rightarrow \quad KL = 10^2 = 100$$

$$\Rightarrow \quad KL = 100$$

Here

K = 10 L = 10

K = 5 L = 20

K = 4 L = 25

K = 1 L = 100

Out of these probabilities the first combination is said to be minimum that is why C = K + L

Minimum combination of capital and labour = 10 + 10 = 20

K = 10 L = 10.

---

6. Given the production function

$Q = 100\ K^{0.5}\ L^{0.5}$

Find out the expansion path of the firm.

Assume that r = Rs. 5 and

W = Rs. 4 per unit

What is the efficient combination of inputs if the production is 200 units.

Ans : **(Dec.-15)**

(i) Refer to Unit-III, Topic : 3.6

(ii) $Q = 100\ K^{0.5}\ L^{0.5}$

$$MRTS_{LK} = \frac{w}{r} \qquad \ldots (1)$$

$$MRTS_{LK} = \frac{MP_L}{MP_K} \qquad \ldots (2)$$

To obtain MP_L or $\frac{\partial Q}{\partial L}$, we differentiate the given production function [$Q = 100\ .\ k^{0.5}\ L^{0.5}$] with respect to labour.

Thus :

$$MP_L = 100 \times \tfrac{1}{2}\ k^{1/2}\ L^{-1/2} = \frac{50\ k^{1/2}}{L^{1/2}}$$

$$MP_K \text{ or } \frac{\partial \theta}{\partial k} = 100 \times \frac{1}{2}\ k^{1/2}\ L^{-1/2}$$

$$= \frac{50L^{1/2}}{k^{1/2}}$$

$$\text{Therefore } MRTS_{LK} = \frac{MP_L}{MP_K} = \frac{50\frac{K^{1/2}}{L^{1/2}}}{50\frac{L^{1/2}}{K^{1/2}}} = \frac{K}{L} \quad \ldots (3)$$

Substituting $\frac{K}{L}$ for $MRTS_{LK}$ in equation (1),

$$\frac{K}{L} = \frac{w}{r}$$

$$\boxed{k = \frac{w}{r}L}$$

If r = s, W = 4

To obtain the efficient combination of inputs if the production is 200 units.

$$Q = 100L\left(\frac{w}{r}\right)^{1/2}$$

$$200 = 100L\left(\frac{4}{5}\right)^{1/2}$$

$$200 = 100L \times (0.8)^{0.5}$$

$$200 = 100L \times 0.894$$

$$200 = 89.4\ L$$

$$L = \frac{200}{89.4} = 2.237$$

$$L = 2.237$$

$$K = \frac{w}{r}.L$$

$$K = \frac{4}{5} \times 2.237 \qquad K = 1.7896$$

Thus optimum combination of inputs consists of 89.4 units of labour and 1.7896 units of capital.

7. Given the production function $Q = 30\ K^{0.5} L^{05}$ find out the efficient combination of inputs to produce 200 units W = 5 and R = 4.

Sol : **(Dec.-14)**

$$Q = 30\ K^{0.5}\ L^{0.5}$$

$$MP_L = \frac{dQ}{dL} = 30 \left[\frac{1}{2}\right] K^{1/2} L^{1/2}$$

$$M_{PL} = 15 K^{1/2} L^{1/2}$$

$$= 15 \frac{\sqrt{K}}{\sqrt{L}}$$

$$K = 200$$

$$= MP_L = 15 \frac{\sqrt{200}}{\sqrt{L}}$$

$$= 4 \times 15 \frac{\sqrt{200}}{\sqrt{L}} = 60 \frac{\sqrt{200}}{\sqrt{L}}$$

$$= 60 \frac{\sqrt{200}}{\sqrt{L}} = 5$$

$$= \sqrt{L} = \frac{60\sqrt{200}}{5}$$

$$= 12\sqrt{2} \times 10$$

$$= 120\sqrt{2}$$

$$L = 14{,}400 \times 2$$

$$L = 28{,}800.$$

8. Fill in the blanks in the following Table

Units of labour	Total product	Average product	Marginal product
1	-	40	-
2	-	-	48
3	138	-	-
4	-	44	-
5	-	-	24
6	210	-	-
7	-	29	-
8	-	-	27

Sol : **(Dec.-16)**

Units of labour	Total product	Average product (TP/Q)	Marginal product ($TP_n - TP_{n-1}$)
1	40	40	40
2	88	44	48
3	138	46	50
4	176	44	38
5	200	40	24
6	210	35	10
7	203	29	– 7
8	176	22	– 27

9. The following table shows the quantity of output of mangoes and the quantity of labour used per acre of land.

Labour	Output
0	**0**
1	**100**
2	**107**
3	**112**
4	**116**
5	**119**
6	**120**
7	**110**

(a) Calculate the marginal revenue product of labour at each rate of input used if mangoes sell for Rs. 10 each.

(b) If the wage rate is Rs. 40, what is the optimal rate of use of labour ? Explain.

Ans : **(Dec.-20)**

(a)

L	MP_L	MR	MRP_L
0	–	–	–
1	100	10	1000
2	7	10	70
3	5	10	50
4	4	10	40
5	3	10	30
6	1	10	10
7	–10	10	–100

Where

$$MP_2 = \frac{\Delta TP}{\Delta L}$$

$$MRP_L = MP_L \times P$$

(b)

If the wage rate is 40. The optimal rate of labour is i.e., from the above table where MRP_L is 40 the labour acquired is 4. (The wage rate is equal to the marginal revenue product)

10. The production of Crompton electronics is

$$\mathbf{Q = 2K^{0.5}\ L^{0.5}}$$

Determine te optimal rate of labour to be hired when capital is fixed at 9 units, the price of output is Rs. 6 per cent and wage rate is Rs. 2 per unit.

Ans : **(Jan.-20)**

$Q = 2K^{0.5}\ L^{0.5}$

Given that

$K = 9$

$P = 6$

$W = 2$

Price determine the MRP_2 as (K = 9) (note that = P = M)

$$MRP_2 = PMP_2$$

$$MP_2 = \frac{dQ}{dL} 2K^{0.5} L^{0.5}$$

$$= 0.5\ (.2)\ K^{0.5} L^{0.5-1}$$

$$= 1.K^{0.5} . L^{0.5} = \frac{K^{0.5}}{L^{0.5}} \text{ (or) } \frac{\sqrt{K}}{\sqrt{L}}$$

$$MRP_1 = PMP_2$$

$$= 6 \times \left(\frac{\sqrt{9}}{\sqrt{L}}\right) = (\sqrt{9} = 3)$$

$$= \frac{6 \times 3}{\sqrt{L}} = \frac{18}{\sqrt{L}} = MRP_2$$

Now equate the MRP_2 function & wage rate & solve for L i.e.,

$$= MRP_2 = W$$

$$= \frac{18}{\sqrt{L}} \times 2 = \sqrt{2} \times 2 = 18$$

$$= \sqrt{2} = \frac{18}{2} = 9$$

$$= \sqrt{2} = 9$$

$$= L = (9^2) = 81$$

$$L = 81$$

Therefore 81 units & labour should be employed.

Short Question and Answers

1. What do you understand by production?

Ans :

Production

Production is an activity of transforming the inputs into output. It involves step-by-step conversion of one form of materials into another form through chemical or mechanical processing in order to create or enhance the utility or usability of the products or services.

Economics view production is as an activity through which utility for a product is created or enhanced.

According to E.S. Buffa, "Production is an process by which goods and services are created". In economics, the term production means a process in which the resources are transformed or converted into a different and more useful commodity or service. In general production means transforming inputs into an outputs. The term production is however limited to "manufacturing organizations" only.

Production i.e., transformation of inputs into output can be any of the three forms change in form, change in phase and change in time. The output produced can be either the final product (like a PC) or an intermediate product (like a semiconductor used in manufacturing a PC). The output goods or services may be either tangible or intangible. Production of a chair from wood is a tangible output whereas medical service by a doctor is an intangible output.

2. Define production function?

Ans :

The production function is purely a relationship between the quantity of output obtained or given out by a production process and the quantities of different inputs used in the process. Production function can take many forms such as linear function or cubic function etc.

Definitions

(i) According to Michael R Baye, "Production Function" is that function which defines the maximum amount of output that can be produced with a given set of inputs.

(ii) According to Samuelson, "Production Function" is the technical relationship, which reveals the maximum amount of output capable of being produced by each and every set of inputs, under the given technology of a firm.

From the above definitions, it can be concluded that the production functions is more concerned with physical aspects of production, which is an engineering relation that expresses the maximum amount of output that can be produced with a given set of inputs.

Production function enables production manager to understand how better he can make use of technology to its greatest potential.

Mathematically, a production function is represented as,

$$Q = f(L, C, M,)$$

Where,

Q = Quantity of the output produced

f = Function of L, C, M

L = Labour units

C = Capital employed

M = Machinery raw materials.

3. Cobb Douglas production function.

Ans :

Cobb and Douglas put forth a production function relating output in American manufacturing industries from 1899 to 1922 to labour and capital inputs. They used the following formula:

$$P = bL^{a} C^{1-a}$$

Where P is total output,

L = The index of employment of labour in manufacturing

C = Index of fixed capital in manufacturing

The exponents a and 1-a are the elasticities of production. These measure the percentage response of output to percentage changes in labour and capital respectively.

The function estimated for the USA by Cobb and Douglas is

$$P = 1.01L^{0.75} C^{0.25}$$

$$R^2 = 0.9409$$

The production function shows that one percent change in labour input, capital remaining the same, is associated with a 0.75 percent change in output. Similarly, one percent change in capital, labour remaining the same, is associated with a 0.25 percent change in output. The coefficient of determination (R^2) means that 94 percent of the variations on the dependent variable (P) were accounted for by the variations in the independent variables (L and C). It indicates constant returns to scale which means that there are no economies or diseconomies of large scale of production. On an average, large or small scale plants are considered equally profitable in the US manufacturing industry, on the assumption that the average and marginal production costs were constant.

4. Criticisms of Cobb-Douglas production function.

Ans :

1. The function includes only two factors and neglects other inputs.
2. The function assumes constant returns to scale.
3. There is the problem of measurement of capital which takes only the quantity of capital available for production.
4. The function assumes perfect competition in the factor market which is unrealistic.
5. It does not fit to all industries.
6. It is based on the substitutability of factors and neglects complementarily of factors.
7. The parameters cannot give proper and correct economic implication.

5. Assumptions of law of diminishing returns.

Ans :

The law of variable proportions is based on the following assumptions.

(i) The technology used in the production process should be constant. If the state of the technology used is increased, the Marginal Product (MP) and Average Product (AP) will rise instead of diminishing.

(ii) The quantity of some of the inputs should be fixed. By doing so, the input proportions can be altered and their effect on the output can be known.

(iii) The law does not hold in the situation where all the inputs are proportionately varied.

(iv) The law is based on the possibility of varying the proportion in which various inputs can be combined to produce a product. The law is not applicable to those cases where the inputs must be used in fixed proportions to yield a product.

6. Define isoquant.

Ans :

The term isoquant has its origin from two words 'iso' and 'quantus'. 'iso' is a Greek word meaning 'equal' and 'quantus' is a Latin word meaning 'quantity'. An isoquant curve is therefore called as 'iso-product curve' or 'equal-product curve' or 'production indifference curve'.

Definition

According to Peterson "An Iso-quant curve may be defined as a curve showing the possible combinations of two variable factors that can be used to produce the same total product."

According to Ferguson "An Iso-quant is a curve showing all possible combinations of inputs physically capable of producing a given level of output."

An isoquant is defined as the curve or locus of points representing various combinations of two inputs [say Labour (L) and Capital (C)] that yield the same level of output.

In other words, an isoquant is a line joining different combinations of two inputs (L and C) which result in the same quantity of output.

Isoquants are used to represent a production function with two variable inputs.

7. Law of Returns to Scale

Ans :

The law of returns to scale refers to the relationship between inputs and the output in the long-run when all the inputs (both fixed and variable) are varied in the same proportion. Economists use the phrase "Returns to Scale" to describe the behaviour in the long-run in relation to the variations in inputs.

The law of returns to scale can be defined as the per-centage 'increase in the output where all the inputs vary in the same proportion.

8. Economies of scope.

Ans :

In business parlance, the concept of economies of scope is often used somewhat differently than the concept of economies of scale. It refers to the reduction in unit cost realized then the firm produces two or more products jointly rather than separately. That is to say, a multi product firm often experiences economies of scope leading to the lowering of costs.

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Where,

DES = Degree of economies of scope

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TC(An + Bn) = Total cost of producing products A and B jointly.
i.e., producing An units product A and Bn units of product B together.

The economies of scope, has a close relationship with the economies of scale. A multi-product firm usually tends to have a scale of operation than a single product firm. So the former reaps the benefits of the economies of scale. This may be attributed to the fact that a multi-product firm uses common infrastructure such as business office, factory plant, vehicles, managerial staff, etc.

Furthermore, a multi-product firm can reap the economy of by-product under the economies of scope. For instance, a sugar factory can use its molasses - by product( ) for producing liquor by starting its own distillery units. In practice, Motorola may be cited as a multi-product firm-producing two-way radios, cellular phones, pagers, semiconductors and other electronic gadgets - experiencing economies of scope and economies of scale to the limit.

9. Expansion path.

Ans :

The expansion path is also known as scale-line because it shows how the entrepreneur will change the quantities of the two factors when it increases the level of output. The expansion path can have different shapes and slopes depending upon the relative prices of the productive factors used and the shape of the isoquants. When the production function exhibits constant returns to scale, the expansion path will be a straight line through the origin. Further, for a given isoquant map there will be different expansion paths for different relative prices of the factors.

10. Importance of Cobb-Douglas production function.

Ans :

(i) The Cobb-Douglas function is convenient for international and inter-industry comparisons. Since a and P (which are partial elasticity coefficients) are pure numbers (i.e., independent of units of measurement) they can be easily used for comparing results of different samples having varied units of measurement.

(ii) Another advantage is that this function captures the essential non-linearities of production process and also has the benefit of the simplification of calculations by transforming the function into a linear form with the help of logarithms. The log-linear function becomes linear in its parameters, which is quite useful to a managerial economist for his analysis.

(iii) In addition to being elasticities, the parameters of Cobb-Douglas function also possess other attributes.

For example, the sum of (a + P) shows the returns to scale in the production process; a and (3 represent the labour share and capital share of output respectively, and so on.

(iv) This function can be used to investigate the nature of long-run production function, viz., increasing, constant and decreasing returns to scale.

Choose the Correct Answers

1. _____ shows the overall output generated at a given level of input. [b]
   (a) Cost function (b) Production function
   (c) Marginal rate (d) ISO cost
2. _____ is an implicit cost of production. [c]
   (a) Wage of the labour (b) Charges for electricity
   (c) Intrest on owned money capital (d) Payment for raw Material
3. In the third of the three stages of production. [b]
   (a) The marginal product curve has a positive slope
   (b) The Marginal product curve lies completely below the average product curve
   (c) Total product increase
   (d) Marginal product is positive
4. Laws of production does not include. [d]
   (a) Returns to scale (b) Law of dimishing returns to a factor
   (c) Law of variable proportion (d) Least cost combination of factors
5. Average product is defined as [c]
   (a) Total product divided by the total cost
   (b) Total product divided by the marginal product
   (c) Total product divided by variable input
   (d) Marginal product divided by the variable input
6. Which of the following is not a factor of production. [c]
   (a) Land (b) Labour
   (c) Raw Material (d) Capital
7. The change in the total product resulting from a chang e in a variable input is. [d]
   (a) Average cost (b) Average product
   (c) Marginal cost (d) Marginal product
8. Constant return to scale is also called. [a]
   (a) Homogeneous droduction function. (b) Constant returns to factor
   (c) Increasing returns to scale (d) None
9. Cobb - Douglas is _____ function. [a]
   (a) Production (b) Demand
   (c) Supply (d) Cost
10. Which of the following is cost curve which will show the various combination of two inputs. [a]
   (a) ISO - Cost (b) ISO Quant
   (c) Both (d) None

Fill in the blanks

1. _____ asserts that the maximum output of a technologically determined production process is a mathematical function.
2. _____ can be defined as the specification of the minimum input requirements needed to produce designated quantities of output.
3. _____ production function is the most popular in empirical research .
4. Expand TP _____ .
5. Expand MP _____.
6. Expand AP _____ .
7. _____ refers to the cost curve which will show various combinations of two inputs.
8. _____ reduces work content due to design defects and excess material removal.
9. _____ ensures right type of material at right time, in right quantities and at competitive prices.
10. _____ analysis is based ont he assumption that workers improve with practice.

ANSWERS

1. Production function
2. Production function
3. Cobb - Douglas
4. Total product
5. Marginal product
6. Average product
7. Iso - cost
8. Product development
9. Material control
10. Learning curve

UNIT IV

Cost Analysis

Concepts of cost – Short run cost functions - Finding minimum average variable cost through equations – Long run cost function – Linear and nonlinear break even analysis.- Profit contribution analysis

4.1 Concepts of Cost

Q1. Define :

(a) Cost

(b) Cost Analysis

Ans :

(a) Cost

- Economist define cost in terms of opportunities that are sacrifice when choice is made.
- Cost is analyzed from the producer point of view. Cost estimates are made in terms of money cost calculations are indispensable for management decisions.
- Cost of production refers to the total money expenses (both explicit and implicit) incurred by the producer in the process of transforming inputs into outputs.
- Thus, it refers total money expenses incurred to produce a particular quantity of output by the produce.

(b) Cost Analysis

Cost analysis is also known as economic evaluation, cost allocation, efficiency assessment, cost-benefit analysis, cost effective analysis.

Cost analysis is a method used to determine how well or how poorly a planned action will turn out. The cost analysis refers to the study of behaviour of cost in relation to one or more production criteria such as size of the output, scale of operations, prices of factors of production and other relevant economic variables.

Q2. Explain different types of costs.

(OR)

Elucidate the different types of costs.

(OR)

What are the costs that are relevant for decision making.

Ans : **(Jan.-20)**

There are several costs that a firm should consider under relevant circumstances. It is-quite essential for a firm to understand the difference between various cost concepts for the purpose of production/business decision-making.

The following are the various cost concepts/ types of colts,

(1) Opportunity and Actual Costs

(i) Opportunity Cost :

Opportunity cost is concerned with the cost of forgone opportunity/alternatives. In other words, it is the return from the second-best use of the firms resources which the firm forgoes in order to avail of the return from the best use of the resources. It can also be said as the comparison between the policy that was chosen and the policy that was rejected. The concept of opportunity cost focuses on the net revenue that could be generated in the next best use of a scarce input. Opportunity cost is also called as "alternative cost".

Example : If a firm owns a land, there is no cost of using the land (i.e., the rent) in the firm's account. But, the firm has an opportunity cost of using this land, which is equal to the rent forgone by not letting the land out on rent.

(ii) Actual Cost :

Actual cost is defined as the cost or expenditure which a firm incurs for producing or acquiring a good or service. The actual costs or expenditures are recorded in the books of accounts of a business unit. Actual costs are also called as "outlay costs" or "absolute costs" or "acquisition costs",

Example : Cost of raw material, rent, interest, wage bill, etc.

(2) Fixed and Variable Costs

(i) Fixed Cost: Fixed costs are the costs that do not vary with the changes in output. In other words, fixed costs are those which are fixed in volume though there are variations in the output level. If the time period under consideration is long enough to make the adjustments in the capacity of the firm, the fixed costs also vary. For an economist fixed costs are overhead costs and for an accountant they are indirect costs.

Example : Expenditures on depreciation (decrease) costs of administrative or managerial staff, rent on land and buildings, property taxes, etc.

(ii) Variable Cost :

Variable costs are those that are directly dependent on the output i.e., they vary with the variation in the volume/level of output. Variable costs increase with an increase in output level but not necessarily in the same proportion. The proportionality between the variable cost and output depends upon the utilization of fixed facilities and resources during the production process.

Example: Cost of raw materials, expenditures on labour, running cost or maintenance costs of fixed assets such as fuel, repairs, routine maintenance expenditure, etc.

(3) Explicit Costs and Implicit Costs

(i) Explicit Cost : Explicit costs are those expenses/expenditures that are actually paid by the firm. These costs are recorded in books of accounts. Explicit costs are important for calculating the profit and loss accounts and guide in economic decision-making. Explicit costs are also called as "paid-out costs".

Example : Interest payment on borrowed funds, rent payment, wages, utility expenses, etc.

(ii) Implicit Cost/Imputed Costs: Implicit costs are a part of opportunity cost. They are the theoretical costs i.e., they are not recognized by the accounting system and are not recorded in the books of accounts but are very important in certain decisions. They are also called as the earnings of those employed resources which belong to the owner himself. Implicit costs are also called as "Imputed costs".

Example : Rent on idle land, depreciation on fully depreciated property still in use, interest on equity capital, etc.

(4) Out-of-Pocket Costs and Imputed Cost

(i) Out-of-Pocket Cost : Out-of-pocket costs are those costs or expenses which are current payments to the outsiders of the firm. All the explicit costs fall into the category of out-of-pocket costs.

Example : Rent paid, wages, salaries, interest, transport charges, etc.

(ii) Imputed/Book Cost : Sometimes book costs is also known as imputed cost. Book costs are those business costs which don't involve any cash payments but a provision is made in the books of accounts. Book costs are imputed costs or the payments made by the firm itself.

Example : Cost of using owners money, depreciation of fully-written-off-property, the firm own capital equipment etc.

(5) Sunk and Incremental Costs

(i) Sunk Cost : Sunk costs are those costs that have spent in the past. Sunk costs are those do not alter by varying the nature or level of business activity. Sunk costs are generally not taken into consideration in decision-making as they do not vary with the changes in the future. Sunk costs are a part of the outlay/ actual costs. Sunk costs are also called as "non-avoidable costs" or "non- escapable costs".

Example : Amortization of past expenses, like depreciation.

(ii) Incremental Cost: Incremental costs are additions to costs resulting from a change in the nature or level of a business activity. As these costs can be avoided by not bringing any variation in the activity, they are also called as "avoidable costs" or "escapable costs".

Moreover, incremental costs can be considered as the difference in the total costs resulting from a contemplated change in the future, they are also called as "differential costs".

Example : Change in distribution channels adding or deleting a product in the product line, replacing a machine, etc.

(6) Direct Vs Indirect Costs

(i) Direct Cost : Direct costs are also called as, "traceable" or "assignable costs". Direct costs are those which have direct relationship with a unit of operation like manufacturing a product organizing a process or an activity, etc. In other words, direct costs are those which are directly and definitely identifiable. The nature of the direct cost depends upon the costing under consideration. As the direct costs are related with a particular product/ process, they vary with variations in them. Therefore, all direct costs are variable in nature.

Example : In operating railway services, the costs of wagons, coaches and engines are direct costs.

(ii) Indirect Cost : Indirect costs are also called as "non-traceable costs" or "non- avoidable costs". Indirect costs are those which cannot be easily and definitely identifiable in relation to a plant, a product, a process or a department. Indirect costs do not vary i.e., they may or may not be variable in nature. However, the nature of indirect costs depend upon the costing under consideration. Indirect costs are both the fixed and the variable type as they may or may not vary as a result of the proposed changes in the production process etc.

Example : The cost of factory building, the track of a railway system, etc., are 'fixed indirect costs' and the cost of machinery, labour, etc., are 'variable indirect inputs'.

(7) Controllable Vs Non-Controllable Costs

(i) Controllable Cost : Controllable costs are those which can be controlled or regulated through observation by an executive and therefore they can be used for assessing the efficiency of the executive. Most of the costs are controllable.

Example : Inventory costs can be controlled at the shop level etc.

(ii) Non-Controllable Cost : The costs which cannot be subjected to administrative control and supervision are called non-controllable costs. Non-controllable costs are those costs which are beyond regulation.

Example : Costs due obselence and depreciation, capital costs, etc.

(8) Historical Cost and Replacement Cost

(i) Historical Cost : Historical cost (original cost) of an asset refers to the original price paid by the management to purchase it in the past.

Example : Financial statements or balance sheet of a firm.

(ii) Replacement Cost: Replacement cost are those costs that are to be paid currently if the asset were to be replaced.

Example : If a firm acquires a machine for ` 20,000 in the year 1990 and the same machine costs ` 40,000 now. The amount ` 20,000 is the historical cost and the amount ` 40,000 is the replacement cost.

(9) Shutdown and Abandonment Costs

(i) Shutdown Cost: The costs of a firm incurs when it temporarily stops its operations are called "shutdown costs". These costs can be saved when the firm again starts its operations. Shutdown costs include fixed costs, maintenance cost, lay-off expenses etc.

Example : Cost of sheltering the plant and equipment and construction of sheds for storing exposed property.

(ii) Abandonment Cost : Abandonment costs are those costs which are incurred for the complete removal of the fixed asset from use. These may occur due to obselence or due to improvisation of the firm. Thus, abandonment costs involve problem of disposal of the asset.

Example : The plant installed during war time may be so improvised that it may not be required during peace time.

(10) Business Cost and Full Cost

(i) Business Cost : Business costs include all the expenses incurred by the firm to carry out business activities. According to Watson and Donald.S, business costs include all the payments and contractual obligations made by the firm together with the book cost of depreciation on plant and equipment. The concept of business cost facilitate in calculating the profit and loss account and for filing returns for income tax and also for other legal purposes.

(ii) Full Cost : Full costs are the sum of opportunity costs and normal profit. Opportunity cost is the expected return/ earnings from the next best use of the firm's resources like capital, land and building, entrepreneurs/owners efforts and time. Normal profit is the necessary minimum earning in addition to the opportunity cost, which a firm must receive to remain in its present occupation.

(11) Short-Run Cost and Long-Run Cost : Both short-run and long-run costs are related fixed and variable costs and are often used in economic analysis.

(i) Short-Run Cost : Short-run costs are which vary with the variations in the output with size of the firm as same. Short-run costs are same as variable costs. Broadly, short-run costs are associated with variable inputs in the utilization of fixed plant or other requirements.

Example : Cost for utilization of fixed plant.

(ii) Long-Run Cost : Long-run costs are which incurred on the fixed assets like land and building, plant and machinery etc. Long-run costs are same as fixed costs. Usually, long-run costs are associated with the variations in size and kind of plant.

Example : Cost of changes in the size and types of plant.

(12) Urgent Costs and Postponable Costs

(i) Urgent Cost: Urgent costs are those costs that are necessary for the continuation of the firm's activities.

Example : The cost of raw materials, labour, fuel, etc., which have to be incurred if production is to take place.

(ii) Postponable Cost : The costs which can be postponed for some time, i.e., whose postponement does not affect the operational efficiency of the firm are called postponable costs.

Example : Maintenance costs which can be postponed for the time-being. This distinction of cost is very useful during war or inflation.

(13) Private and Social Costs

(i) Private Cost: Private costs are costs incurred by a firm in producing a commodity or service. It is a cost incurred in the production process by the producer including profit margins that are anticipated. Private costs for a producer of a good, service or activity includes the costs the firm pays to purchase capital equipment, hire labour and buy materials or other inputs. Private costs are paid by the firm of consumer and must be included in production and consumption decisions.

(ii) Social Cost : Social costs are implicated on the society at the time of production in forestry sector. The social costs take the form of pollution, damage to the resilience of forest ecosystems itself and other ecosystems, deforestation, natural resource depletion, etc. The value of these social costs can be estimated with the help of contingent valuation method and other methods used for valuing non-market goods and services.

(14) Accounting Cost and Economic Cost

(i) Accounting Cost : Accounting costs relate to those costs only which involve cash payments by the entrepreneur of the firm. Accounting costs are also called explicit costs. The accounting costs are useful for managing taxation needs as well as to calculate profit or loss of the firm.

(ii) Economic Cost : Economic costs includes not only the explicit cost but also the implicit cost. The money rewards for the own services of the entrepreneur and the factors owned by himself and employed by him/his own business is considered a part of economic costs.

(15) Total Cost : Average Cost and Marginal Cost

(i) Total Cost (TC) : Total Cost (TC) refers to the money value of the total resources/ inputs required for the production of goods and services by the firm. In other words, it refers to the total outlays of money expenditure, both explicit and implicit, on the resources used to produce a given level output. Total cost includes both fixed and variable costs and is given by.

$$TC = VC + FC$$

Where,

TC = Total cost.

VC = Variable cost.

FC = Fixed cost.

(ii) Average Cost (AC) : Average cost refers to the cost per unit of output assuming that production of each unit of output incurs in the same cost. It is statistical In nature and is not an actual cost. It is obtained by dividing Total Cost (TC) by total Output (Q).

Average cost,

$$AC = \frac{TC}{Q}$$

Where,

TC = Total cost incurred in production process.

Q = Output level.

Also

$$AC = AFC + A\,VC$$

Where,

AFC = Average fixed cost.

AVC = Average variable cost.

(iii) Marginal Cost (MC) : Marginal cost refers to the incremental or additional costs that are incurred when there is an addition to the existing output level of goods and services. In other words, it is the addition to the Total Cost (TC) on account of producing additional units of the output. Marginal cost is given by,

$$MC = \frac{\Delta TC}{\Delta Q}$$

Where,

ΔTC = Partial differentiation of total cost.

ΔQ = Total output

Q3. What are the differences between fixed cost and variable cost.

Ans :

S.No.	Nature	Fixed cost	Variable Cost
i)	**Meaning**	Fixed cost are those cost which are fixed in volume, even though if any variation exist in the output level.	Variable cost are those cost which are not constant and are directly depends on the output i.e., they vary in their variation at the level/ volume of output.
ii)	**Time period**	Fixed cost relate to short-period only. The firm will not stop production if these costs remain uncovered.	Variable cost relate to both short and long period. The firm will stop production if these cost are not covered.
iii)	**Factor of production**	Fixed costs are those cost in curred on fixed factors of production like land, building, machines etc.	Variable cost are incurred on the employment of variable factors, such as labour, raw materials, transportation etc.
iv)	**Relation of output with input**	Fixed cost remains fixed at all level of output. These cost have to be in-curred even when output is zero.	Variable cost go on rising the higher level of output. First, they rise at the dimishing rate and than at a constant rate and finally they increase at an increasing rate.
v)	**Example**	Rent, wages of permanent staff, license fee, cost of plant and machinery etc.	Cost of raw materials, wages of casual labour, expenses on electricity etc.

Q4. Explain various Determinants of Cost.

Ans :

The main determinants of Cost are the following :

(a) Size of Output

(b) Output Level

(c) Price of Inputs

(d) Technology

(e) Managerial Efficiency.

(a) Size of Output

- Plant size is an important variable influencing cost.
- The relation between scale of operations or size of plant to the unit cost is negative in the sense that, as the former increases, per unit cost decreases and vice versa.

(b) Output Level

- Level of output and total cost are obviously related.
- Total cost increasing with increase in output. But average and marginal costs first decline and then increase with the increase in the output.
- The average total cost or marginal costs function are derived by relating the relevant costs with the level of capacity utilization of given sized plant.
- Since such as cost function forms a U-shaped curve, a quadratic or cubic function is more appropriate to use.

(c) Price of Inputs

- Changes in input prices influence costs, depending on the selective usage of the inputs and relative changes in their prices.
- When a factor, which is a major component in production, becomes relatively costly it rises the cost significantly.

(d) Technology

- Technology is often qualified as capital-output ratio. Modern and efficient technology is certainly cost saving and is, therefore, generally found to have higher capital output ratio.

(e) Managerial Efficiency

- Though cost is influenced a great deal by managerial efficiency, it is difficult to quantity it.
- However, a change in cost at two points of time may explain how organizational or marginal changes within the firm have bought labour cost efficiency, provided it is possible to exclude the effect of other factors.

4.2 SHORT RUN COST FUNCTIONS

Q5. Explain Cost-Output Relationship in the Short-Run.

(OR)

Describe the various short run cost functions.

Ans : **(Dec.-20, Jan.-18, June-16)**

The cost concepts made use of in the cost behavior are Total cost, Average cost, and Marginal cost.

Total cost is the actual money spent to produce a particular quantity of output. Total Cost is the summation of Fixed Costs and Variable Costs.

$$TC = TFC + TVC$$

Up to a certain level of production Total Fixed Cost i.e., the cost of plant, building, equipment etc, remains fixed. But the Total Variable Cost i.e., the cost of labor, raw materials etc., vary with the variation in output. Average cost is the total cost per unit. It can be found out as follows:

$$AC = TC/Q$$

The total of Average Fixed Cost (TFC/Q) keep coming down as the production is increased and Average Variable Cost (TVC/Q) will remain constant at any level of output.

Marginal Cost is the addition to the total cost due to the production of an additional unit of product. It can be arrived at by dividing the change in total cost by the change in total output.

In the short-run there will not be any change in Total Fixed Cost. Hence change in total cost implies change in Total Variable Cost only.

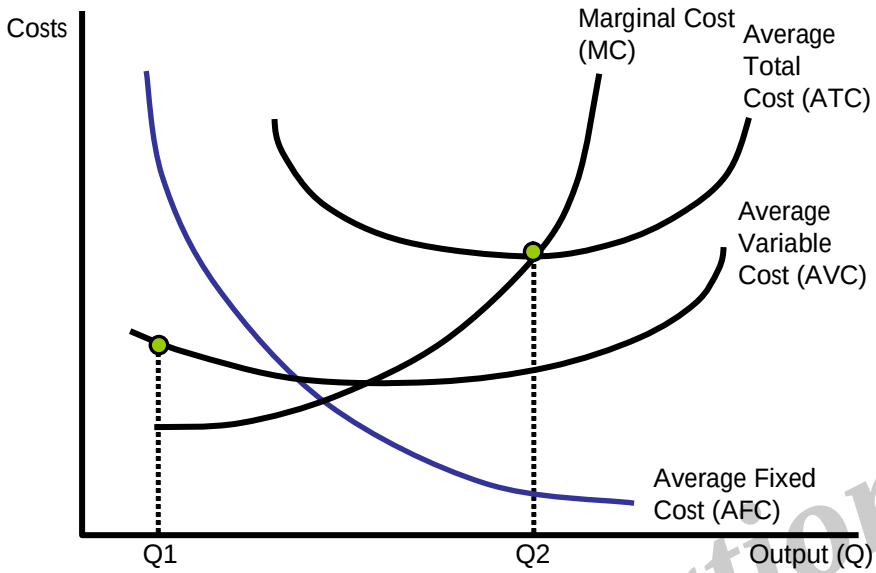
Units of Output	Total fixed cost (TFC)	Total variable cost (TVC)	Total cost (TC) (TFC + TVC)	Average variable cost (AVC) (TVC / Q)	Average fixed cost (AVC) (TFC / Q)	Average total cost (ATC) (TC / Q)	Marginal cost (MC)
0	60	–	60	–	–	–	–
1	60	20	80	20	60	80	20
2	60	37	96	18	30	48	16
3	60	48	108	16	20	36	12
4	60	64	124	16	15	31	16
5	60	90	150	18	12	30	26
6	60	132	192	22	10	32	42

The above table represents the cost-output relationship. The table is prepared on the basis of the law of diminishing marginal returns. The fixed cost Rs. 60 May include rent of factory building, interest on capital, salaries of permanently employed staff, insurance etc. The table shows that fixed cost is same at all levels of output but the average fixed cost, i.e., the fixed cost per unit, falls continuously as the output increases. The expenditure on the variable factors (TVC) is at different rate. If more and more units are produced with a given physical capacity the AVC will fall initially, as per the table declining up to 3rd unit, and being constant up to 4th unit and then rising. It implies that variable factors produce more efficiently near a firm's optimum capacity than at any other levels of output and later rises.

But the rise in AC is felt only after the start rising. In the table 'AVC' starts rising from the 5th unit onwards whereas the 'AC' starts rising from the 6th unit only so long as 'AVC' declines 'AC' also will decline. 'AFC' continues to fall with an increase in Output. When the rise in 'AVC' is more than the decline in 'AFC', the total cost again begin to rise. Thus there will be a stage where the 'AVC', the total cost again begin to rise thus there will be a stage where the 'AVC' may have started rising, yet the 'AC' is still declining because the rise in 'AVC' is less than the drop in 'AFC'.

Thus the table shows an increasing returns or diminishing cost in the first stage and diminishing returns or diminishing cost in the second stage and followed by diminishing returns or increasing cost in the third stage.

The short-run cost-output relationship can be shown graphically as follows.



In the above graph the "AFC' curve continues to fall as output rises an account of its spread over more and more units Output. But AVC curve (i.e. variable cost per unit) first falls and then rises due to the operation of the law of variable proportions. The behaviour of "ATC' curve depends upon the behaviour of 'AVC' curve and 'AFC' curve. In the initial stage of production both 'AVC' and 'AFC' decline and hence 'ATC' also decline. But after a certain point 'AVC' starts rising. If the rise in variable cost is less than the decline in fixed cost, ATC will still continue to decline otherwise AC begins to rise. Thus the lower end of 'ATC' curve thus turns up and gives it a U-shape. That is why 'ATC' curve are U-shaped. The lowest point in 'ATC' curve indicates the least-cost combination of inputs. Where the total average cost is the minimum and where the "MC' curve intersects 'AC' curve, It is not be the maximum output level rather it is the point where per unit cost of production will be at its lowest.

The relationship between 'AVC', 'AFC' and 'ATC' can be summarized up as follows:

If both AFC and 'AVC' fall, 'ATC' will also fall.

When 'AFC' falls and 'AVC' rises

'ATC' will fall where the drop in 'AFC' is more than the raise in 'AVC'.

'ATC' remains constant is the drop in 'AFC' = rise in 'AVC'

'ATC' will rise where the drop in 'AFC' is less than the rise in 'AVC'

4.3 Finding Minimum Average Variable Cost Through Equations

Q6. What is average variable cost? Explain its equation.

Ans :

The average variable cost (AVC) is the total variable cost per unit of output. This is found by dividing total variable cost (TVC) by total output (Q). Total variable cost (TVC) is all the costs that vary with output, such as materials and labor. The easiest way to determine if a cost is variable is if the output changes, the cost changes as well.

Profit-maximizing firms will use the AVC to determine at what point they should shut down production in the short run. If the price they are receiving for the good is more than the AVC given the output they are producing, then they are at least covering all variable costs and some fixed costs. Fixed costs are those costs incurred that do not vary with production; they are fixed at a certain price no matter how much is produced. The best example is rent on the space used to produce the good or provide the service. It doesn't matter how many units you produce or customers you serve, the rent will always remain the same. Therefore even if you are producing zero, as would be the case if you shut down production, you will still have to pay the fixed costs.

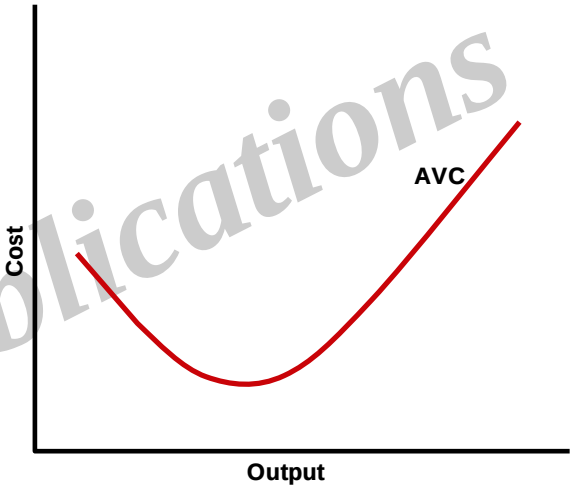
As long as price is above the AVC and covering some of the fixed costs, you are better off continuing production. If the price falls below the AVC, then the firm may decide to shut down production in the short run because the price is no longer covering any portion of the fixed costs or all of the variable costs. Therefore the firm would rather not incur any variable costs and just pay the fixed costs.

AVC Function and Equation

This chart below shows the average variable cost function. It's a U-shaped curve. Initially, the variable cost per unit of output decreases as output increases. At one point, it reaches a low. After the low, the variable cost per unit of output starts to increase. The increase in AVC after a certain point is indirectly related to the law of diminishing marginal returns. The law states that at some point, the additional cost incurred to produce one more unit is greater than the additional revenue (or returns) received. At that point, the AVC starts to increase.

Average Variable Cost Function

The average variable cost (AVC) can be determined with the following equation:



$$AVC = TVC / Q$$

Where AVC is the average variable cost

TVC is the total variable cost

Q is the Quantity.

Q7. Explain relationship between average variable cost and average product.

Ans :

Average variable cost bears an important relationship with the average product per unit of the variable factor. Let Q stand for quantity of total product produced; L for the amount of the variable factor, say labour, used and w for the price per unit of the variable factor and AP for the average product of the variable factor. We assume that the price of the variable factor remains unaltered as more or fewer Units of the variable factor are employed.

Total product (or output Q) = AP × L

where AP stands for average product of labour, the variable factor and L for the amount of labour used.

Average variable cost (AVC) = $\frac{TVC}{Q}$

Since the total variable cost (TVC) is equal to the amount of the variable factor (L) em-ployed multiplied by the price per unit (w) of the variable factor, (TVC = L.w.). Therefore,

$$AVC = \frac{L.w}{Q}$$

Since $Q = AP \times L$

$$\therefore \quad AVC = \frac{L.w}{AP \times L} = \frac{w}{AP} = w\left(\frac{1}{AP}\right)$$

Thus, given the price of the variable factor w, the average variable cost is equal to the reciprocal of the average product $\left(\frac{1}{AP}\text{ is the reciprocal of AP}\right)$ multiplied by a constant w. It follows that average cost and average product vary inversely with each other. Therefore, when average product rises in the beginning as more units of the variable factor are employed, the average variable cost must be falling. And when the average product of the variable factor falls, the average variable cost must be rising. At the level of output at which the average product is maximum, the average variable cost is minimum. Thus the average variable cost (AVC) curve looks like the average product (AP) curve turned upside down with minimum point of the AVC curve corresponding to the maximum point of the AP curve.

4.4 Long Run Cost Function

Q8. Explain Cost-Output Relationship in the Long-Run.

(OR)

Explain in detail the long run cost functions with diagram.

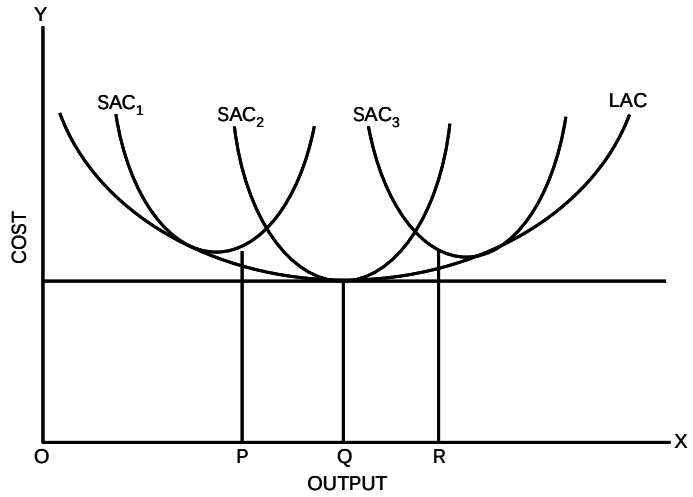
Ans : **(Dec.-20, Dec.-16, June-16)**

Long run is a period, during which all inputs are variable including the one, which are fixes in the short-run. In the long run a firm can change its output according to its demand. Over a long period, the size of the plant can be changed, unwanted buildings can be sold staff can be increased or reduced. The long run enables the firms to expand and scale of their operation by bringing or purchasing larger quantities of all the inputs. Thus in the long run all factors become variable.

The long-run cost-output relations therefore imply the relationship between the total cost and the total output. In the long-run cost-output relationship is influenced by the law of returns to scale.

In the long run a firm has a number of alternatives in regards to the scale of operations. For each scale of production or plant size, the firm has an appropriate short-run average cost curves. The short-run average cost (SAC) curve applies to only one plant whereas the long-run average cost (LAC) curve takes in to consideration many plants.

The long-run cost-output relationship is shown graphically with the help of "LCA' curve.



To draw on 'LAC' curve we have to start with a number of 'SAC' curves. In the above figure it is assumed that technologically there are only three sizes of plants – small, medium and large, 'SAC', for the small size, 'SAC2' for the medium size plant and 'SAC3' for the large size plant. If the firm wants to produce 'OP' units of output, it will choose the smallest plant. For an output beyond 'OQ' the firm wills optimum for medium size plant. It does not mean that the OQ production is not possible with small plant. Rather it implies that cost of production will be more with small plant compared to the medium plant.

For an output 'OR' the firm will choose the largest plant as the cost of production will be more with medium plant. Thus the firm has a series of 'SAC' curves. The 'LCA' curve drawn will be tangential to the entire family of 'SAC' curves i.e. the 'LAC' curve touches each 'SAC' curve at one point, and thus it is known as envelope curve. It is also known as planning curve as it serves as guide to the entrepreneur in his planning to expand the production in future. With the help of 'LAC' the firm determines the size of plant which yields the lowest average cost of producing a given volume of output it anticipates.

Q9. What are the differences between short run and long run cost.

(OR)

Distinguish between short-run cost and long-run costs.

Ans :

Basis of Difference	Short Run Costs	Long Run Costs
(i) Time Period	The short-run is a period of time in which output can be increased or decreased by changing only variable factors.	The long run is defined as a period in which quantities of all factors are variable. No factor is fixed.
(ii) Expansion	No increase in short-run output can be made by expanding the existing plants and equipments.	In the long run output can be expanded not only by increasing labour and raw-materials but also by expanding the size of plants and equipments.

(iii) Produce Output	In short run a firm produces output at a higher point on its short-run marginal cost curve.	The firms, under long run produce at another cost curve called long period curve. In long period a firm is at will to produce or to leave the industry.
(iv) Technology	In short run costs production technology is given.	Long run can adapt production technology in market.

4.5 BREAK EVEN ANALYSIS

4.5.1 Linear Break even Analysis

Q10. What is Break even point? Taking a linear Revenue and cost function, graphically show the level of output at which a firm break even.

Ans : **(Dec.-20, Jan.-20, June-16)**

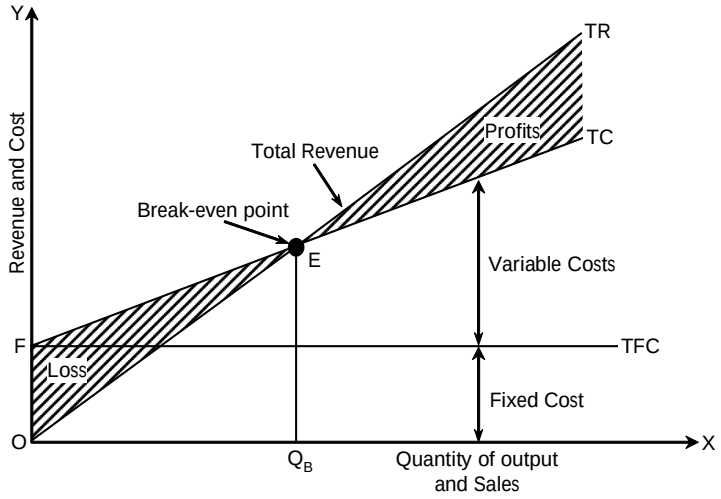
Introduction

Theory of costs has an important application in the decision making of the firm regarding the level of output at which it will break even, that is, at which its total revenue will equal total cost and therefore it will attain no profit, no loss position. Break-even analysis is also sometimes called profit contribution analysis.

Break-even analysis is also applied to determine the quantity of output sold at which the firm will realise its target level of profits. Break even analysis can be made by assuming firstly linear cost-output and revenue-output relationships and, secondly, by assuming non-linear cost and revenue functions. Besides, break-even analysis can be either made through graphical method or algebraic method. In our analysis below, we will explain break-even analysis through both these methods.

Linear Break-Even Analysis : Graphic Method

As mentioned above, break-even analyses is based on revenue functions and cost functions. Figure, graphically shows a typical linear break-even analysis chart. When price of the product remains constant as the firm expands its production and sales, the total revenue will be linearly related to output.



Thus, the total revenue function TR in Figure represents the total revenue that the firm will earn at each level of output, assuming that the price (P) of product for the firm remains constant. Similarly, total cost function TC is a straight line starting from point F on the y-axis and thus represents the linear relationship between been total cost and output. It may be noted that in our analysis of cost function we have-explained that average variable cost falls over a range of output in the beginning and then begins to rise.

However, the managers of business firms who use the break-even analysis are interested in a relevant middle ranges of output without considering the extremes of low and very high ranges of output at which average variable cost falls or rises. Hence linear cost function represented by the straight-line curve is generally used in break-even analysis. TFC is the total fixed cost line, with the given fixed cost equal to OF.

The vertical distance between the total cost line TC and total fixed cost line TFC represents the total variable cost. As will be seen from Figure, the vertical distance between the TC and TFC curves representing the total variable cost increases as quantity of output produced and sold increases. But, TC line is linear starting from point F, which shows that average variable cost is constant. It will be further seen that the slope of the total revenue curve (which indicates the price at which additional units of the good are sold) is greater than the slope of the total cost curve (which indicates the additional variable cost incurred per unit of output by the firm). This means the price which the firm receives for every unit of the good sold exceeds the additional cost incurred per unit of output on labour, raw materials and other variable factors. But the total profit-loss position depends on total revenue on the one hand and total cost (i.e., variable costs plus fixed cost) on the other.

It will be seen from Figure, that up to quantity Q_B of the commodity produced and sold total cost exceeds total revenue indicating that the firm will suffer losses if it produces and sells less than Q_B quantity of the commodity. At output Q_B produced and sold, the total revenue received equals the total cost (TR = TC) and therefore at this output level the firm neither makes profits, nor incurs losses. In other words, at Q_B quantity of output produced and sold, the firm just breaks even.

Therefore, output level Q_B or intersection point E at which the firm neither make profits, nor suffers losses is called a break-even point. Break-even level of output shows the minimum level of output required to be sold if the firm will just be in no profit, no loss position. If the firm's estimate of demand for its product falls short of this break-even level, it would not produce the product. The firm will undertake the production of a commodity if it estimates that it will be able to sell the quantity of output equal to or greater than the break-even point.

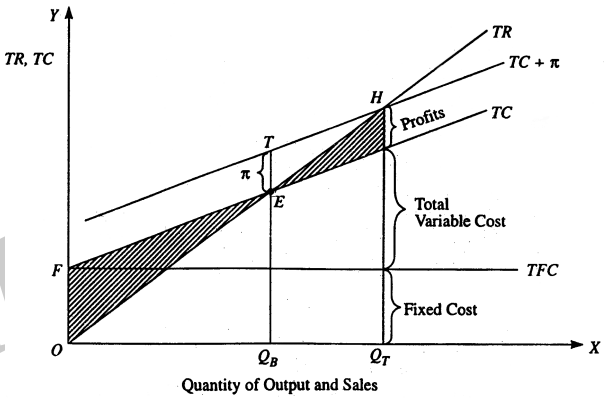


Fig. : Level of Output and Sales to Achieve a Target Amount of Profits

Further, the break-even analysis is also useful for determining the level of output necessary to make a certain target amount of profits. Suppose if the Firm sets a target amount of profits for a period equal to 20 lakhs (which is supposed to be equal to ET in Figure, then the level of output required to be produced and sold to obtain the given target amount of profit exceeds the break-even level. It will been seen from Figure that to realise target amount of profits n or ET, the level of output necessary to be produced and sold increases to Q_T.

4.5.2 Nonlinear Break even Analysis

Q11. Explain briefly about Nonlinear Break even Analysis.

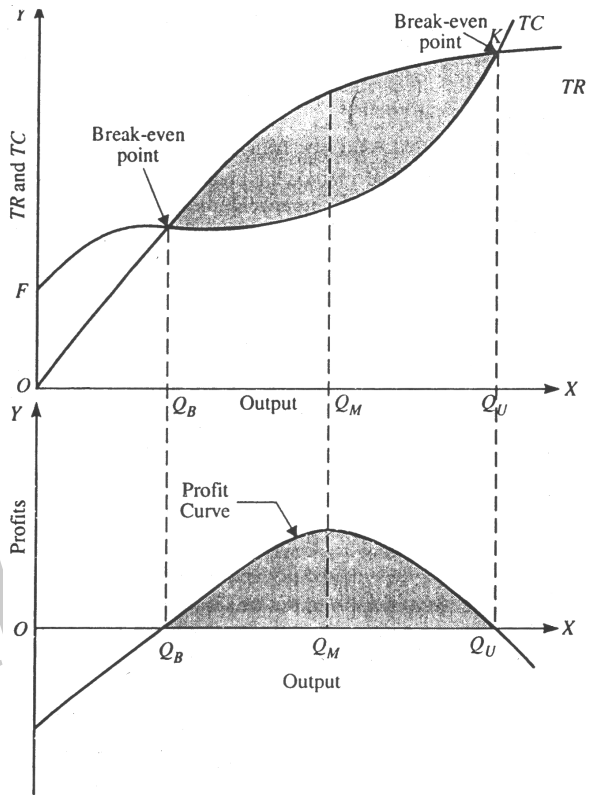
Ans : **(Dec.-20, Jan.-20, June-16)**

In non-linear where TR represents total revenue curve. This break even analysis total

revenue curve is increasing at a diminishing rate. This is because for a firm working under monopoly or imperfect competition, price of its product falls as it sells more and marginal revenue is less than price. However it will be seen that total cost curve TC starts from a point F which lies above the origin. It means that OF is the fixed cost which the firm has to incur even if it stops production in the short-run. It will be seen that total short-run cost curve TC initially increases at a decreasing rate and then after a point it increases at an increasing rate. This implies that average total cost curve is roughly of U-shape. Total profits can be measured as the vertical distance between the TR and TC curves. It will be observed from Figure that upto the level of output OQ_B TC curve lies above TR curve showing that as the firm raises its out-put in the initial stages total cost is greater than total revenue and the firm is incurring losses. When it produces OQ_B level of output, total revenue just equals total cost and the firm is therefore neither making profits nor losses. That is, the firm is only breaking even at output level OQ_B. Thus the point B or output level OQ_B is called Break-Even Point.

When the firm increases its output beyond OQ_B, total revenue becomes larger than total cost and profits begin to accrue to the firm. It will be noticed from the figure that profits are increasing as the firm increases production to output OQ_M, since he distance between the total revenue curve (TR) and total cost curve (TC) is widening. At OQ_M level of output, the distance between the TR curve and TC curve is the largest and therefore profits will be maximum. If the firm expands output beyond Q_M, the gap between TR and TC curves goes on narrowing down and therefore the total profits will be declining. It is therefore clear that at Q_M level of output where total revenue exceeds total cost by the largest amount firm's profits are maximum.

It will be observed from Figure that at output level Q_U, total revenue is again equal to total cost (TR curve cuts TC curve at point K corresponding to output Q_U). Thus, point K is again a break-even point, usually called upper break-even point. It may however be noted that this upper break-even point K or output level Q_U is not of much relevance as it lies beyond firm's profit maximising level and may actually lie beyond firm's capacity to produce. It is the first break-even point B or output level Q_B which is highly significant as a firm will not plan to produce if it cannot sell output equal to at least Q_B at which total revenue just covers total cost of production so that its economic profits are zero.



For a more vivid representation of break-even point and its comparison with profit-maximising point in the lower panel of Figure we have drawn the profit. Curve which measures the distance between TR and TC curves, it will be seen from this panel that upto output level Q_B profit curve lies below the X-axis showing that the firm is making losses if it produces, less than Q_B. At output level Q_B, the firm's net profits are zero because at this output level total revenue just covers total cost of production. Therefore, Q_B is break-even level bf output. As firm expands its level of output beyond Q_B, profit curve is rising until it reaches at its maximum point corresponding to level of output Q_M. Beyond level of output Q_M, profit curve slopes downward indicating that profit decline beyond output Q_M. Thus, at output level Q_M, the firm maximises its profits. At a higher output level Q_U, net profits are again zero indicating the upper break-even point.

Q12. Explain algebraic method of Linear Break even Analysis with an example.

Ans :

Although graphic method of break-even analysis is useful way of illustrating cost-output, revenue-output and profit-output relationships break-even analysis through algebraic model is of great help in decision-making problems by a firm.

Let,

P = Price per unit of commodity sold

Q = Quantity produced and sold

TFC = Total fixed cost

AVC = Average variable cost per unit of output.

π = Profits

Recall that profit π is the difference between total revenue (TR) and total cost (TC). To write in symbolic terms

$$\pi = TR - TC$$

Total revenue (TR) is equal to the price (P) per unit of the commodity times the quantity of output sold.

Therefore,

$$TR = P \times Q \quad \text{... (i)}$$

On the other hand, total cost is the sum of total variable cost (TVC) and total fixed cost (TFC). Total variable cost (TVC) is the variable cost per unit multiplied by the output produced and sold (TVC = AVC.Q). Therefore

$$TC = TVC + TFC$$

$$TC = AVC.Q + TFC \quad \text{... (ii)}$$

As explained above, break-even quantity of output produced and sold occurs at' the level at which total revenue (TR) equals total cost (TC).

Let Q_B indicates the break-even quantity. From (i) and (ii) above, at the break-even quantity (Q_B) we have

$$TR = TC$$

$$P.Q_B = TFC + AVC.QB$$

$$P.Q_B - AVC.Q_B = TFC$$

$$(P - AVC)Q_B = TFC$$

$$Q_B = \frac{TFC}{P - AVC} \quad \text{... (iii)}$$

From (iii) it follows that break-even quantity of output produced and sold is determined by total fixed cost (TFC), price of output (P) and variable cost per unit of output (AVC). Change in any of these variables will cause a change in the break-even quantity. The denominator in (iii), that is, P – AVC, is the profit contribution per unit and the numerator TFC is the total fixed cost

Linear Break-Even Analysis and Target Amount of Profits

Beak-even analysis can be used to determine the quantity of output required to be produced and sold to achieve a target amount of profits. Let n stand for a profit target. Then this target profit π can be added to total fixed cost in expression (iii). Therefore,

$$Q_r = \frac{TFC + \pi}{P - AVC}$$

The expression (iv) shows that to achieve a profit objective, the difference between P and AVC must be large enough to recover the total fixed cost (TFC) and target amount of profits (π).

A Numerical Example of Break-Even Analysis

Break-even analysis can be easily understood from a numerical example. Let us take the case of a book-publishing company. The total fixed cost incurred on typesetting, providing il-lustrations, proof reading etc. incurred is Rs. 50,000. Variable cost incurred per copy on printing paper, binding, author's royalty per copy, book seller's commission is equal to Rs. 15 per copy. Suppose he fixes Rs. 40 as price per copy of the book. We have to find out the break-even number of copies of the book printed and sold.

Thus, in this example

TFC = Rs. 50,000

AVC = Rs. 15

P = Rs. 40

$$\text{Break-even quantity} = \frac{TFC}{P - AVC}$$

$$Q_B = \frac{50,000}{40 - 15}$$

= 2000 copies

Thus, 2000 copies of the book represents the break-even output and sales of the book. That is, if he produces and is able to sell 2000 copies, he will achieve no profits, no loss situation.

If the publishing company expects or estimates to sell less than 2000 copies (say 1800 copies) of the book, it will incur losses. As a result, the publisher may consider cutting production costs such as using lower grade paper, negotiating with the author to reduce the royalty rate, etc. so as to break-even or even achieve some profits. In the "alternative, he can think of fixing a higher price. If he fixes price equal to Rs. 55 per copy, his costs and estimates of sales remaining the same, we can calculate the new break-even sales of the book.

$$Q'_B = \frac{50,000}{55 - 15}$$

$$= \frac{50,000}{40}$$

= 1250

Thus, if he is able to sell 1800 copies at price Rs 55 per copy, his sales will exceed the break-even point and will therefore yield profits to him.

Now, suppose the publishing company has a profit objective of making Rs. 10,000 from the book, then required quantity of sales can be calculated to realise the target amount of profits of Rs. 10,000 by using expression (iv) above. Thus,

$$Q_T = \frac{TFC + \pi}{P - AVC}$$

$$= \frac{50,000 + 10,000}{55 - 15}$$

$$= \frac{60,000}{40} = 1500$$

It follows from above, that if he is able to sell 1500 copies of the book he will recover the fixed and variable costs and also make profits of Rs. 10,000. His profits will be greater if his sales exceed 1500 copies.

Q13. Explain the limitations of Break Even Analysis.

Ans :

Break-even analysis has certain underlying assumptions which form its limitations.

1. Break-even point is based on fixed cost, variable cost and total revenue. A change in one variable is going to affect the BEP.
2. All costs cannot be classified into fixed and variable costs. We have semi-variable costs also.
3. In case of multi-product firm, a single chart cannot be of any use. Series of charts have to be made use of.
4. It is based on fixed cost concept and hence holds good only in the short-run.
5. Total cost and total revenue lines are not always straight as shown in the figure. The quantity and price discounts are the usual phenomena affecting the total revenue line.
6. Where the business conditions are volatile, BEP cannot give stable results.

Q14. What are the differences between linear and Nonlinear break even analysis.

Ans : **(Dec.-20)**

1. Linear break even analysis

Breakeven analysis, or profit contribution analysis is an important analytical technique used in studying the relationship between total cost, total revenue and total profits and losses over the whole range of stipulated output.

The break-even analysis is a technique of previewing profit prospects and a tool of profit planning. It integrates cost and revenue estimates to ascertain the profits and losses associated with different levels of output.

2. Non-Linear break even analysis

Non linearity arise because of AVC and price vary with variation in the output. As a result, TC may increase at a increasing rate and TR may increase at a decreasing rate. Some stages of output TC exceeds TR.

4.6 PROFIT CONTRIBUTION ANALYSIS

Q15. What is Profit contribution analysis?

(OR)

What do you understand by profit contribution analysis.

Ans : **(Dec.-20, Jan-18)**

The profit-volume (P/V) or cost-volume-profit (CVP) analysis is the result of the attempt to apply the break-even analysis to situations of multi-product firms, where break-even charts are constructed separately for the different divisions or the products of the firm. The individual division, department or the product is called a "sector". The following terms are used in P/V analysis :

1. P/V Income = Difference between the sale proceeds and the variable costs of a sector.
2. P/V Ratio = (P/V income)/unit price of the sector (i.e., unit contribution).
3. Specific Programmed Costs = Production and promotional costs of the sector.
4. Profit Contribution = Difference between P/V income and specific programmed costs.

Preparing a Profit Graph (or) Break-even Chart for P/V Analysis

The following steps art involved in preparing such a chart:

1. Finding TR, TC and specific programmed cost to have a profit contribution equation. For example, if price of the product is Rs. 50, its variable cost is Rs. 25 and the specific programmed cost is Rs. 1,000, then the profit contribution equation can be calculated as :

$$\text{Profit contribution} = \left(\frac{50-25}{50}\right) \text{Sales} - 1000$$

$$= 0.5 \text{ sales} - 1000.$$

2. Treat the horizontal axis as a zero contribution line.
3. Draw the P/V line, starting from zero output/sales level. The upward sloping line shows profit contribution. Slope of this line is the P/V ratio or contribution per rupee sales.
4. The vertical distance between P/V line and the zero-contribution line shows the profit contribution at different levels of sales for the sector. Before the break-even point the sales of the sector are too low to make profit, while beyond this point the sector makes profits.

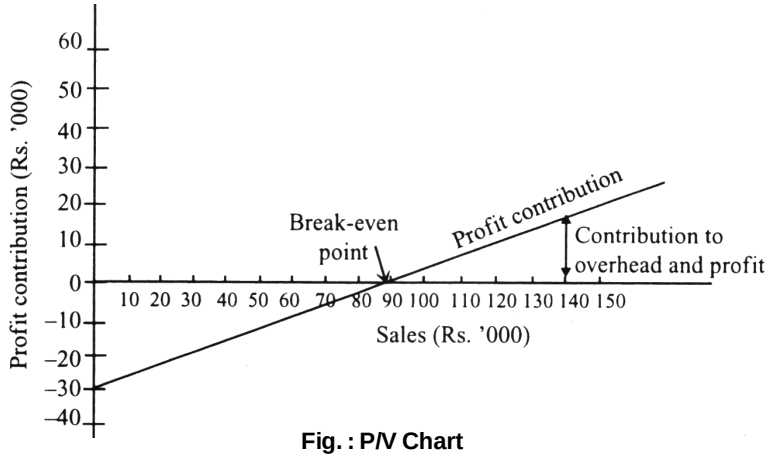


Fig. : P/V Chart

The profit graph or the break-even chart for P/V analysis is illustrated with the help of Fig. The specific programmed cost is Rs. 30,000; the firm breaks even at the sales volume of Rs. 90,000 and makes profits thereafter. The slope of the profit contribution line is the P/V ratio or 'contribution per rupee of sales'. If the expected sales volume of this firm is Rs. 1,40,000, it is shown to have made profits contribution equal to Rs. 18,000. That is, the vertical distance represents the contribution of the product to the overall company profits and overheads. Thus, this chart can be used to compare the contribution of the product at various levels of sales.

Fig. below shows how the profit contribution curves would differ if there are two products having different programmed costs and the rate of contribution.

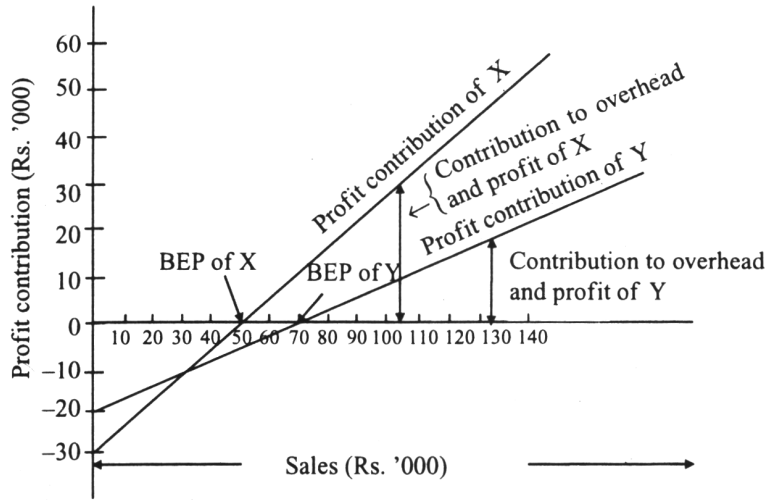


Fig. : Difference in Profit Contribution

Similarly, Fig. below illustrates how the profit contribution line would shift if price of the product is changed.

Assumptions of P/V Analysis

The cost-volume-profit analysis is based on certain basic assumptions. These are :

i) It is possible to ascertain fixed and variable costs.

ii) Behaviour of fixed and variable costs remains constant, *i.e.,* it is assumed to remain unchanged during the period being analysed.

iii) Price does not change with volume, i.e., there is a given price.

iv) Sales-mix is given.

v) Efficiency does not change with output.

vi) There is no change in corporate policies as the sales volume changes.

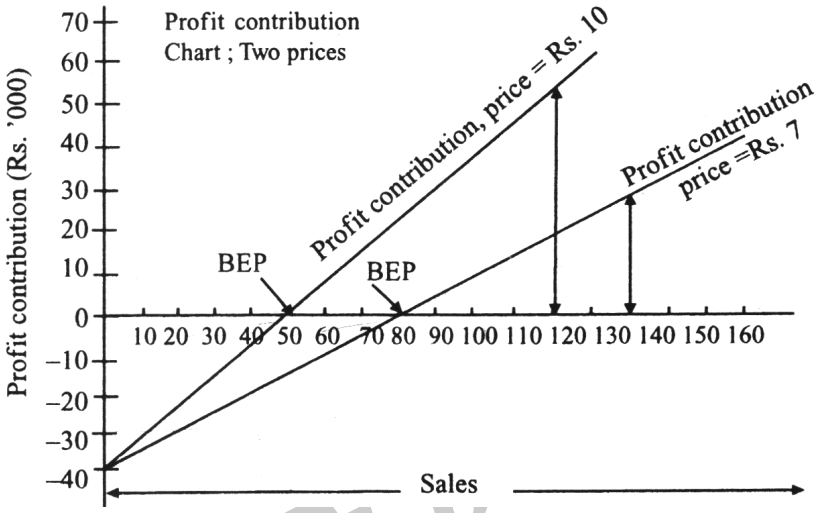


Fig.: Price Change and Profit Contribution

Measurement of P/V Ratio

The following equations can be used to find profit-volume ratio

1. $\text{P/V Ratio} = \frac{\text{Sales} - \text{Variable cost}}{\text{Sales}} \times 100 = \frac{\text{Contribution}}{\text{Sales}}$

$\therefore$ Contribution = P/V Ratio × Sales

$$\text{and Sales} = \frac{\text{Contribution (or) Fixed cost + Profit}}{\text{P/V Ratio}}$$

2. $\text{P/V Ratio} = \frac{\text{Change in contribution}}{\text{Change in sales}}$

3. $\text{P/V Ratio} = \frac{\text{Change in Profit}}{\text{Change in sales}}$

4. $\text{P/V Ratio} = \frac{\text{Profit}}{\text{Margin of safety ratio}}$

Formulae and Some More Illustrations

A) Break-even Point

1. B.E.P Sales (money)

$$= \frac{\text{Total Fixed Cost}}{1-(\text{Average Variable Cost} \div \text{Price})} = \frac{\text{TFC}}{1-(\text{AVC})/\text{P}}$$

Also, B.E.P. Sales (money)

$$= \frac{\text{Total Fixed cost}}{1-\frac{\text{Total Variance Cost}}{\text{Total Revenue}}} - \frac{\text{TFC}}{1-(\text{TVC}/\text{TR})}$$

$$\text{and B.E.P. Sales} = \frac{\text{Total Fixed Cost}}{\text{Contribution Percentage or P/V ratio}} = \frac{\text{TFC}}{\text{P/V Ratio}}$$

where, contribution percentage or Profit-volume (P/V) Ratio

$$= \frac{\text{Total Sales Revenue} - \text{Total Variable Cost}}{\text{Total Sales Revenue}} \times 100$$

2. B.E.P Sales (physical units) $= \frac{\text{Total Fixed Cost}}{\text{Average Contribution Margin}} = \frac{\text{TFC}}{\text{ACM}}$

where, contribution per unit or ACM = (Selling price per unit – Variable cost per unit)

3. Break-even percentage of capacity ($\%_B$)

$$\%_B = \frac{\text{Total Fixed Cost}}{(\text{Price} - \text{Average Variable Cost})\ \text{Quantity}_{max}} \times 100$$

$$= \frac{\text{TFC}}{(\text{P} - \text{AVC})\text{Q}_{max}} \times 100$$

B) Profit

1. Profit = (Sales × P/V Ratio) – Fixed Cost
2. Profit = P/V Ratio × Margin of Safety Ratio

C) Sales to earn a given Level of Profit

1. Sales (Rs.) $= \frac{\text{Fixed cost + Profit}}{\text{P/V Ratio}} = \frac{\text{Contribution}}{\text{P/V Ratio}}$

2. Sales (units) $= \frac{\text{Fixed cost + Profit}}{\text{Contribution per unit}}$

D) Variable Cost

Variable Cost = Sales x (100% - P/V Ratio).

PROBLEMS

1. Golden Airline has the monthly seating capacity of 20,000 passengers on one of its routes at a fare of Rs. 170. Variable cost is Rs. 20 per passenger and fixed cost is Rs. 6,00,000. Find :

i) Break-even quantity,

ii) Break-even sales,

iii) Break-even percentage of capacity,

iv) Suppose that management sets a profit target of the route at Rs. 4,00,000, what would be the requited profit before tax to achieve this profit target (tax rate = 46%)?

Sol :

Maximum No. of passengers that can be carried on the route per month = 20,000.

Fare per passenger = Rs. 170

Total fixed cost = Rs. 6,00,000

Variable cost/passenger = Rs. 20

$\therefore$ Total variable cost – 20,000 × 20 = 4,00,000

i) BEP (Quantity) $= \frac{TFC}{P - AVC} = \frac{6,00,000}{150}$ = 4000 passengers

ii) BEP (Rs. sales) $= \frac{TFC}{\text{Contribution ratio}}$

where, Contribution ratio $= \frac{TSR - TVC}{TSR} = \frac{34,00,000 - 4,00,000}{34,00,000}$

$= \frac{30,00,000}{34,00,000} = \frac{15}{17}.$

iii) BEP (Percentage of capacity) $= \frac{TFC}{(P - AVC)Q_{max}} \times 100$

$= \frac{6,00,000 \times 100}{(170 - 20) \times 20,000} = 20\%$

iv) Profit after tax = Profit before tax – r(Profit before tax)

= PBT (1 – r)

$\therefore \quad PBT = \frac{PAT}{(1 - r)} = \frac{4,00,000}{(1 - 0.46)} = \frac{4,00,000}{0.54} \times 100 = 7,40,740.74.$

2. A company manufacturing a specialized motor part is operating at 60% of its capacity of producing 10,000 units per month. Its monthly budget for fixed expenses (inclusive of depreciation) is Rs. 6 lakhs per month. The direct cost of making the part is as under :

Direct material	**Rs. 55.00**
Direct labour	**10.00**
Direct expenses	**25.00**

The company has invested Rs. 1 crore in the business and is currently earning a return of 7.2 per cent per annum before taxes. The managing director is prepared to accept new business at any price which will raise the return of investment to 20% per unit. A car manufacturer has offered to buy 4,000 units of the part every month if it could be supplied at Rs. 120 per unit.

Would you advise the company to accept the offer ?

Sol :

1) Output capacity of the company = 10,000 units per month

Present rate of capacity utilization = 60%

∴ Present monthly output = 60% of 10,000 = 6,000 units

New purchase offer at Rs. 120 per unit = 4,000 units

Total output if new purchase offer is accepted = 6,000 + 4,000 = 10,000 units.

Since the production capacity of the firm is 10,000 units, it can, therefore, safely produce additional 4,000 units.

2) Present return on investment @ 7.2% of Rs. 1 crore = Rs. 7,20,000. New offer of 4,000 unit ? is acceptable only if it raises the rate of return on investment to 20% of Rs. 1 crore. That is, the new offer should add to the returns so much that the total return is equal to or greater than Rs. 20,00,000.

3) Return from the new offer of 4,000-units is calculated as :

Sales per month 4,000 × Rs. 120 = Rs. 4,80,000

Less : Variable Cost :

Direct material	4,000 × Rs. 55 =	2,20,000
Direct labour	4,000 × Rs. 10 =	40,000
Direct expenses	4,000 × Rs. 25 =	1,00,000
	3,60,000	Rs. 3,60,000
Monthly Contribution		Rs. 1,20,000
Annual Contribution (Rs. 1,20,000 x 12)		Rs. 14,40,000

4) Total Return = Return from existing output + Return from the new offer

= Rs. 7,20,000 + Rs. 14,40,000

= Rs. 21,60,000.

Since the return of Rs. 21,60,000 is greater than Rs. 20,00,000 (which is the minimum return necessary for accepting the new offer), the new offer should be accepted by the firm.

3. Break-even production of a firm is 5,000 units. Its fixed cost is Rs. 50,000; the variable cost per unit is Rs. 25. Find out the price of the product. How much the firm should produce to earn profit of Rs. 25,000 ?

Sol :

The information given to us is: BEP (units) = 5,000

Fixed cost = Rs. 50,000

Variable cost per unit = Rs. 25

i) We know that,

$$\text{BEP (units)} = \frac{\text{Fixed cost}}{\text{Variable cost per unit}}$$

$$\therefore \quad 5000 = \frac{\text{Rs. } 50{,}000}{P - \text{Rs. } 25}$$

$$5000\ P = \text{Rs. } 50{,}000 + 1{,}25{,}000 = \text{Rs. } 1{,}75{,}000$$

$$P = \frac{1{,}75{,}000}{5000} = 35$$

ii) We need to find the output to earn profit of Rs. 25,000

We know that

$$\text{Sales (units)} = \frac{\text{Fixed Cost + Profit}}{\text{Contribution margin per unit}} = \frac{\text{Fixed Cost + Profit}}{\text{Price} - \text{Variable cost per unit}}$$

$$= \frac{50{,}000 + 25{,}000}{35 - 25} = 7500 \text{ units.}$$

4. From the following information, calculate the break-even point and the turnover required to earn a profit of Rs. 36,000 :

Fixed overheads	**Rs. 1,80,000**
Variable cost per unit	**Rs. 2**
Selling price	**Rs. 20**

If the company is earning a profit of Rs. 36,000, expenses the margin of safety available to it.

Sol :

We know that TFC = 1,80,000

AVC = 2; and

SP = Rs. 20

i) $$\text{BEP (units)} = \frac{\text{TFC}}{P - \text{AVC}} = \frac{1{,}80{,}000}{20 - 2} = \frac{1{,}80{,}000}{18} = 10{,}000 \text{ units}$$

ii) We need to find the turnover to earn a profit of Rs. 36,000. In order to find this we need to use the following equation :

$$\text{Sales (Rs.)} = \frac{\text{Fixed cost + Profit}}{\text{P/V Ratio}}$$

where, $\text{P/V Ratio} = \frac{P - AVC}{P} = \frac{20 - 2}{20} = \frac{9}{10}$

$\therefore$ Sales value to earn Rs. 36,000 profit $= \frac{1,80,000 + 36,000}{9/10}$

$$= \frac{2,16,000 \times 10}{9} = 2,40,000$$

iii) In order to find margin of safety, we need to find the break-even sales value, which is :

$$\text{BEP (value)} = \frac{TFC}{\text{P/V Ratio}} = \frac{1,80,000 \times 10}{9}$$

$$= 2,00,000$$

$\therefore$ Margin of Safety (M/S) = 2,40,000 – 2,00,000

= 40,000.

5. A firm's long-run total cost (LRTC) function is:

$LRTC = 5,000Q - 6Q^2 + 0.005\,Q^3$

i) Measure the average cost in the long-run

ii) Find minimum efficient scale (MES) of production.

Sol :

i) Long-run Average Cost

$$LRAC = \frac{LRTC}{Q}$$

$$\therefore LRAC = \frac{5,000Q - 6Q^2 + 0.005Q^3}{Q}$$

$$= 5,000 - 6Q + 0.005Q^3$$

ii) Minimum Efficient Scale

$$\frac{dLRAC}{dQ} = -6 + 0.01Q = 0$$

$$\therefore Q = 600$$

The minimum efficient scale of production is 600 units.

6. Following is the short run total cost function

$$TC = 100 + 50Q - 12Q^2 + Q^3$$

Determine total variable cost function average variable cost function and marginal cost function. Calculate total cost, ATC, AVC and MC when firm produced 10 units of output.

Sol : **(June-16)**

$TC = 100 + 50\,Q - 12Q^2 + Q^3$

$TC = 100 + 50(10) - 12\,(10)^2 + (10)^3$

$= 100 + 500 - 1200 + 1000$

TC = ` 400

$$\text{Average cost} = \frac{TC}{Q} = \frac{100}{10} + \frac{50(10)}{10} - \frac{12(10)^2}{10} + \frac{(10)^3}{10}$$

$= 10 + 50 - 120 + 100$

Average cost = `40

$$\text{Marginal cost} = \frac{dTVC}{dQ}$$

$= a + 2bQ + 3CQ^2 + 4dQ^3$

$= 100 + 2(50)\,(10) - 3(12)\,(10)^2 + 4(10)^3$

$= 100 + 1000 - 3600 + 4000$

MC = `1500

---

7. Given the following TR and TC function

TR = 50 Q

TC = 10000 + 30 Q

Determine the break-even rate of output. Determine the output rate necessary to earn profit of Rs. 20,000.

Sol : **(June-16)**

TR = 50Q

TC = 10,000 + 3Q

TR = TC

$P.Q_B = TFC + AVC \,.\, QB$

$P.Q_B - AVCQ_B = TFC$

$(P - AVC)\,Q_B = TFC$

$$Q_B = \frac{TFC}{P - AVC}$$

P = 50

TFC = 10,000

AVC = 30

$$Q_B = \frac{10,000}{50 - 30}$$

$$= \frac{10,000}{20} = 500 \text{ units}$$

To earn a profit of `20,000

$$\text{Desired output} = \frac{TFC + \pi}{P - AVC}$$

$$= \frac{10,000 + 20,000}{50 - 30} = \frac{30,000}{20}$$

Desired output = 1500 units

From the above, it can be concluded that if he is able to sell 1500 units, he will recover the fixed and variable cost and also makes a profit of ` 20,000.

---

8. The short run cost functions of a firm is

$TC = 120 + 6Q + 2Q^2$

Where TC = Total cost, Q = Quantity of output

Find the rate of output that results in minimum average variable cost.

Sol : **(Dec.-16)**

$TC = 120 + 6Q + 2Q^2$

$TVC = (120 + 6Q + 2Q^2) - 120$

$= 6Q + 2Q^2$

$$AVC = \frac{TVC}{q} = \frac{6q + 2q^2}{q} = 6 + 2q$$

To find out the output level at which MC is minimum, we have to set the first derivative of MC function equal to zero. The first derivative of MC function is

$$\frac{d(MC)}{dQ} = 6 + 2q$$

$$6 + 2q = 0$$

$$2q = -6$$

$$q = 3$$

Thus, at output level 3, MC is minimum. It is thus clear from the above that marginal cost takes on the minimum value at an output level smaller than that at which AVC is minimum.

9. Suppose that a local metal fabricator has estimated its short run total cost function and total revenue function is :

$TC = 1600 + 100\ Q + 25Q^2$

$TR = 500\ Q$

What is the breakeven amount of output? How might the company go about reducing the breakeven rate if its does not feel that it can sell the estimated amount in the market place?

Sol : **(June-16)**

$TC = 1600 + 100\ Q + 25Q^2$

$TR = 500\ Q$

$\pi = TR - TC$

$TR = P.\ Q.$

$TC = TVC + TFC$

$TC = AVC.Q + TFC$

$$Q_B = \frac{TFC}{p - AVC}$$

$$Q_B = \frac{1600}{500 - 100} = \frac{1600}{400}$$

$= 4$

$Q_B = 4$ units

10. Given the following total cost and revenue function

$TC = 15000 + 45Q$

$TR = 75Q$

Find the breakeven are at output and the rate of output required to earn profit of Rs. 35,000.

Sol :

$TC = 15,000 + 45\ Q$

$TR = 75\ Q$

$\pi = TR - TC$

$= 75\ Q - (15000 + 45Q)$

$= 75\ Q - 15,000 - 45\ Q$

$\pi = 30\ Q - 15,000$

thus, given the total revenues and total cost functions, the profit function would also be linear. The breakeven point is given by

$\pi = TR - TC = 0$

$30Q - 15000 = 0$

$30\ Q = 15000$

$$Q = \frac{15,000}{30} = 500$$

$Q = 500$ units

When profit are `35,000

π = Profit = 35,000

$\pi = TR - TC$

$35,000 = P \times Q - TC$

$35,000 = 500 \times 75\ P - [15,000 + 45\ (500)]$

$35,000 = 500 \times 75\ P - [15,000 + 22,500]$

$35,000 = 37,500\ P - 37,500$

$72,500 = 37,500\ P$

$P = 1.93$ `≅ ` 2

P = ` 2.

11. From the following data indicate the Break Even sales and sales to earn a profit of x 1,00,000

Fixed Cost : ` 10,00,000

Variable Cost : ` 100/- per unit

Selling Price : ` 150/- per unit

Sol:

Contribution per unit = Selling price – VC

= 150 – 100 = 50

FC = Fixed cost,

DP = Desired profit

C = Contribution per unit

$$\text{P/V Ratio} = \frac{C}{S} \text{ or } \frac{\text{Contribution per unit}}{\text{Selling price per unit}}$$

$$\frac{50}{150} = 0.333$$

$$\text{BEP units} = \frac{FC}{C} = \frac{10,00,000}{50} = 20,000$$

$$\text{Volume of sales to achieve target} = \frac{FC + D.P}{C} = \frac{10,00,000 + 1,00,000}{50} = 22,000.$$

12. Calculate the required sales for the desired profit of Rs. 20,000, when FC is Rs. 18,000, SP is Rs. 30 and AVC is Rs. 20.

Sol : **(Jan.-20)**

Given that

Desired Profit = 20,000

Fixed Cost = 18,000

Selling Price = Rs. 30

AVC = Rs. 20

$$\text{Desired Sales} = \frac{\text{Fixed Cost} + \text{Profit}}{SP - AVC}$$

$$= \frac{18,000 + 20,000}{30 - 20} = \frac{38,000}{10}$$

Desired Sales = 3800 units

13. Given the total cost function

$$TC = 500 + 10Q - 0.9Q^2 + 0.04Q^3$$

Find the rate of output that results in minimum average variable cost.

Sol : **(Dec.-15)**

$TC = 500 + 10Q - 0.9\ Q^2 + 0.04Q^3$

To determine the level of output at which average variable cost is minimum, take first derivative of the average variable cost function and set this derivative equal to zero.

$$\frac{d(A \vee C)}{dQ} = -9 + 0.08\ Q$$

$$-9 + 0.08\ Q = 0$$

$$0.08\ Q = 9$$

$$Q = \frac{9}{0.08}$$

$$Q = 112.5$$

$$Q = 113 \text{ units}$$

Thus, at output level equal to 113 units, the average variable cost will be minimum.

14. Given the following total cost and revenue function

$TC = 15000 + 45Q$

$TR = 75Q$

Find the breakeven are at output and the rate of output required to earn profit of Rs. 35,000.

Sol : **(Dec.-15)**

$TC = 15{,}000 + 45\ Q$

$TR = 75\ Q$

$\pi = TR - TC$

$= 75\ Q - (15000 + 45Q)$

$= 75\ Q - 15{,}000 - 45\ Q$

$\pi = 30\ Q - 15{,}000$

thus, given the total revenues and total cost functions, the profit function would also be linear. The breakeven point is given by

$\pi = TR - TC = 0$

$30Q - 15000 = 0$

$30\ Q = 15000$

$$Q = \frac{15,000}{30} = 500$$

$$Q = 500 \text{ units}$$

When profit are `35,000

$$\pi = \text{Profit} = 35,000$$

$$\pi = TR - TC$$

$$35,000 = P \times Q - TC$$

$$35,000 = 500 \times 75\ P - [15,000 + 45\ (500)]$$

$$35,000 = 500 \times 75\ P - [15,000 + 22,500]$$

$$35,000 = 37,500\ P - 37,500$$

$$72,500 = 37,500\ P$$

$$P = 1.93\ \text{`} \cong \text{`}\ 2$$

$$P = \text{`}2$$

15. The total and marginal cost functions for Honda Ltd. Are

$$\mathbf{TC = 500 + 10Q - 0.06Q^2 + 0.003Q^3}$$

$$\mathbf{MC = 10 - 0.\ 12Q + 0.009Q^2}$$

Determine the level of fixed cost and equations for average total cost, average variable cost and average fixed cost. And also determine the rate of output that results in minimum average variable cost.

Sol : **(Jan.-20)**

$$TC = 500 + 10Q - 0.6Q^2 + 0.003Q^3$$

$$MC = 10 - 0.12\ Q + 0.009Q^2$$

$$FC = 500$$

$$ATC = \frac{TC}{Q}$$

$$= \frac{500 + 10Q - 0.6Q^2 + 0.003Q^3}{Q}$$

$$= \frac{500}{Q} + 10 - 0.6Q - 0.003Q^2$$

$$AVC = \frac{VC}{Q}$$

$$= \frac{10Q - 0.6Q^2 + 0.03Q^3}{Q} = 10 - 0.6Q + 0.03Q^2$$

$$AFC = \frac{F.C}{Q} = \frac{500}{Q}$$

Rate of output that results in minimum AVC is

$$AVC = 10$$

$$AVC = 10 - 0.6Q + 0.003Q^2 = 0$$

$$\frac{d(AVXC)}{d(Q)} = 10 - 0.6Q + 0.003Q^2$$

$$= 0.6 + 0.006Q = 0$$

$$= 0.006Q = 0.6$$

$$Q = \frac{0.6}{0.006}$$

$$= 100$$

16. If TC = 12,000 + 150 Q – 5Q² + 0.05Q³. Determine the rate of output that results minimum average variable cost.

Sol : **(Dec.-20)**

$$TC = 12{,}000 + 150\,Q - 5\,Q^2 + 0.05\,Q^3$$

$$V_C = TC - FC$$

$$V_C = 12{,}000 + 150\,Q - 5\,Q^2 + 0.05\,Q^3 - 1200$$

$$= 150\,Q - 5\,Q^2 + 0.05\,Q^3$$

$$AVC = \frac{VC}{Q} = \frac{150Q - 5Q^2 + 0.05Q^3}{Q}$$

$$= 150 - 5Q + 0.05\,Q^2$$

Minimum AVC = AVC = 0

$$= 150 - 5Q + 0.05\,Q^2 = 0$$

$$\frac{d(AVC)}{dQ} = -5 + 0.1\,Q = 0$$

$$= 0.1Q = 5 = Q = \frac{5}{0.1} = 50$$

At output rate 50 the minimum AVC is minimizes.

17. Consider the following Total Cost Functions:

i) $TC = 120 + 0.5Q + 0.002Q^2$

ii) $TC = 120Q + 0.5 Q^2 + 0.02Q^3$

Determine whether they are short-run or long run cost functions and explain the reasons for your answer.

Sol : **(Dec.-20)**

i) $TC = 120 + 0.5 Q + 0.002Q^2$

We can say that the above equation is short run cost function because it contains one fixed cost and variable cost short run cost function is a function contains both fixed cost and variable cost.

ii) $TC = 120 Q + 0.5 Q^2 + 0.02 Q^3$

In the above equation all constraints are variable values. It does not contain any fixed cost. So, we can say that the above equations is long run cost function.

Short Question & Answers

1. Meaning of Cost

Ans :

Economist define cost in terms of opportunities that are sacrifice when choice is made.

Cost is analyzed from the producer point of view. Cost estimates are made in terms of money cost calculations are indispensable for management decisions.

Cost of production refers to the total money expenses (both explicit and implicit) incurred by the producer in the process of transforming inputs into outputs.

Thus, it refers total money expenses incurred to produce a particular quantity of output by the produce.

2. Opportunity and Actual Costs

Ans :

(i) Opportunity Cost

Opportunity cost is concerned with the cost of forgone opportunity/alternatives. In other words, it is the return from the second-best use of the firms resources which the firm forgoes in order to avail of the return from the best use of the resources. It can also be said as the comparison between the policy that was chosen and the policy that was rejected. The concept of opportunity cost focuses on the net revenue that could be generated in the next best use of a scarce input. Opportunity cost is also called as "alternative cost".

Example : If a firm owns a land, there is no cost of using the land (i.e., the rent) in the firm's account. But, the firm has an opportunity cost of using this land, which is equal to the rent forgone by not letting the land out on rent.

(ii) Actual Cost

Actual cost is defined as the cost or expenditure which a firm incurs for producing or acquiring a good or service. The actual costs or expenditures are recorded in the books of accounts of a business unit. Actual costs are also called as "outlay costs" or "absolute costs" or "acquisition costs",

Example : Cost of raw material, rent, interest, wage bill, etc.

3. Direct Vs Indirect Costs

Ans :

(i) Direct Cost : Direct costs are also called as, "traceable" or "assignable costs". Direct costs are those which have direct relationship with a unit of operation like manufacturing a product organizing a process or an activity, etc. In other words, direct costs are those which are directly and definitely identifiable. The nature of the direct cost depends upon the costing under consideration. As the direct costs are related with a particular product/ process, they vary with variations in them. Therefore, all direct costs are variable in nature.

Example : In operating railway services, the costs of wagons, coaches and engines are direct costs.

(ii) Indirect Cost : Indirect costs are also called as "non-traceable costs" or "non- avoidable costs". Indirect costs are those which cannot be easily and definitely identifiable in relation to a plant, a product, a process or a department. Indirect costs do not vary i.e., they may or may not be variable in nature. However, the nature of indirect costs depend upon the costing under consideration. Indirect costs are both the fixed and the variable type as they may or may not vary as a result of the proposed changes in the production process etc.

Example : The cost of factory building, the track of a railway system, etc., are 'fixed indirect costs' and the cost of machinery, labour, etc., are 'variable indirect inputs'.

4. What are the differences between fixed cost and variable cost.

Ans :

Basis	Fixed cost	Variable Cost
i) Meaning	Fixed cost are those cost which are fixed in volume, even though if any variation exist in the output level.	Variable cost are those cost which are not constant and are directly depends on the output i.e., they vary in their variation at the level/ volume of output.
ii) Time period	Fixed cost relate to short-period only. The firm will not stop production if these costs remain uncovered.	Variable cost relate to both short and long period. The firm will stop production if these cost are not covered.
iii) Factor of production	Fixed costs are those cost in curred on fixed factors of production like land, building, machines etc.	Variable cost are incurred on the employment of variable factors, such as labour, raw materials, transportation etc.
iv) Relation of output with input	Fixed cost remains fixed at all level of output. These cost have to be in-curred even when output is zero.	Variable cost go on rising the higher level of output. First, they rise at the dimishing rate and than at a constant rate and finally they increase at an increasing rate.
v) Example	Rent, wages of permanent staff, license fee, cost of plant and machinery etc.	Cost of raw materials, wages of casual labour, expenses on electricity etc.

5. What are the differences between short run and long run cost.

Ans :

Basis of Difference	Short Run Costs	Long Run Costs
(i) Time Period	The short-run is a period of time in which output can be increased or decreased by changing only variable factors.	The long run is defined as a period in which quantities of all factors are variable. No factor is fixed.
(ii) Expansion	No increase in short-run output can be made by expanding the existing plants and equipments.	In the long run output can be expanded not only by increasing labour and raw-materials but also by expanding the size of plants and equipments.
(iii) Produce Output	In short run a firm produces out-put at a higher point on its short-run marginal cost curve.	The firms, under long run produce at another cost curve called long period curve. In long period a firm is at will to produce or to leave the industry.
(iv) Technology	In short run costs production technology is given.	Long run can adapt production technology in market.

6. What is Break even point?

Ans :

Theory of costs has an important application in the decision making of the firm regarding the level of output at which it will break even, that is, at which its total revenue will equal total cost and therefore it will attain no profit, no loss position. Break-even analysis is also sometimes called profit contribution analysis.

Break-even analysis is also applied to determine the quantity of output sold at which the firm will realise its target level of profits. Break even analysis can be made by assuming firstly linear cost-output and revenue-output relationships and, secondly, by assuming non-linear cost and revenue functions. Besides, break-even analysis can be either made through graphical metho or algebraic method. In our analysis below, we will explain break-even analysis through both these methods.

7. Explain the limitations of Break Even Analysis.

Ans :

Break-even analysis has certain underlying assumptions which form its limitations.

i) Break-even point is based on fixed cost, variable cost and total revenue. A change in one variable is going to affect the BEP.

ii) All costs cannot be classified into fixed and variable costs. We have semi-variable costs also.

iii) In case of multi-product firm, a single chart cannot be of any use. Series of charts have to be made use of.

iv) It is based on fixed cost concept and hence holds good only in the short-run.

v) Total cost and total revenue lines are not always straight as shown in the figure. The quantity and price discounts are the usual phenomena affecting the total revenue line.

vi) Where the business conditions are volatile, BEP cannot give stable results.

8. What is Profit contribution analysis?

Ans :

The profit-volume (P/V) or cost-volume-profit (CVP) analysis is the result of the attempt to apply the break-even analysis to situations of multi-product firms, where break-even charts are constructed separately for the different divisions or the products of the firm. The individual division, department or the product is called a "sector". The following terms are used in P/V analysis :

i) P/V Income = Difference between the sale proceeds and the variable costs of a sector.

ii) P/V Ratio = (P/V income)/unit price of the sector (i.e., unit contribution).

iii) Specific Programmed Costs = Production and promotional costs of the sector.

iv) Profit Contribution = Difference between P/V income and specific programmed costs.

9. Assumptions of P/V Analysis

Ans :

The cost-volume-profit analysis is based on certain basic assumptions. These are :

i) It is possible to ascertain fixed and variable costs.

ii) Behaviour of fixed and variable costs remains constant, *i.e.,* it is assumed to remain unchanged during the period being analysed.

iii) Price does not change with volume, i.e., there is a given price.

iv) Sales-mix is given.

v) Efficiency does not change with output.

vi) There is no change in corporate policies as the sales volume changes.

10. Marginal Cost Vs Variable cost

Ans :

Marginal costs are a function of the total cost of production, which includes fixed and variable costs. Fixed costs of production are constant, occur regularly, and do not change in the short-term with changes in production.

Examples of fixed costs are rent and insurance payments, property taxes, and employee salaries. By contrast, a variable cost is one that changes based on production output and costs.

For example, a country club with a swimming pool may spend more money on chlorine in the summer months.

11. Long Run Costs

Ans :

Long run is a period, during which all inputs are variable including the one, which are fixes in the short-run. In the long run a firm can change its output according to its demand. Over a long period, the size of the plant can be changed, unwanted buildings can be sold staff can be increased or reduced. The long run enables the firms to expand and scale of their operation by bringing or purchasing larger quantities of all the inputs. Thus in the long run all factors become variable.

The long-run cost-output relations therefore imply the relationship between the total cost and the total output. In the long-run cost-output relationship is influenced by the law of returns to scale.

12. Marginal Vs Incremental costs

Ans :

While marginal cost refers to the change in total cost resulting from producing an additional unit of output, incremental cost refers to total additional cost associated with the decision to expand output or to add a new variety of product etc. It represents the difference between two alternatives.

Choose the Correct Answers

1. Identify the fixed cost from the following . [c]
   (a) Labour (b) Electricity
   (c) Salary (d) Raw Material
2. Which of the following is a variable cost in the short run. [b]
   (a) Rent of the factory (b) Wages paid
   (c) Intrest payment on borrowed funds (d) Payment of the lease for equipment
3. Marginal cost changes due to change in _____ . [c]
   (a) Total cost (b) Average cost
   (c) Variable cost (d) Quantity of output
4. With which of the following is the concept of Marginal cost closely related. [a]
   (a) Variable cost (b) Fixed cost
   (c) Oppurtunity cost (d) Economic cost
5. Which of the following is not a determinent of the firm's cost function. [d]
   (a) The production function (b) Price of labour
   (c) Tax (d) The price of firm's output
6. Which of the following is true of relation ship among the average cost function. [d]
   (a) ATC = AFC – AVC (b) AVC = AFC + ATC
   (c) AFC = ATC + AVC (d) AFC = ATC – AVC
7. Which of the following is correct cost function. [c]
   (a) TC = TFC – TVC (b) TVC = TFC – TC
   (c) TFC = TC – TVC (d) TC = TVC – TFC
8. _____ Cost are important in short term decision making of the form to determine the output at which profits can be maximized. [b]
   (a) Fixed cost (b) Sunk cost
   (c) Opportunity (d) Marginal.
9. _____ cost is the total additional cost that a firm has to incurr as a result of implemputing a major managerial decision. [d]
   (a) Sunk cost (b) Incremental
   (c) Oppurtunity (d) Marginal
10. The Last function determine the benaviour of cost with change in [a]
   (a) Output (b) Input
   (c) Technology (d) Wages

Fill in the Blanks

1. _____ is defined as those expenses face by a business in the process of supplying goods and services to consumers.
2. _____ is an economics evaluation technique that involve systamatic collection, categorisation and analysis of program or intervention cost.
3. _____ are those must be recleved by resources owners in order to assume that they will continue to supply then.
4. _____ has a special meaning all of the payments or expenditure necessary to obtain the factors of production.
5. _____ of a decision demands on both the cost of the alternative chosen and the benefits.
6. _____ is concerned with the cost of forg one opportunity.
7. _____ are those donot alter by varying the nature or level of business activity.
8. _____ are additions to cost resulting from a change in the nature or level of a business activity.
9. _____ are those expenses that are actually paid by firm.
10. _____ are those which have direct relationship with a unit of operation like manufacturing a product, organizing a process or an activity etc.

ANSWERS

1. Cost
2. Cost Analysis
3. Production cost
4. Cost of production
5. Economic cost
6. Opportunity cost
7. Sunk cost
8. Incremental cost
9. Explicit cost
10. Direct cost

UNIT V

Market Structure:

Perfect and Imperfect market condition – Perfect competition – Characteristics – Equilibrium price – Profit maximization, (in short run and long run) – Shut down decision – Monopoly: characteristics,– Profit Maximization in short run and long run, Allocative inefficiency, Income Transfer and Rent seeking – price discrimination-Monopolistic competition: Characteristics – Profit Maximization – Price and output determination in the short run and long run, Oligopoly: Characteristics – Price Rigidity – price leadership - Kinked demand model

5.1 MARKET STRUCTURE

Q1. Define market ? Explain the features of market.

Ans :

Meaning

The term "market" refers to a particular place where goods are purchased and sold. But, in economics, market is used in a wide perspective. In economics, the term "market" does not mean a particular place but the whole area where the buyers and sellers of a product are spread.

Definitions

i) **According to Prof. R. Chapman,** "The term market refers not necessarily to a place but always to a commodity and the buyers and sellers who are in direct competition with one another".

ii) **According to A.A. Cournot,** "Economists understand by the term 'market', not any particular place in which things are bought and sold but the whole of any region in which buyers and sellers are in such free intercourse with one another that the price of the same goods tends to equality, easily and quickly".

iii) **According to Benham,** "Any area over which buyers and sellers are in such close touch with one another, either directly or through dealers, that the prices obtainable in one part of the market affect the prices paid on other parts".

Features

The essential features of a market are as follows:

1. Area

In economics, a market does not mean a particular place but the whole region where sellers and buyers of a product are spread. Modern modes of communication and transport have made the market area for a product very wide.

2. One Commodity

In economics, a market is not related to a place but to a particular product. Hence, there are separate markets for various commodities. For example, there are separate markets for clothes, grains, jewellery, etc.

3. Buyers and Sellers

The presence of buyers and sellers is necessary for the sale and purchase of a product in the market. In the modern age, the presence of buyers and sellers is not necessary in the market because they can do transactions of goods through letters, telephones, business representatives, internet, etc.

4. Free Competition

There should be free competition among buyers and sellers in the market. This competition is in relation to the price determination of a product among buyers and sellers.

5. One Price

The price of a product is the same in the market because of free competition among buyers and sellers.

Q2. What do you understand by market structure ?

Ans :

Meaning

Market structure is a set of market characteristics that determine the nature of market in which a firm operates. It refers to economically significant features of a market, which affects the behaviour and working of firm in the industry.

Definition

According to Pappas and Hirschey, "Market structure refers to the number and size distribution of buyers and sellers in the market for a goods or services".

Thus, market structure deals with the selected number of the characteristics through buyers and sellers.

1. Degree of Seller Concentration

One of the most important criteria to identify the market structure is the degree of seller concentration. The degree of seller concentration refers to the number of firms producing a particular type of product and their market share for that particular product in the market.

2. Extent of Product Differentiation

The extent of product differentiation is also an important criterion to identify the market structure. Product differentiation refers to the extent by which the product of one trader is differentiated from that of the other.

3. Nature of Entry Conditions

The nature for entry of new firms in the market or industry also determines the market structure. In a perfectly competitive market structure, it is assumed that there are no barriers on the entry of new firms. In a monopolistic competition, the entry of new firms in the market is accompanied by new brands of the product. It is the barriers on entry that reduces the number of firms in the market thereby causing imperfection in the competitive market structure.

4. Degree of Buyer Concentration

This refers to the number of buyers and their ability to purchase a given product in the market.

5.1.1 Perfect and Imperfect Market Condition

Q3. What are the different types of Market Structure ?

(OR)

State and explain the factors which are used in the basis for market classification.

Ans : **(Jan.-20, Dec.-14)**

The type of market depends on the degree of competition prevailing in the market. Broadly speaking, there are two types of competition prevailing in the markets. These are:

1. Perfect Competition

Perfect competition is characterized by many sellers selling identical products to many buyers. Perfect market (or) competition is characterized by many sellers selling identical products to many buyers. The efficient market where goods are produced using the most efficient techniques and the least amount of factors. This market is considered to be unrealistic but it is nevertheless of special interest for hypothetical and theoretical reasons.

2. Imperfect Competition

Imperfect competition is the competitive situation in any market where the conditions necessary for perfect competition are not satisfied. It is a market structure that does not meet the conditions of perfect competition. Forms of imperfect competition include:

(a) Monopoly

Monopoly comes from the greek monos, single, and polein, to sell. This is a form of market structure of imperfect competition, mainly characterized by the existence of a sole seller and many buyers. This kind of market is normally

associated with entry and exit barriers. Monopoly is a situation of a single seller producing for many buyers. Its product is necessarily extremely differentiated since there are no competing sellers producing near substitute product.

(b) Monopolistic Competition

It differs in only one respect, namely, there are many sellers offering differentiated product to many buyers.

(c) Oligopoly

In oligopoly, there are a few sellers selling competing products for many buyers. Oligopoly word comes from the Greek oligos, few, and polein, to sell. This kind of imperfect competition is characterized by having a relatively scarce amount of firms, but always more than one, which produce a homogeneous good. Due to the small number of firms in the market, the strategies between firms will be interdependent, thus implying that the profits of an oligopolistic firm will highly depend on their competitors' actions.

(d) Duopoly

Duopoly comes from the Greek *duo*, two, and *polein,* to sell. This is a type of oligopoly. This kind of imperfect competition is characterized by having only two firms in the market producing a homogeneous good. For simplicity purposes, oligopolies are normally studied by analyzing duopoly. A is a market that has only two suppliers, or a market that is dominated by two suppliers to the extent that they jointly control prices.

5.2 PERFECT COMPETITION

5.2.1 Characteristics

Q4. What is Perfect Competition Market? Explain the characteristics of Perfect Competition Market.

(OR)

What are the important characteristics of Perfect Competition?

(OR)

State the features of Perfect Competition.

Ans : **(Dec.-15)**

Meaning

A perfectly competitive market is one in which the number of buyers and sellers is very large, all engaged in buying and selling a homogeneous product without any artificial restrictions and possessing perfect knowledge of market at a time, e.g., fruit and vegetable market.

Definitions

(i) According to A. Koutsoyiannis, "Perfect competition is a market structure characterized by a complete absence of rivalry among the individual firms".

(ii) According to R.G. Lipsey, "Perfect competition is a market structure in which all firms in an industry are price-takers and in which there is freedom of entry into, and exit from, industry".

Features

The following are features of perfect competition. In other words, these are the assumptions underlying perfect markets.

(a) Large number of buyers and sellers

There should be significantly large number of buyers and sellers in the market. The number should be so large that it should not make any difference in terms of price or quantity supplied even if one enters the market or one leaves the market.

(b) Homogeneous products or services

The products and services of each seller should be homogeneous. They cannot be differentiated from that of one another. It makes no difference to the buyer whether he buys from firm X or firm Z. In other words, the buyer does not have any particular preference to buy the goods from a particular trader or supplier. The price is one and the

same in every firm. There are no concessions or discounts.

(c) Freedom to enter or exit the market

There should not be any restrictions on the part of the buyers and sellers to enter the market or leave the market. There should not be any barriers. The buyers can enter the market or leave the market whenever they want.

(d) Perfect information available to the buyers and sellers

Each buyer and seller has total knowledge of the prices prevailing in the market at every given point of time, quantity supplied, costs, demand, nature of product, and other relevant information. There is no need for any advertisement expenditure as the buyers and sellers are fully informed.

(e) Perfect mobility of factors of production

There should not be any restrictions on the utilization of factors of production such as land, labour, capital and so on. In other words, the firm or buyer should have free access to the factors of production. Whenever capital or labour is required, it should instantly be made available.

(f) Each firm is a price taker

An individual firm can alter its rate of production or sales without significantly affecting the market price of the product. A firm in a perfect market cannot influence the market through its own individual actions. It has no alternative other than selling its products at the price prevailing in the market. It cannot sell as much as it wants at its own set price.

5.2.2 Equilibrium price

Q5. "Under perfect competition a firm is a price taker and not a price maker". Explain.

(OR)

"A firm under perfect competition is a price taker and not price maker".

Ans :

The individual firm under perfect competition has no control over the market price. This means there is no other way for it to accept the price as given by the market. Market forces determine the price and the individual firm has to accept it. The individual firm has absolutely no control over price determination. Thus, the individual firm has no choice other than accepting the given market price.

A good example is agricultural market, where individual farmer has no control over the market price determination and he has to accept the prevailing market price.

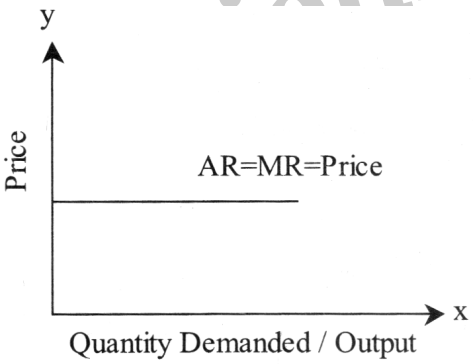


Fig : Demand Curve for the Firm Under Perfect Competition

In the figure above, it can be observed that the demand curve for the output of individual firm is a horizontal line parallel to x-axis at the given market price.

In case of perfect competition, the firm cannot change the market price even if it sells the whole of its produced output. Therefore, the price, Average Revenue (AR), and Marginal Revenue (MR) are equal to each other which are also shown in the figure.

There is only alternative available to a firm is that it can sell any quantity at the given market price. If it wants to sell at a higher price, nobody will buy from it because they can buy same from others at the given market prices, which are lower.

Firm and Industry Equilibrium Under Perfect Competition

Price is determined by the market forces under the conditions of perfect competition. Here the firms have absolutely no control over the prices. The only pricing strategy available to them in perfect competition is to charge the same price as other firms charges. In case of perfect competition, the industry demand curve is negatively sloped curve. It is because, it indicates the demand from all consumers at various prices.

The industry demand curve 'ID' can be seen in the following figure.

We can also observe the firms supply curve 'FS' which is rising upward. It indicates that the firm is more interested to sell large quantity at a higher price. It is the price that determine the quantity demanded and quantity supplied. The ultimate price that prevails in the market under perfect competition is one at which quantity demanded is equal to the quantity supplied. This price is also called equilibrium price, as it balances the influence of demand on supply and vice versa.

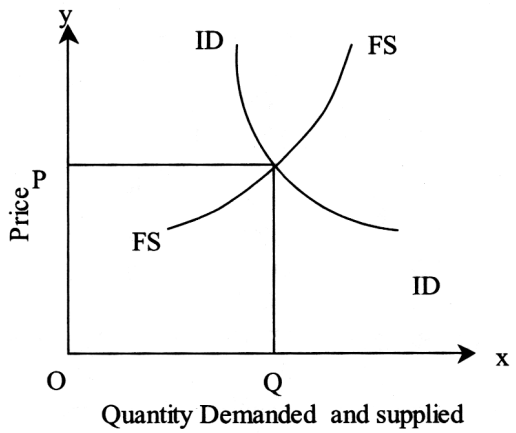


Fig : Price Determination in Case of the Firm and Industry Under Perfect Competition

The figure above, shows how the equilibrium is determined. OP is the equilibrium price at which ID and FS intersect each other. At price OP, the quantity demanded is equal to the quantity supplied. If the price is higher than equilibrium price OP, supply will be more and hence the price is likely to fall due to decrease in demand. As the price falls, demand for quantity will increase. But the quantity supply may decline.

If the price falls below OP, the demanded quantity will rise quickly and the supply is not forthcoming to meet that demand. This will push up the price in the market to OP.

5.2.3 Profit maximization in short run

Q6. Explain Profit maximization in short run under perfect competition.

Ans : **(June-16)**

Under perfect competition, since an individual firm cannot influence the market price by raising or lowering its output, the firm faces a horizontal demand curve, that is, the demand curve of any single firm is perfectly elastic - its elasticity is equal to infinity at all levels of Output. If a firm charges a price slightly higher than the prevailing market price, demand for that firm will fall to zero because there are many other sellers selling exactly the same product. On the other hand, if a firm reduces its price slightly, its demand will increase to infinity and thus other firms will match the low price.

A firm under perfect competition is a price-taker and not a price-maker. Because an individual firm's demand or Average Revenue (AR) curve is horizontal under perfect competition, the Marginal Revenue (MR) curve of the firm is also horizontal and coincides with the AR curve.

In other words, AR and MR are constant and equal at all levels of output. You should satisfy yourself that if price (i.e. average revenue) is constant, marginal revenue will be equal to price.

The price output determination and equilibrium of the firm under perfect competition may be explained through a numerical example. Suppose the demand and supply conditions of a product are represented by the following equations:

Aggregate Demand: $Q = 25 - 0.5\ P$

Aggregate Supply: $Q = 10 + 1.0\ P$

The equilibrium price would be at a point where aggregate demand equals aggregate supply:

$25 - 0.5\ P = 10 + 1.0\ P$ (or) $P = 10$

Industry output at P = 10 is obtained by substituting this price into either the demand or supply function:

Q = 10 + l.'0(10)

= 20

Therefore equilibrium price, P = 10 and equilibrium output, Q = 20.

Figure. Shows that when the market price is at P_1 demand and marginal revenue facing the firm are D, and MR,. The optimal output for the firm to

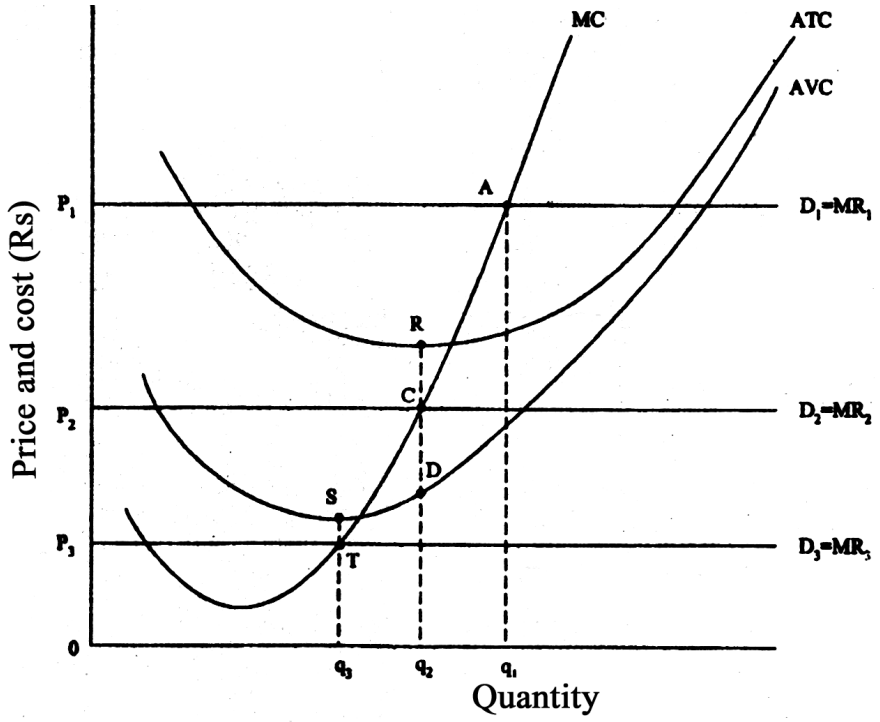


Fig. Profit Maximizing Equilibrium in the Short Run

produce is at point A, where Marginal Cost (MC) = P and the firm will produce Q, units of output. At Q, level of output, the Average Total Cost (ATC) is less than the price and the firm makes an economic profit.

Suppose the market price falls to P price equals MC at point C. Because at this level of output (Q,) average total cost is greater than price, total cost is greater than total revenue, and the firm suffers losses. The amount of loss is the loss per unit (CR) times the number of units produced (Q_2).

At price level P_2 demand is $D_2 = MR_2$, there is no way that the firm can earn a profit. This is because at every output level average total cost exceeds price (ATC > P). The firm will continue to produce only if it loses less by producing than by closing its operations entirely. When the firm produced zero output, total revenue would also be zero and the total cost would be the total fixed cost. The loss would thus be equal to total fixed cost. If the firm produces at MC = MR, (point C), total revenue is greater than total variable cost, because P_2 > AVC at Q, units of output. The firm will be in a position to cover all its variable costs and still has CD times the number of units produced (Q_2) left over to pay part of its fixed cost. This way the firm suffers a smaller loss when it continues production than it shut down its operations.

At market price P_3, demand is given by $D_3 = MR_3$. The equilibrium output Q_3 would be at T where MC = P_3. At this output level, since the average variable cost of production exceeds price, the firm not only loses all its fixed costs but would also lose Rs. ST per unit on its variable costs as well. The firm could improve its earnings situation by producing zero output and losing only fixed costs. In other words, when price is below average variable cost at every level of output, the short-run loss-minimizing output is zero.

To reiterate, the profit maximizing output for a perfectly competitive firm in the short run is to set P = MC. Since P = MR, this is equivalent to setting MR = MC. In the short run, as the above discussion shows, it is possible for the firm to make above normal or economic profit. On the other hand, it is also possible for the firm to make losses, as long as those losses are less than its total fixed costs. In other words, the firm will continue to produce as long as P > AVC in the short run, because this is a better strategy than shutting down. The firm will shut down only if P < AVC.

5.2.4 Profit maximization in long run

Q7. Explain Profit maximization in long run under perfect competition.

Ans : **(June-16)**

In the long run, the firm attempts to maximize profits in the same manner as in short run, except that there are no fixed costs. All costs are variable in the long run. Here again the firm takes the market price as given and this market price is the firm's marginal revenue. The firm would increase output as long as the marginal revenue from each additional unit is greater than the marginal cost of that unit. It would decrease output when marginal cost exceeds marginal revenue. This way the finn maximizes profit by equating marginal cost and marginal revenue (MR = MC).

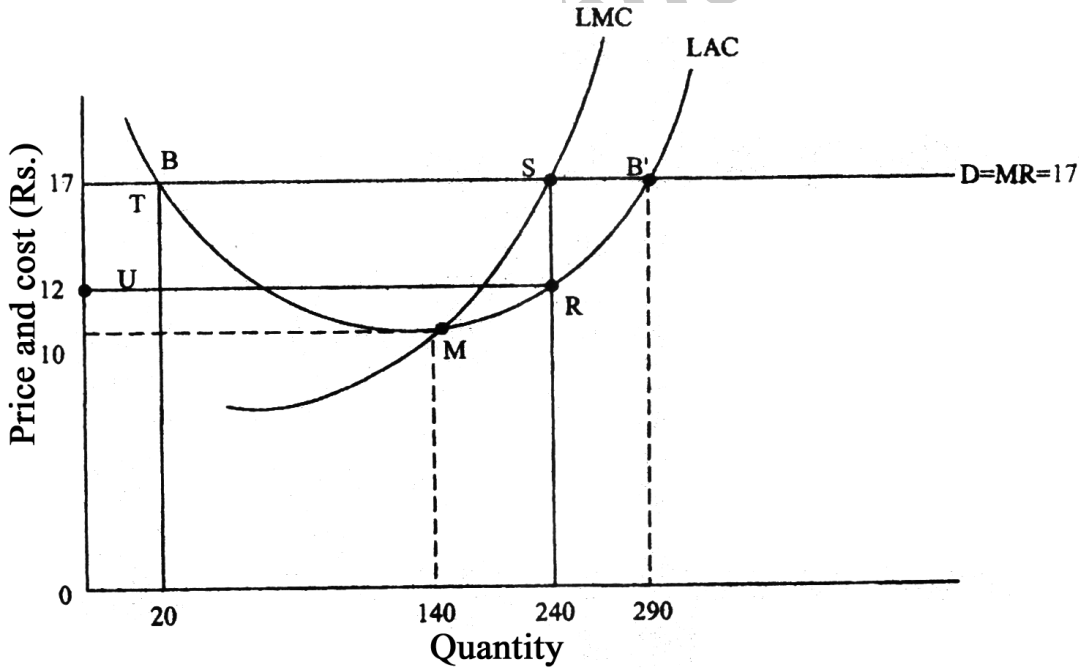


Fig. Profit Maximizing Equilibrium in the Long Run

The firm's long run average cost (LAC) and marginal cost (LMC) curves are shown in figure. The firm faces a perfectly elastic demand indicating the equilibrium price (Rs. 17) which is the same as marginal revenue (i.e., D = MR = P). You may observe that as long as price is greater than LAC, the firm can make a profit. Therefore, any output ranging from 20 - 290 units yields some economic profit to the firm. In

figure, B and B' are the breakeven points, at which price equals LAC, economic profit is zero, and the firm can earn only a normal profit. The firm, however, earns the maximum profit at output level 240 units (point S). At this point marginal revenue equals LMC and the firm would ideally select the plant size to produce 240 units of output. Note that in this situation the firm would not produce 140 units of output at point M, which is the minimum point of LAC. At this point marginal revenue exceeds marginal cost, so the firm can gain by producing more output. As shown in figure. at point S total revenue (price times quantity) at 240 units of output is equal to Rs. 4080 (= Rs. 17 * 240), which is the area of the rectangle OTSV. The total cost (average cost times quantity) is equal to Rs. 2,880 (= Rs. 12 * 240) which is the area of the rectangle OURV. The total profit is Rs. 1,200 = (Rs. 17 - Rs. 12) * 240, which is the area of the rectangle UTSR.

Thus, the firm would operate at a scale such that long run marginal cost equals price. This would be the most profitable situation for an individual firm (illustrated in figure). Therefore, if the price is Rs. 17.00 per unit, the firm will produce 240 units of output, generating a profit of Rs. 1,200.00. This profit is variously known as above normal, super normal or economic profit. The crucial question that one needs to ask is whether this is a sustainable situation in a perfectly competitive market i.e. whether a firm in a perfectly competitive industry can continue to make positive economic profits even in the long run? The answer is unambiguously no. This result derives from the assumption that in a perfectly competitive market there are no barriers to entry. Recall that in a market economy, profit is a signal that guides investment and therefore resource allocation decisions. In this case, the situation will change with other prospective entrants in the industry. The economic force that attracts new firms to enter into or drives out of an industry is the existence of economic profits or economic losses respectively. Economic profits attract new firms into the industry whose entry increases industry supply. As a result, the prices would fall and the firms in the industry adjust their output levels in order to remain at profit maximization level. This process continues until all economic profits are eliminated. There is no longer any attraction for new firms to enter since they can only earn normal profits. By observing figure you should try to work out the price that will prevail in this market in the long run when all firms are earning normal profit.

Analogous to economic profit serves as a signal to attract investment, economic losses drive some existing firms out of the industry. The industry supply declines due to exit of these firms which pushes the market prices up. As the prices have risen, all the firms in the industry adjust their output levels in order to remain at a profit maximization level. Firms continue to exit until economic losses are eliminated and economic profit becomes zero, that is, firms earn only a normal rate of profit.

Q8. What are the advantages and dis-advantages of Perfect Competition?

Ans :

Advantages

Advantages of perfect competition can be explained as follows:

1. Consumer Sovereignty

There is consumer sovereignty in a perfect competitive market. The consumer is rational and he has perfect knowledge about the market conditions. Therefore, he will not purchase the products at a higher price.

2. Beneficial to Consumers

In the perfectly competitive market, the price is equal to the minimum average cost. It is beneficial to the consumer.

3. Cost-Saving

The perfectly competitive firms are price-takers and the products are homogeneous. Therefore it is not necessary for the producers to incur expenditure on advertisement to promote sales. This reduces the wastage of resources.

4. Economic Efficiency

In the long-run, the perfectly competitive firm is functioning at the optimum level. This means that maximum economic efficiency in production is achieved. As the actual output produced by the firm is equal to the optimum output, there is no idle or unused or excess capacity.

Disadvantages

Disadvantages of perfect competition can be explained as follows :

1. No Scope for Economies of Scale

This is because there are many small firms producing relatively small amounts. Industries with high fixed costs would be particularly unsuitable to perfect competition. This is one reason why perfect competition is unlikely in the real world.

2. Homogenous Products

Undifferentiated products are boring giving little choice to consumers. Differentiated products are very important in industries such as clothing and cars.

3. Insufficient Profits

Lack of supernormal profit may make investment in R & D unlikely this would be important in an industry such as pharmaceuticals which require significant investment.

4. Free flow of Technology

As there is no patent kind of thing, there is no incentive to develop new technology because it would be shared with other companies.

5. Externalities

If there are externalities in production or consumption there is likely to be market failure without government intervention.

5.3 SHUT DOWN DECISION

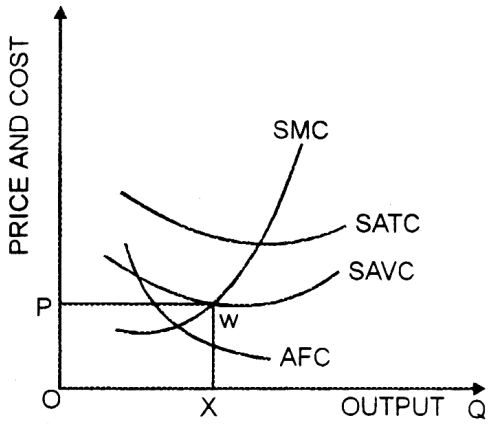
Q9. Explain the concept of Shut down decision.

Ans :

When a firm is incurring losses, there are two options open to it. (i) One option is to continue to produce at the least unprofitable (minimum losses) output (ii) Another option is to shut down operations and produce nothing.

In the short-run, the firm may prefer to stay in business if the price covers at least the average variable cost. Since short run represents a time period during which the firm can not change its fixed capital it continues to incur fixed costs, even if it stops production completely. If the firm stops production, it can avoid only variable costs. The firm will continue to stay in the industry in the short run if the market price covers atleast its average variable costs. We therefore, conclude that as long as price exceeds average variable costs, the firm should continue to produce in the short-run. This is shown in the diagram.

In figure, SAC represents the short run average cost curve and AVC represents the average variable cost curve. That portion of the SMC curve which lies above the average variable cost represents firm's supply curve. Suppose that the price OP_1 is determined in the market. We can see from the diagram that at W, SMC = MR. The firm is in equilibrium at this point but it is minimizing its losses.



a) Shutdown Point

Suppose the price is just equal to the average variable cost as indicated by OP. In this case, only average variable costs are recovered. It does not recover even a part of the fixed costs. The revenue the firm makes just covers the costs of variable inputs. If the price is less than OP, the firm cannot recover even variable costs and therefore prefers to close down altogether. It will therefore pay the firm to

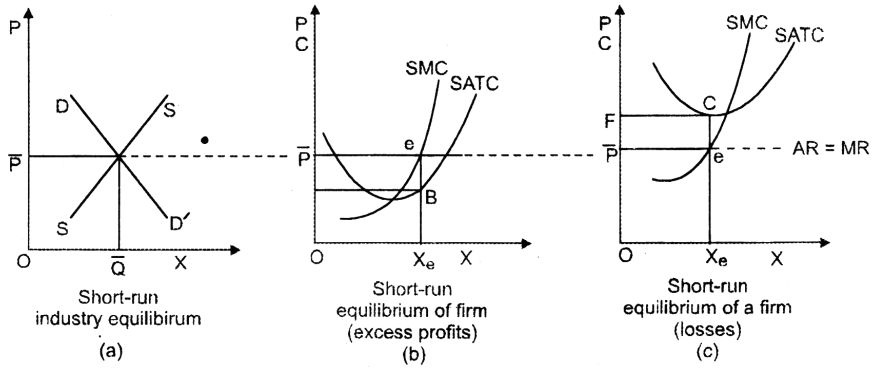
stop producing anything at all, in the short-run if the price does not cover at least AVC. The firm prefers to shutdown operations.

So, we can say that a competitive firm will maximize profits or minimize its losses in the short- run by producing that output at which SMC = MR and price exceeds the average variable cost.

b) Equilibrium of industry

Given the market demand and supply curves, the industry is in equilibrium at that price which clears the market i.e., the price at which quantity demanded is equal to quantity supplied. In the short-period firms can vary output within their plant capacity. They cannot dismantle plants and equipment even when they are sustaining losses. Entry or exit of firms can happen only in the long run. However, there will be short-run equilibrium if at the prevailing price firms are making excess profits or losses. Firms making losses will vanish in the long-run if they cannot adjust their plant capacity Firms making abnormal profits will expand output.

The diagram given below depicts the short-run industry equilibrium.



The market price is determined by demand and supply as shown in figure (a) The two firm attain equilibrium when SMC = MR and SMC curve cuts the MR curve from below. Firm A makers abnormal profits since OP price is higher than its SATC. Firm B incurs losses since the price is It than its SATC.

5.4 MONOPOLY

5.4.1 Characteristics

Q10. Define monopoly. What are the characteristics of monopoly ?

(OR)

What are the features of monopoly market.

(OR)

State the characteristics of monopoly.

Ans : **(Jan.-20, Dec.-16, Dec.-14)**

Introduction

A natural monopoly is defined in economics as an industry where the fixed cost of the capital goods is so high that it is not profitable for a second firm to enter and compete. There is a "natural" reason for this industry being a monopoly. It is an extreme imperfect form of market. In ancient times, common salt was responsible for natural monopolies, till the time people learned about winning sea-salt. Regions facing scarcity of transport facilities and storage were most prone to notorious acceleration of commodity prices and uneven distribution of daily use products and services.

The characteristics of monopoly are solitary to the condition generated by intent. Monopoly symbolizes domination over a product to the extent that the enterprise or individual in the terms of access and the markets for availability. The term is specific to a seller's market. A similar situation in the buyer's market is referred to as monopsony. It first appeared as an economics-related term in 'Politics' by Aristotle.

Meaning

The term 'Monopoly' has been derived from Greek term 'Monopolies' which means a single seller. Thus, monopoly is a market condition in which there is a single seller of a particular commodity who is called monopolist and has complete control over the supply of his product.

Definitions

i) **According to D. Salvatore,** "Monopoly is the form of market organization in which there is a single firm selling a commodity for which there are no close substitutes."

ii) **According to Ferguson and Kreps,** "A pure monopoly exists when one and only one firm produces or sells the commodity in question. In other words, a monopoly is a one-firm industry"

iii) **According to Koutsoyiannis,** "Monopoly is a market situation in which there is a single seller, there are no close substitutes for commodity it produces, there are barriers to entry."

iv) **In the words of Baumol,** "A pure monopoly is defined as the firm that is also an industry. It is the only supplier of some particular commodity for which there exists no close substitute."

Characteristics

1. Single Seller

The producer or seller of the commodity is a single person, firm or an individual and that firm has complete control on the output of the commodity.

2. No Close Substitutes

All the units of a commodity are similar and there are no substitutes to that commodity.

3. No Entry for New Firms

Monopoly situation in a market can continue only when other firms do not enter the industry. If new firms enter the industry, there will not be complete control of a firm on the supply. As such, whenever a firm enters the industry, monopoly situation comes to an end. There, monopoly industry is essentially one-firm industry. This signifies that under monopoly there is no difference between a firm and an industry.

4. Profit in the Long Run

A monopolist can earn abnormal profit even in the long run because he has no fear of a competitive seller. In other words, if a monopolist gets abnormal profits in the long run, he cannot be dislodged from this position. However, this is not possible under perfect competition. If abnormal profits are available to a competitive firm, other firms will enter the competition with the result abnormal profits will be eliminated.

5. Losses in the Short Period

Generally, a common man thinks that a monopoly firm cannot incur loss because it can fix any price it wants. However, this understanding is not correct. A monopoly firm can sustain losses equal to fixed cost in the short period. A monopolist means that there is only a single person or a firm to sell the commodity.

6. Nature of Demand Curve

Under monopoly the demand for the commodity of the firm is less than being perfectly elastic and, therefore, it slopes downwards to the right. The main reason of the demand curve sloping downwards to the right is the complete control of the monopolist on the supply of the commodity.

7. Price discrimination

From the point of view of profit a monopolist can change different prices from different consumers of his commodity. This policy is known as price discrimination. He adopts the policy of price discrimination on various bases such as charging different prices from different

consumers or fixing different prices at different places etc.

8. Firm is a Price-Maker

A competitive firm is a price-taker whereas a monopoly firm is a price-maker. This is because a competitive firm is small compared to market and therefore, it does not have market power. This is not true in the case of a monopoly firm because it has market power. Hence, it is a price maker.

9. Average and Marginal Revenue Curves

Under monopoly, average revenue is greater than marginal revenue. Under monopoly, if the firm wants to increase the sale it can do so only when it reduces its price. This means AR would decline when sale increases. In that case MR would be less than AR. (ii) AR slopes downwards to the right and is greater than MR.

Q11. Explain the classification of monopoly.

Ans :

The Monopoly firms as a Price makes cam be classified into two types.

(a) Simple Monopoly

If the monopoly firm charges the same price from all its clients, it is called simple or single price monopoly.

E.g.: Tata Company charges the same price to all the Tata Indica cars of the same model.

(b) Discriminating Monopoly

If the monopoly firm charges different prices to different consumers for the same product, it is called discriminating monopoly.

E.g.: A Doctor may take Rs.100/- from a rich man and only Rs.50/- from a poor man for the same treatment.

The Monopoly on the basis of Ownership of the firm can be classified as two types:

(a) Private Monopoly

If a private firm monopolizes the market, it is called private monopoly.

Eg.: Hindustan Lever Ltd., is having monopoly power to produce LUX Soap.

(b) Public Monopoly

If the market for a product is monopolized by a government enterprise, it is called public or social monopoly.

E.g: Water, electricity etc.

Others

(a) Limited Monopoly

If the monopolist having limited power in fixing the price of his product, it is called Limited Monopoly. It may be due to the fear of distant substitutes or government intervention or the entry of rival firms.

(b) Unlimited Monopoly

If the monopolist is having unlimited power in fixing the price of his good or service, it is called Unlimited Monopoly. Ex. A Doctor in a village.

(c) Natural Monopoly

Sometimes monopoly may arise due to scarcity of natural resources. Nature provides raw materials in some places only. The owner of the place will become monopolist. For Eg.Diamond mines in South Africa.

(d) Legal Monopoly

If monopoly arises on account of legal support or as a matter of legal privilege, it is called Legal Monopoly. Ex. Patent rights, special brands, trade names, copyright etc.,

(e) Voluntary Monopoly

To get the advantages of Monopoly some private firms come together voluntarily to control the supply of commodity. These are called voluntary monopolies. Generally, these monopolies arise with industrial combinations. These voluntary monopolies are of three kinds (a) cartel (b) trust (c) holding company. It may be called artificial monopoly.

5.4.2 Profit Maximization in short run

Q12. Explain briefly about price-output determination under monopoly in the short-run market.

(OR)

How the profit will maximize in short-run market?

Ans : **(Jan.-20, Dec.-16, Dec.-14)**

Under monopoly, the average revenue curve for a firm is a downward sloping one. It is because, if the monopolist reduces the price of his product, the quantity demanded increases and vice versa. In monopoly, marginal revenue is less than the average revenue. In other words, the marginal revenue curve lies below the average revenue curve.

The monopolist always wants to maximize his profits. To achieve maximum his profits. To achieve maximum profits, it is necessary that the marginal revenue should be more than the marginal cost.

He can continue to sell as long as the marginal revenue exceeds marginal cost. At the point F, where MR = MC, profits will be maximized. Profits will diminish if the production is continued beyond this point.

From fig. below, it can be seen that the demand curve or average curve is represented by AR, marginal revenue curve by MR, average cost by AC, and marginal cost curve by MC. OQ is the equilibrium output, OA is the equilibrium price, QC is the average cost, and BC is the average profit (AR minus AC is the average profit).

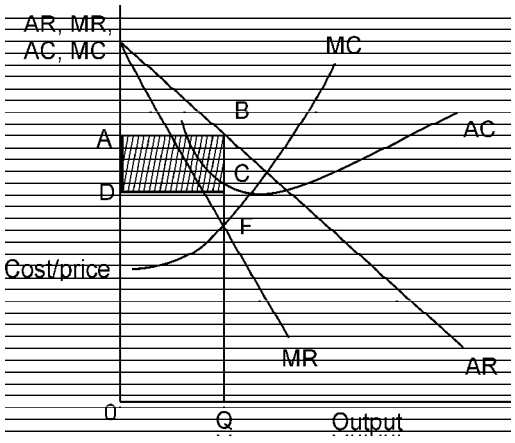


Fig.: Price-Output Determination in Monopoly

Upto OQ output, MR is greater than MC and beyond OQ, MR is less than MC. Therefore, the monopolist will be in equilibrium at output OQ where MR = MC and profits are maximum. OA is the corresponding price to the output level of OQ. The rectangle ABCD represents the profits earned by the monopolist in the equilibrium position in the short-term.

5.4.3 Profit Maximization in long run

Q13. How is price determined under monopoly in the long run market ?

(OR)

How the profit will maximize in long-run market.

Ans : **(Jan.-20, Dec.-14, Dec.-14)**

The long-run is sufficiently a long period for the monopolist to adjust the plant size or to use the existing plant at any level that maximizes his profit. Since there is no entry of outside firms in the monopoly market, there is no competition. In the absence of competition, the monopolist can afford to produce output at sub optimal scale. That means the monopolist need to produce output at sub-optimal sale.

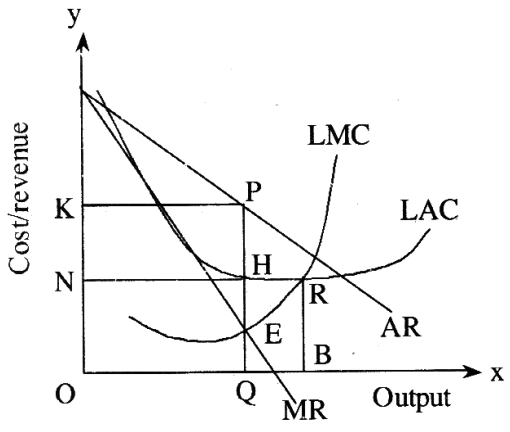


Fig. : Price Determination

Therefore, the monopolist need not reach the minimum point of the LAC as the market size does not permit to expand output to produce it at the minimum cost per unit (LAC). However, the

monopolist would not stay in the business if he makes losses in the long-period. He will continue to secure super-normal profit even in the long- period as the entry of outside firms is blocked.

Figure explains the long-period equilibrium of a monopoly firm. The firm is in equilibrium at E where LMC = MR and LMC curve cuts MR curve from below. QP is the equilibrium price and OQ is the equilibrium output. Since the price per unit (AR)QP is greater than the cost per unit (LAC) QH, HP represents the per unit super normal profit.

The total super normal profit is equal to PKNH. It is important to point out that the equilibrium price QP is determined on the assumption of the absence of the actual entry and potential entry. If there is potential entry in the market, the monopolist will fix up the price at a level lower than QP.

In order to block the potential entry of outside firms, the monopolist may fix up price equal to BR. Since the price per unit is equal to the cost per unit at R, the monopoly firm can earn only normal profit even in the long-run if it has to prevent potential entry.

Therefore it can be said that in the absence of actual and potential entry of outside firms in the market the monopoly firm can secure super-normal profit in the long- period. But in the presence of potential entry, even in the long-period the monopoly firm can earn just normal profit to meet the threat of entry.

Q14. What are the advantages and disadvantages of Monopoly ?

Ans :

Advantages

Advantages of monopoly can be explained as follows:

1. Research and Development

Supernormal Profit can be used to fund high cost capital investment spending. Successful research can be used for improved products and lower costs in the long term.

E.g.: Telecommunications and Pharmaceuticals.

2. Economies of Scale

Monopolies can produce at lower costs which makes them more efficient than smaller firms. This in turn increases output which leads to a decrease in average costs of production. These can be passed on to consumers in the form of lower prices.

3. Competition for Corporate Control

Monopolists are subject to the discipline of the financial markets. If a monopoly, with potentially low costs, fails to perform, then it may be a subject to takeover bid.

4. Stability of Prices

In a monopoly market the prices are most of the times stable. This happens because there is only one firm involved in the market that sets the prices if and when it feels like. In other types of market structures prices are not stable and tend to be elastic as a result of the competition that exists but this is not the case in a monopoly market as there is little or no competition at all.

5. Source of Revenue for the Government

The government gets revenue in form of taxation from monopoly firms.

6. Massive Profits

Due to the absence of competitors which leads to high number of sales monopoly firms tend to receive super profits from their operations. The massive profits realized may be used in such things as launching other products, carrying out research and development among many other things that may be beneficial to the firm.

Disadvantages

Following are the disadvantages of monopoly:

1. Exploitation of Consumers

A monopoly market is best known for consumer exploitation. There are indeed no competing products and as a result the consumer gets a raw deal in terms of quantity, quality and pricing. The firm may find it easy to produce inferior or sub-standard goods if

it wishes because the end of the day they know very well that the items will be purchased as there are no competing products for the already available market.

2. Dissatisfied Consumers

Consumers get a raw deal from a monopoly market because quality will be compromised. Therefore it is not a wonder to see very dissatisfied consumers who often complain about the firm's products.

3. Higher Prices

No competition in the market means absence of such things as price wars that may have benefited the consumer and as a result of this monopoly firms tend to charge higher prices on goods and services hence inconveniencing the buyer.

4. Price Discrimination

Monopoly firms are also sometimes known for practicing price discrimination where they charge different prices on the same product for different consumers.

5. Inferior Goods and Services

Competition is minimal or totally absent and as such the monopoly firm may willingly produce inferior goods and services because after all they know the goods will not fail to sell.

6. Prices and Costs

These will be higher than under perfect competition. Under perfect competition, firms are forced to produce at the lowest cost possible, taking into account the current state of technology and available resources, which keeps prices down while allowing them to make a reasonable profit. However, barriers to entry allow the monopolist to charge higher prices and make large profits, even if it is not producing in the most efficient way.

Q15. Distinguish between Perfect Competition and Monopoly

Ans :

S.No.	Points of comparison	Perfect competition	Monopoly
1.	**Relation between AR**	AR = MR	AR > MR
2.	**Profit in the long-run long-run**	Normal profits in the long-run also.	Supernormal profits in the
3.	**Number of sellers**	Large number of sellers	Single seller
4.	**Barriers to entry and exit**	Free entry and exit, as there are no barriers.	There are strong barriers
5.	**Control on price taker**	The seller is only the price inelastic.	Monopolist is the price maker
6.	**Nature of demand-curve**	Perfectly elastic	Inelastic
7.	**Relationship between firm and industry**	Each firm is a part of the industry.	Firm and industry are one and the same.

5.4.4 Allocative Inefficiency

Q16. Explain various Allocative Inefficiency involved in monopoly market.

Ans :

Major inefficiencies associated with monopolies include :

1. **Allocative inefficiency -** prices will tend to be higher, and output lower, than what would exist in a market with low barriers to entry. Prices will tend to be higher than both marginal costs and average total cost.

2. **Weakened market forces -** when consumers of a product have many alternatives, producers must serve their customers efficiently in order to stay in business. If consumers can't purchase competitive products easily, the monopolist doesn't need to worry a lot about losing customers when poor service or a poor quality good is provided.

3. **Rent or favor seeking -** firms and/or individuals will put a great deal of effort into obtaining or maintaining high entry barriers; by doing so, they hope to achieve monopoly-type profits. Such efforts enrich some people, at the expense of many others.

PROBLEMS

1. **The following demand function and total cost function of a monopolist are given. Calculate his marginal revenue and marginal cost. At what level of output, the monopolist will be in equilibrium. What price will be set at the equilibrium output and calculate total profits made by him.**

Price (Rs.)	Quantity sold	Total cost (Rs.)
15	1	12
14	2	22
13	3	31
12	4	39
11	5	46
10	6	54
9	7	64
8	8	75

Sol :

In order to find marginal revenue (MR) we have first to calculate total revenue (TR). MR = TR_n – TR_{n-1} and marginal cost which is TC_n – TC_{n-1}. The monopolist will be in equilibrium at the level of output at which MR = MC. Calculating TR, MR and MC we have the following table.

It will be seen from the table given below that MC = MR when 5 units of out-put are sold. Therefore, to be in equilibrium the monopolist will produce 5 units to maximize his profits.

Table : Finding Equilibrium Output

Price (P) Rs.	Quantity sold (Q)	TR (P × Q)	MR $TR_n - TR_{n-1}$	TC Rs.	MC $TC_n - TC_{n-1}$
15	1	15	15	12	12
14	2	28	13	22	10
13	3	39	11	31	9
12	4	48	9	39	8
11	5	55	7	46	7
10	6	60	5	54	8
9	7	63	3	64	10
8	8	64	1	75	11

Table : At Equilibrium Output, Price = AR = $\frac{TR}{Q} = \frac{55}{5} = 11$

Total profits = TR – TC = 55 – 46 = 9

2. Suppose a monopolist faces the following demand schedule

Demand Schedule

Price	Quantity
100	0
90	5
80	10
70	15
60	20
50	25
40	30
30	35

(i) Calculate the marginal revenue. If marginal cost is Rs. 50 what is the profit-maximizing level of output and price.

(ii) If price is set equal to marginal cost, what will be the output that the monopoly will produce?

Sol :

Note that in this problem quantity demanded sold, increases by blocks of 5 units and price changes by blocks of Rs. 10. This should be kept in mind while calculating marginal revenue.

Price (P) Rs.	Quantity demanded or sold (Q)	Total Revenue (TR) (P × Q)	MR $\left(=\frac{\Delta TR}{\Delta Q}\right)$
100	0	0	0
90	5	450	$\frac{450}{5}$ = 90 (450-0)
80	10	800	$\frac{350}{5}$ = 70 (800-40)
70	15	1050	$\frac{250}{5}$ = 50 (1050-800)
60	20	1200	$\frac{150}{5}$ = 30 (1200-1050)
50	25	1250	$\frac{50}{5}$ = 10 (1250-1200)
40	30	1200	$\frac{-50}{5}$ = – 10 (1200-1200)
30	35	1050	$\frac{-150}{5}$ = – 30 (1250-1200)

To obtain marginal revenue we have first to calculate total revenue (TR) which is equal to P × Q. Then marginal revenue (MR) = $\frac{\Delta TR}{\Delta Q}$. We have calculated MR above.

Given marginal cost equal to Rs.50, the profit-maximizing condition of MC = MR is satisfied when 15 units of the product are sold. It will be seen from the above table that with 15 units of output sale price of the product is Rs. 70 per unit.

If price is set equal to marginal cost, that is, Rs. 50, then, as wilt be seen from the above table, 25 units of output will be produced and sold by the monopolist.

3. A monopolist faces a demand curve, P = 100-2Q. If marginal cost is constant and is equal to 20. How much output the monopolist will produce to maximize profits. What is the amount of profits made by the monopolist ?

Sol :

For monopoly equilibrium, MR = MC.

The given demand curve is P = 100 – 2Q

$$TR = PQ = 100Q - 2Q^2$$

$$MR = \frac{d(TR)}{dQ} = \frac{d(PQ)}{dQ}$$

$= 100 - 4Q$

Equating MR with MC (=20) we have

$100 - 4Q = 20$

$4Q = 100 - 20 = 80$

$$Q = \frac{80}{4} = 20$$

To obtain equilibrium price we substitute Q = 20 in the given demand function. Thus

$P = 100 - 2 \times 20$

$= 100 - 40 = \text{Rs. } 60$

4. Suppose the following demand and total cost functions of a monopolist are given

$Q = 360 - 20P$ (demand function)

$TC = 6Q + 0.05Q^2$ (cost function)

Determine equilibrium output of the monopolist. What price will be charged in this equilibrium solution ?

Sol :

In order to find the profit-maximizing solution we have to derive the marginal revenue and marginal cost from the demand and cost equations given above. In order to find out the marginal revenue we have to first obtain the total revenue function.

Rearranging to obtain the inverse demand function we have

$Q = 36^o - 20P$

$20P = 360 - Q$

$P = 18 - 0.05Q$ (inverse demand function) ...(i)

Total revenue (TR) = $P.Q = 18Q - 0.05Q^2$

Differentiating TR function with respect to output Q, we can get MR. Thus,

$$MR = \frac{\Delta TR}{\Delta Q} = \frac{\Delta(P.Q)}{\Delta Q} = 18 - 0.1Q \quad \text{...(ii)}$$

Marginal cost can be obtained by differentiating the given total cost function ($TC = 6Q + 0.05Q^2$) with repeat to output (Q). Thus

$$MC = \frac{\Delta TC}{\Delta C} = 6 + 0.1Q \quad \text{...(iii)}$$

Since the profits of the monopolist will be maximized when he equates marginal revenue with marginal cost, setting MR = MC, we have

$MR = MC$

$18 - 0.1Q = 6 + 0.1Q$

$$0.2Q = 18 - 6 = 12$$

$$Q = 12 \times \frac{10}{2} = 60$$

Substituting Q = 60 in the inverse demand function (i) we have

$$P = 18 - 0.05 \times 60 = 15$$

$$TR - P.Q = 15 \times 60 = 900$$

$$TC = 6Q + 0.05Q^2 = 6 \times 60 + 0.05\ (60)^2$$

$$= 360 + \frac{5}{100} \times 3600 = 540$$

Profits = TR-TC = 900 – 540 = 360

Thus, output (Q) = 60; price (P) = 15 and profits = Rs. 360

5. A monopolist has the following total cost function TC = 10 + 5Q

(i) If the price elasticity of demand for his products is - 2, find out price he will fix for his product.

(ii) If the price elasticity of demand for his product changes to -4, how will he change his price ?

Sol :

$$TC = 10 + 5Q$$

$$MC = \frac{\Delta TC}{\Delta Q} = 5 \qquad \ldots (1)$$

The relationship between MR, price and price elasticity of demand (e) is

$$MR = P\left(1 + \frac{1}{e}\right)$$

Given that price elasticity of demand is – 2,

$$MR = P\left(1 + \frac{1}{-2}\right) = P\left(1 - \frac{1}{2}\right)$$

$$MR = \frac{1}{2}P \qquad \ldots(2)$$

In equilibrium MR = MC

$$\frac{1}{2}P = 5$$

$$P = 5 \times 2 = 10$$

Given that price elasticity of demand, e = – 4

$$MR = P\left(1+\frac{1}{-4}\right) = P\left(1-\frac{1}{4}\right) = \frac{3}{4}P$$

In equilibrium MR = MC

$$\frac{3}{4}P = 5;\ P = 5 \times \frac{4}{3} = 6.67$$

Thus, with the increase in absolute value of price elasticity of demand, monopolist will reduce the price of his product.

6. Given the following linear demand and cost functions, show that monopolist will produce half the output under perfect competition.

Q = 300 – 2P (Linear demand function)

TC = 150 + 10Q

Sol :

$$TC = 150 + 10Q$$

$$MC = \frac{\Delta TC}{\Delta Q} = 10 \quad ...(i)$$

Now, the given linear demand function is

$$Q = 300 - 2P$$

$$2P = 300 - Q$$

$$P = 150 - 0.5Q \quad ...(ii)$$

$$TR = PQ = 150Q - 0.5Q^2$$

$$MR = \frac{\Delta(PQ)}{\Delta Q} = 150 - Q \quad ...(iii)$$

Output under perfect competition is determined where MC = P

Thus, in equilibrium under perfect competition

$$10 = 150 - 0.5Q$$

$$0.5Q = 150 - 10 = 140$$

Hence, $Q_{PC} = 280$ ...(iv)

In equilibrium under monopoly,

$$MR = MC$$

We know MR = 150 – Q and from (i)

We know that MC = 10

Thus, in equilibrium under monopoly

$$150 - Q = 10$$

$$Q = 150 - 10 = 140$$

Thus, $Q_n = 140$

Comparing (iv) and (v) we find that output under monopoly is half of that under competition.

7. A firm's total variable cost is given by the following:

$$TVC = 75Q - 10Q^2 + Q^3$$

Will the firm produce the product if the price of the product is Rs. 40/-?

Sol : **(June-16)**

A firm should produce a product if price of the product exceeds its minimum average variable cost.

$$AVC = \frac{TVC}{Q} = \frac{75Q - 10Q^2 + Q^3}{Q}$$

$$= 75 - 10Q + Q^2$$

AVC is minimized at the output level at which.

$$\frac{d(AVC)}{dQ} = 0.$$

Taking the derivative of AVC

$$\frac{d(AVC)}{dQ} = -10 + 2Q$$

Therefore, AVC will be minimum, when

$$-10 + 2Q = 0$$

$$2Q = 10 \Rightarrow Q = 5$$

Now substituting the value of Q in the equation for AVC,

Minimum AVC $= 75 - 10 \times 5 + 25$

$= 100 - 50$

$= 50.$

Thus, price of `40 of the product is less than the minimum average variable cost, the firm will not produce the product.

8. A firm producing bread in operating in a perfectly competitive market. The firm's variable cost function is given by :

$$TVC = 150\,Q - 20Q^2 + Q^3$$

Determine below what price the firm should shut down production in the short run.

Sol : **(Dec.-15)**

$TVC = 150Q - 20\,Q^2 + Q^3$

In the short run, a firm will shut down operations if the price fall below the level of minimum average variable cost. So, we first determine the minimum average variable cost.

$$AVC = \frac{TVC}{Q} = \frac{150\,Q}{Q} - \frac{20\,Q^2}{Q} + \frac{Q^3}{Q}$$

$$AVC = 150 - 20Q + Q2$$

To determine the level of output at which average variable cost is minimum, we take the first derivative of the AVC function & set it equal to zero.

$$\frac{d(AVC)}{dQ} = -20 + 2Q$$

$$2Q = 20$$

$$Q = 10$$

Now substitute the value of Q in the AVC function, we know the minimum average variable cost.

$$AVC = 150 - 20 \times 10 + (10)^2$$

$$= 150 - 200 + 100 = 50$$

Thus, if the price falls below Rs. 50 per unit, the firm will shutdown.

9. A monopolist faces a demand curve P = 700 – 2Q. If the marginal cost is constant and is equal to 20. What is the amount at profit made by a monopolist ? What is dead weight welfare loss on account at monopoly?

Sol : **(Dec.-15)**

For monopoly equilibrium, MR = MC

Given demand curve : P = 100 – 2Q

$$TR = P \times Q = 100\,Q - 2Q^2$$

$$MR = \frac{d(TR)}{dQ} = \frac{d(pQ)}{dQ} = 100 - 4Q$$

Equating MR with MC (= 20) we have,

$$100 - 4Q = 22$$

$$4Q = 80$$

$$Q = 20$$

To obtain equilibrium price, substitute Q = 20 in the given demand function. Thus

$$P = 100 - 2 \times 20 = 60 \text{ `}$$

Welfare is maximized when the output produced price equals to marginal cost under the conditions of perfect competition. thus, equating price with marginal cost.

$$P = MC$$

$$100 - 2Q = 20$$

$$2Q = 80$$

$$Q = 40$$

The dead weight loss of welfare is :

$$= \frac{1}{2}(40 \times 20) = \frac{1}{2} \times 800 = 400$$

This dead weight loss represents social cost of monopoly.

5.5 Income Transfer and Rent Seeking

Q17. What do you understand by income transfer and Rent seeking?

Ans :

When a firm uses its resources to procure an unwarranted monetary gain from external elements, be it directly or indirectly, without giving anything in return to them or the society, it is termed as rent-seeking.

Instead of creating wealth, a firm seeks to obtain financial gains from others through alteration/ manipulation of the environment where economic activities take place. A popular example for rent-seeking is political lobbying by companies. These are primarily done by companies in order to make economic gains through government action.

This might be done by a company to get subsidy from the government for the product which it produces or increasing tariff rates by the government for its services, etc. Such a practice neither leads to creation of new wealth, nor does it benefit the society.

Rent seeking can disrupt market efficiencies and create pricing disadvantages for market participants. It has been known to cause limited competition and high barriers to entry.

Those that benefit from successful rent seeking obtain added economic rents without any added obligations. This can potentially create unfair advantages, specifically providing wealth to certain businesses that leads to greater market share at the detriment of competitors.

Lastly, rent seeking wealth is typically a function of taxpayer funding. These tax revenues are used to provide economic wealth for rent seekers but may or may not improve the economic climate or produce any benefits for taxpayers-at-large. This can lead to disparaging funds that lack regeneration and require higher taxes in the future.

5.6 Price Discrimination

Q18. What is price discriminations ? Explain factors and different types of price discriminations.

Ans :

Price discrimination takes place when the seller sells the same product at more than one price.

Example

A cloth seller may sell the same cloth to different consumers at different prices.

An airlines company can sell the tickets of a certain flight at the different prices. It may charge high prices to business travellers and low to college students.

Price discrimination also takes place when same products are sold at prices which are in different ratios to their marginal costs. In price discrimination, the differences in the price between same products should display cost differences.

Factors

The following are the factors that determine the degree of price discrimination.

a) Purchasing power

The firm is likely to charge a high price from a customer who has the ability to pay a higher price. Urgency, quality consciousness, indispensability, high quality living, and so forth are some of the factors that compel the rich customers to pay a high price.

b) Quantity bought

A customer buying large number of units is relatively charged a lower rate per unit.

c) Customers from different market conditions

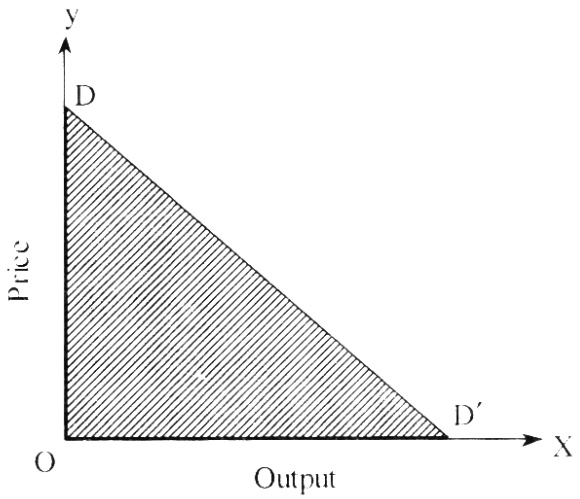
If the goods are bought for further processing or resale, the buyer may be charged a lower price. If the goods are bought for ultimate consumption, the buyer may be charged relatively higher.

Types

The degree of price discrimination is ascertained on the basis of the magnitude of the loss of consumers surplus caused by it. The term consumer surplus denotes what the consumer saves by actually paying price less than what he is willing to pay. The loss of consumer surplus takes place because the consumer is required to pay high price now. The size of the loss of consumer surplus depends upon the degree of price discrimination.

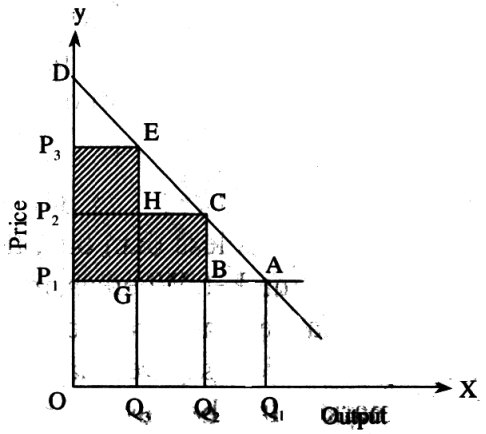
i) First-degree Price Discrimination

If the monopolist charges different prices from each different consumer, then it is called the first-degree discrimination. In fact, the first degree price discrimination indicates as many prices as many consumers. This type of price discrimination completely wipes out the consumer surplus.



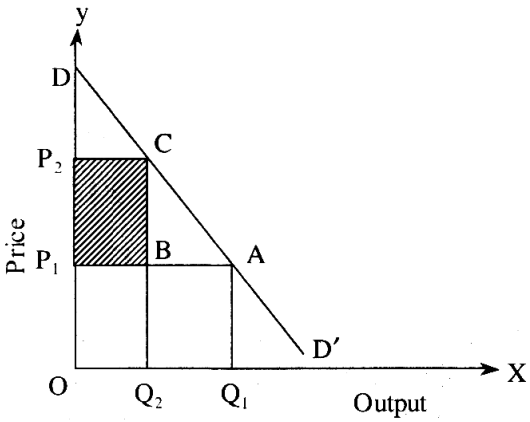
ii) Second degree Price Discrimination

If the monopolist divides the total market for his product into more than two sub-markets and sells his output at more than two different prices, it is called second- degree price discrimination. The figure explains the second- degree price discrimination. If the monopolist sells his whole output OQ_1 at price P_1, he would receive total revenue $OQ_1 AP_1$ and the consumer surplus DP_1A.



If the monopolist can sell OQ_3, at P_3 price Q_3Q_2 output at P_2 price and Q_2Q_1 output at P_1 price and Q_2Q_1 output at P_1 price, then his total revenue would be $OQ_3EP_3 + Q_3Q_2 CH + Q_2Q_1 AB$. As a result, the loss of consumer surplus increases as denoted by the shaded areas.

iii) Third-degree Price Discrimination



If the monopolist divides the total market for his product into two sub-markets and sells his output at two different prices, it is called third-degree of price discrimination.

The figure explains the third-degree price discrimination. If the monopolist sells the whole output OQ_1 at price P_1, he would receive total revenue $OQ_1 AP_1$ and consumer surplus is DP_1A.

Let us now assume that the monopolist sells OQ_2 output at price P_2 and the remaining quantity at price P_1, then his total revenue would be $OQ_2CP_2 + Q_2Q_1AB$. Thus, as a

result of price discrimination the monopolist's total revenue has increased by P_1BCP_2 which represents the loss to consumers. Hence, due to price discrimination the loss of consumer surplus is equal to P_1BCP_2 as denoted by the shaded rectangle.

5.7 MONOPOLISTIC COMPETITION

5.7.1 Characteristics

Q19. What is monopolistic competition? Explain the Characteristics of monopolistic competition.

(OR)

State the characteristics of monopolistic competition.

Ans : **(Dec.-20)**

Meaning

Monopolistic competition refers to a market situation where there are many firms selling a differentiated product. "There is competition which is keen, though not perfect, among many firms making very similar products". No firm can have any perceptible influence on the price-output policies of the other sellers nor can it be influenced much by their actions. Thus, monopolistic competition refers to competition among a large number of sellers producing close but not perfect substitutes for each other.

Definitions

i) **According to J.S. Bains,** "Monopolistic competition is market structure where there is a long number of small sellers, selling differentiated but close substitute products".

ii) **According to Baumoul,** "The term monopolistic competition refers to the market structure in which the sellers do have a monopoly (they are the only sellers) of their own product, but they are also subject to substantial competitive pressures from sellers of substitute product".

Monopolistic competition is the main form of imperfect competition. Thus, imperfect competition is a market situation wherein one or more conditions of perfect competition are absent.

Features

Monopolistic competition is a modern form of the market. A large variety of goods are sold in such a market. Its main features can be stated as follows :

i) Large Number

The number of firms operating under monopolistic competition is sufficiently large. Moreover there is freedom of entry. There are no quantitative restrictions or differences in market conditions. However, each firm differs from its rivals in some qualitative respect.

ii) Close Substitutes

In case of a monopoly there are no substitutes available. Under monopolistic competition firms produce very close substitutes. Chocolates of one company may serve a similar purpose as that of some other firm. The only difference may be of some variation in the quality of the product.

iii) Group

Firms under monopolistic competition together form a group. They cannot be called an industry. This is because their products are somewhat dissimilar and not homogenous as under competitive industry.

iv) Product Differentiation

Under monopolistic competition products are differentiated. This is the outstanding feature of this form of market. Otherwise monopolistic competition closely resembles perfect competition. The fundamental difference between the two is that products are no more homogenous. Goods produced are deliberately differentiated.

v) Selling (Advertising) Cost

Selling Cost (SC) is another outstanding feature of a monopolistic competitive market. This in the form of advertisement expenditure. Selling Cost and Product Differentiation together enable the producer to maintain some control over market conditions and influence the shape of the demand curve. Both features are interdependent.

5.7.2 Profit Maximization – Price and output determination in the short run and long run

Q20. How is price output determined under monopolistic competition.

Ans : **(Dec.-20,Dec.-16)**

It is common that every firm whether operating under perfect market or imperfect market, wants to maximize the profits. It means that the firm under monopolistic competition also will reach equilibrium when its marginal cost equals its marginal revenue (MC = MR). The demand curve for the firm in case of monopolistic competition is just similar to that of monopolist.

As the products are differentiated, the demand curve has a downward slope, In other words, each firm has a limited control over price. These firms are price makers as far a given group of customers is concerned. The demand for their products and services is relatively inelastic. The degree of elasticity of demand of a firm in monopolistic competition depends upon the extent to which the firm can resort to product differentiation. The greater the ability of the firm to differentiate the product, the less elastic the demand is. The firm's influence to increase the price depends upon the extent to which it can differentiate the product. At lower prices, the firm can sell more. There is no significant variant in the cost functions also.

A) Price Output Determination in Short-run

In the short-run, firms may experience supernormal or normal profits or even losses. When there is a fall in costs or increase in demand, the firms may enjoy supernormal profits. In other words, if the firm satisfies the following two conditions, it may take supernormal profits.

a) Where marginal cost is equal to marginal revenue (MC = MR).

b) Where a average revenue is less than average cost (AR < AC).

The firm may be in losses when the costs rise or demand decreases.

Figure below reveals that the demand curve is a downward sloping curve because of product differentiation. The cost functions of a firm are not different from those of earlier market situations. At F, marginal cost (MC) is equal to marginal revenue (MR), extend F to point B on average revenue (AR) curve and Point Q on X axis.

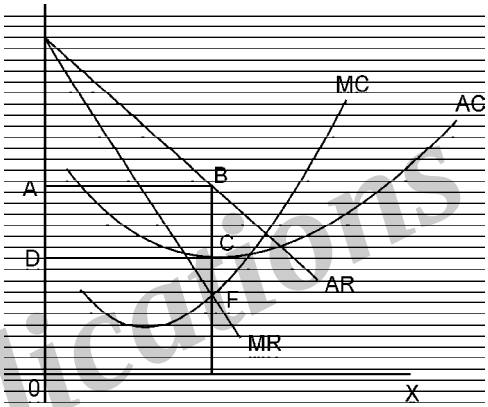


Fig.: Price-Output Determination in Monopolistic Competition in the Short-run

OQ is the equilibrium output, OA = OB = Equilibrium price and QC is the average cost. Average profit = average revenue minus average cost. BC is the average profit.

Profit × Quantity = Total profit.

The area ABCD represents the supernormal profits earned by a firm under monopolistic competition in the short-run.

B) Price Output Determination in Long run

More and more firms will be entering the market having been attracted by supernormal profits enjoyed by the existing firms in the industry. As a result, competition becomes intensive on one hand, firms will compete with one another for acquiring scarce inputs pushing up the prices of factor inputs. On the other hand, on the entry of several firms the supply in the market will increase, pulling down the selling price of the products.

In order to cope with the competition, the firms will have to increase the budget on

advertising. The entry of new firms continue till the supernormal profits of the firms completely get eroded and ultimately firms in the industry will earn only normal profits. Those firms which are not able to earn at least normal profits will get closed.

Thus in the long-run, every firm in the monopolistic competitive industry will earn only normal profits, which are just sufficient to stay in the business. It is to be noted that normal profits are part of average costs.

In the long-run, in order to achieve equilibrium position, the firm has to fulfil the following two conditions:

a) MR = MC

b) AR = AC

At the equilibrium level of output.

Thus, the firm has to fulfil dual equilibrium conditions as mentioned above. But when compared to long run equilibrium position of a perfectly competitive firm, even though AR = AC, AC will not be at its minimum point at equilibrium level of output. And also, MR is not equal to either AR or AC, MR is well below AR in the case of monopolistic competitive firm.

Why Average Cost (AC) is not Equal to Average Revenue (AR) at its Minimum Point

It is because, the average cost (AC) can be tangential to the downward slopping average revenue (AR) curve only at higher than its minimum point. The average cost (AC) is higher in case of monopolistic competitive firms because of excess or idle capacity and high advertising costs.

From Fig. below, it can be observed that in the long-run, the average cost (AC) curve will be tangential to the downward sloping average revenue (AR) curve at point E. It can be noted that the average cost curve is tangential to the average revenue curve at higher than its minimum point F. MR = MC at point K. OQ is the equilibrium output and OP is the equilibrium price.

Thus, in the long-run, a firm under monopolistic competition achieves equilibrium price and output level when both conditions of equilibrium are satisfied.

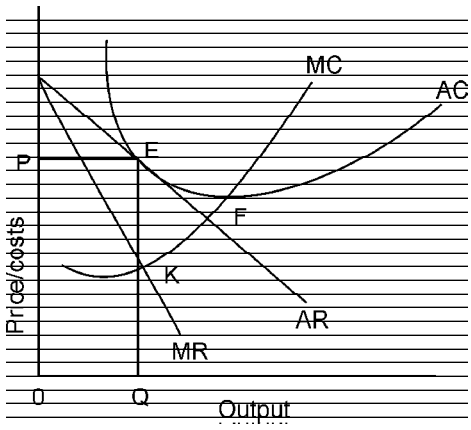


Fig.: Price-output Determination in Monopolistic Competition in the Long run

Q21. What are the advantages and disadvantages of Monopolistic Competition ?

Ans :

Advantages

The advantages of monopolistic competition are as follows:

1. Promotion of Competition (Lack of Barriers to Entry)

In such a market, one of its primary aspects is that there a lack of barriers to entry (factors that cause difficulty for a new firm to enter the market, e.g., intellectual property rights, advertising, large start-up costs, etc.), hence making it relatively easy for firms to enter and exit the market. This therefore ensures (atleast in the long run) no 'single firm' will find themselves with monopoly power (and with that - the ability to exploit consumers), due to new entering firms to the market.

2. Differentiation Brings Greater Consumer Choice and Variety

One of the main positives to come out of a monopolistically competitive market is that in order to be a competitive firm within such a marketplace, a firm's primary goal is to differentiate itself from others in order to gain greater custom than its rival competitors - essentially appealing to consumer sovereignty (where consumers determine the goods to be produced within a market). With this, is

the provision of greater choice and variety of products and services for consumers to purchase from they have a wider range of consumer choice as opposed to just a single choice (either just one product - monopoly - or all the products are generic and homogenous - perfectly competitive).

3. Product and Service Quality Development

An advantage of monopolistic competition is that it enhances a firm's ability to improve a product's quality through its brand. Economists defend branding as a way to enhance trust and reliability to the consumer. Brands strengthen the need to maintain high quality based on the business's financial stake in its reputation.

4. Consumers Become More Knowledgeable of Products

A positive externality from monopolistic competition and the intense advertising and marketing that accompanies it, is that due to firms trying to differentiate their products - consumers become more informed and aware of their options regarding such products and services. They can gain an understanding of the unique features and aspects that certain products have compared to that of others. Hence, with this comes further competition, as firms can recognize what consumers are wanting to a better degree.

Disadvantages

Following are the disadvantages of monopolistic competition:

1. Liable of Excess Capacity

A negative factor of firms that are in monopolistic competition is that' they do not produce enough output to efficiently lower the average cost and benefit from economies of scale. They are reducing their 'economic profits', as a result of the marginal revenue being less than that of the marginal cost. Moreover, the funding and expense that goes into packaging, marketing and advertising can deemed extremely wasteful on some levels.

2. Allocatively Inefficient

Compared with perfect competition, it can be shown that such firms that there is an element of allocation efficiency as the price is above that of the marginal cost curve - less so in the long- run, due to more competition. As the demand curve is one which is downward sloping this then implies the price has to be greater than the marginal cost for a monopolistically competitive firm. Hence it is allocatively inefficient as not enough of the product gets produced for society to benefit - they want more, however this would force the company to lose money.

3. Higher Prices

Another drawback of a monopolistic competition is that as a result of firms having 'some market power', they can mark-up on the marginal cost of revenue. Compared to a perfectly competitive firm, who have their price equal to their marginal cost. This would be difficult for a governmental authority to regulate for two reasons:

(i) There are many firms; and

(ii) They would be making a loss - hence eventually forcing such firms out of business.

4. Advertising

Advertising and marketing can be beneficial to consumers on some levels such as providing information to customers and from this an increase in competition; it can also have negative impacts on consumer sovereignty. It is argued to manipulate and distort what consumers desire, as well as obviously reducing competition as consumers become captivated over the perception of differentiation.

PROBLEMS

10. In Hyderabad the movie market is monopolistically competitive. In the longeron, the demand for movies of Srinivasa Theatre is given by

P = 5-0.002 Q

Q is the number of persons watching a movie per month. The AC function is given by

AC = 6–0.004 Q + 0.00 0001Q^2. To maximize profit, what price should the srinivasa Theatre charge? What will be the number of people buying the tickets.

Sol : **(June-16)**

$P = 5 - 0.002Q$

$TR = P.Q$

$TR = 5Q - 0.002Q^2$

$$MR = \frac{\Delta TR}{\Delta Q} = \frac{\Delta(P.Q)}{\Delta Q} = 5 - 0.002Q$$

Marginal cost can be obtained by differentiating the total function.

$$TC = 6 - 0.004Q + 0.000001Q2$$

$$MC = \frac{\Delta TC}{\Delta Q} = -0.004 + 0.000001Q$$

$$MR = MC$$

$$5 - 0.002Q = -0.004 + 0.000001Q$$

$$5 + 0.004 = 0.002 + 0.000001Q$$

$$5.004 = 0.002001Q$$

$$Q = \frac{5.004}{0.002001} = 2501 \text{ units}$$

$$Q = 2501 \text{ units}$$

5.8 OLIGOPOLY

5.8.1 Characteristics

Q22. Define oligopoly. Explain the Characteristics of oligopoly.

(OR)

What are the characteristics of oligopoly market?

Ans : **(Dec.-20, Jan.-20, Jan.-18, Dec.-16)**

Oligopoly is situation where a few large firms compete against each other and there is an element of interdependence in the decision-making of these firms. Each firm in the oligopoly recognizes this

interdependence. Any decision one firm makes (be it on price, product or promotion) will affect the trade of the competitors and so results in countermoves. As a result, one's competitor's behaviour depends on one's own behaviour, and this must be taken account of when decisions are made. A major policy change on the part of one firm will have obvious and immediate effects on its competitors.

Definitions

- **According to P.C. Dooley,** "An oligopoly is a market of only a few sellers, offering either homogenous or differentiated products. There are so few sellers that they recognize their mutual dependence."
- **According to Mansfield,** "Oligopoly is a market structure characterized by a small number of firms and a great deal of interdependence."
- **According to Grinols, "**An oligopoly is a market situation in which each of a small number of interdependent, competing producers influences but does not control the market".
- **According to Mc Connell,** "Oligopoly is a market situation in which number of firms in an industry is, so small that each must consider the reactions of rivals in formulating its price policy."

Features

1. Few Firms

Oligopoly is the market in which few firms compete with each other. The simplest model of oligopoly is duopoly. Duopoly is the market structure when only two firms produced and supply the product.

2. Nature of the Product

All the new firms produce an identical product. Such market is called pure or perfect oligopoly. Where product differentiation is there then it is called imperfect oligopoly.

3. Interdependence of Firms

There is interdependence among firms. Each firm threats the other firms as its rivals.

4. Indeterminateness

The oligopoly firm's demand curve for the product is in determinant because the firm cannot assume that the rival firms will not change their prices in response to change in price effected by it.

5. Complex Market Structure

The market structure of oligopoly is quite complex. On one hand there is a rival and on the other hand there may be collusion. Cartel is an example of collusive oligopoly. The non-collusive oligopoly is the other form of complex market structure.

6. Selling Costs

Each firm pursues an aggressive and defensive marketing strategy to gain a greater share in the market. Advertising is an important method used by oligopolist to gain larger share in the market. The costs incurred on advertisements are selling costs.

Q23. Explain the classification of Oligopoly.

Ans :

The oligopoly may be classified in the following categories:

1. Perfect (or) Imperfect Oligopoly

Perfect oligopoly is that situation in which all the firms produce homogeneous products. It is also known as pure oligopoly. On the other hand imperfect or differentiated oligopoly is that market situation in which all firms produce differentiated but close substitutes.

2. Open (or) Closed Oligopoly

Open oligopoly is that market situation in which there is no barrier on the entry of the firm in the industry. The entry of the firm is free. But in the situation of closed oligopoly there is barrier on the entry of the firm in the industry. The barrier may be technological, legal or of any other type.

3. Partial (or) Full Oligopoly

Partial oligopoly is that situation in which there is a dominant firm in the industry. This dominant firm is called the price leader. The

dominant firm or the price leader fixes the price and others follow that price. Full oligopoly, on the other hand, is that situation in which there is no dominant firm or price leader.

4. Collusive (or) Non-collusive Oligopoly

Collusive oligopoly is that oligopoly in which the firms cooperate with each other in determining the price. They follow a common price policy and do not compete with each other. Non-collusive oligopoly is that oligopoly in which the firms act independently. They compete with each other and determine independently the price of their products.

5.8.2 Price Leadership

Q24. What are the different types of price leadership that may be established in oligopolistic market situation.

Ans :

Price leadership is an important oligopoly problem and is similar to collusive oligopoly model. Price leadership comes into existence either through tacit or formal agreement. But as the formal or open agreement to establish price leadership are generally illegal, price leadership is established as a result of informal and tacit understanding between the oligopolists. The competing oligopolists in an informal meeting choose a leader and agree to follow him in setting price.

Types of Price Leadership

1. Price leadership by a low-cost firm

In order to maximize profits the low-cost firm sets a lower price than the profit-maximizing price of the high-cost firms. Since the high-cost firms will not be able to sell their product at the higher price, they are forced to agree to the low price set by the low-cost firm. Of course, the low-cost price leader has to ensure that the price which he sets must yields some profits to the high cost firms their followers.

2. Price leadership of the dominant firm

Under this one of the few firms in the industry may be producing a vary large proportion of the total production of the industry and may therefore dominate the market for the product. This dominant firm wields a great influence over the market for the product, while other firms are small and are incapable of making any impact on the market. As a result, the dominant firm estimates its own demand curve and fixes a price which maximizes its own profits. The other firms which are small having no individual effects on the price, follow the dominant firm and accepting the price set by it adjust their output accordingly.

Q25. Assuming that there are two firms producing homogeneous products explain price and output are determined where there is price leadership by

(a) The lower cost firm

(b) The dominant firm

Ans :

a) Price-Output Determination under Low-Cost Price Leadership

Economists have developed various models concerning price-output determination under price leadership making different assumptions about the behaviour of price leader and his followers. We shall first explain price-output determination under price leadership by a low-cost firm. In order to simplify our analysis we make the following assumptions:

1. There are two firms, A and B. The firm A has a lower cost of production than B.
2. The product produced by the two firms is homogeneous so that the consumers have no preference between them.
3. Each of the two firms has equal share in the market. In other words, demand curve facing each firm will be the same and will be half of the total market demand curve of product.

Given the above assumptions, price and output determination under price leadership is illustrated in Fig. Each firm is facing demand curve d which is half of the total market demand curve DD for the product. MR is the marginal revenue curve of each

firm. AC_a and MC_a are the average and marginal cost curves of firm A and AC_b and MC_b are the average and marginal cost curves of firm B. Cost curves of firm A lie below the cost curves of firm B because we are assuming that firm A has a lower cost of production than firm B.

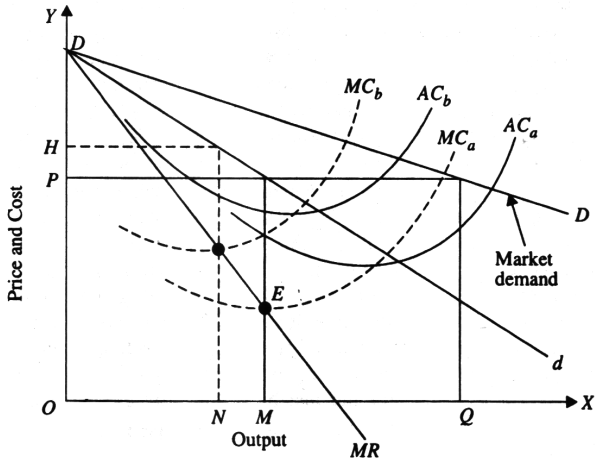


Fig. : Price Leadership by Low Cost Firm

The firm A will be maximizing its profits by selling output OM and setting price OP, since at output OM, its marginal cost is equal to the marginal revenue. Firm B's profits will be maximum when it fixes price OH and sells output ON. It will be seen from the figure that profit maximizing price OP of firm A is lower than the profit-maximizing price OH of firm B. Since the two firms are producing a homogeneous product, they cannot charge two different prices. Be-cause the profit-maximizing price OP of firm A is lower than the profit-maximizing price OH of firm B, firm A will dictate the price to the firm B or in other words, firm A will win if there is price war between the two and will emerge as a price leader and firm B will be compelled to follow. Given these facts, the agreement reached between them, even though tacit it may be, will require that the firm A will act as the price leader and firm B as the price follower.

It should be noted that firm B after having accepted firm A as the price leader will actually charge price OP and produce and sell OM. This is because at price OP, it can sell OM output like firm A because the demand curve facing each firm is the same. Thus both the firms will charge the same price OP and sell the same amount (OM). Note that the total output of the two firms will be OM + OM = OQ which will be equal to the market demand for the good at price OP. But there is an important difference between the two. While firm A, the price leader, will be maximizing its profits by selling output OM and charging price OP, the firm B will not be making maximum profits with this price-output combination because its profits are maximum at output ON and price OH. Profits earned by firm B by producing and selling output OM and charging price OP will be smaller than those of firm A because its costs are greater.

When the products of the price leader and his price-followers are differentiated, then the price charged by them will be different but the prices charged by the followers will be only slightly different either way from that of the price leader and they will conform to a definite pattern of differentials.

b) Price Leadership by the Dominant Firm

We now proceed to explain the determination of price and output when there exists price leadership by a dominant firm which is having a large share of the market with a number of small firms as followers each of which has a small share of the market. To explain this we assume that the dominant firm knows the total market demand curve for the product. Further, the dominant firm also knows

the marginal cost curves of the smaller firms whose lateral summation yields the total supply of the product by the small firms at various prices. This implies that from his past experience the dominant firm can estimate fairly well the likely supply of the product by the small firms at various prices. With this information, the leader can obtain his demand curve. Consider panel (a) of Fig. where DD is the market demand curve for the product. At each price the leader will be able to sell the part of the market demand not fulfilled by the supply from the small firms. Thus at price P_1 the small firms supply the whole of the quantity of the product demanded at that price. Therefore, demand for leader's product is zero. At price the small firms supply P_2C and therefore the remaining part of CT of the market demand will constitute the demand for the leader's product. The demand for leader's product has been separately shown in panel (b) of Fig. by the curve d_L. P_2Z in panel B is equal to CT in panel (a). At price P_3, the supply of the product by the small firms is zero. Therefore, the whole market demand B_3U will have to be satisfied by the price leader. Likewise, the other point of the demand curve for the price leader can be obtained. In panel (b) of Fig. The MR_L is the marginal revenue curve of the price leader corresponding to his demand curve d_L. AC and MC are his average and marginal cost curves. The dominant price leader will maximize his profits by producing output OQ (or PH) and setting price OP. The followers, that is, the small firms will charge the price OP and will together produce PB. [PH in panel (b) equals BS of panel (a) in Fig.].

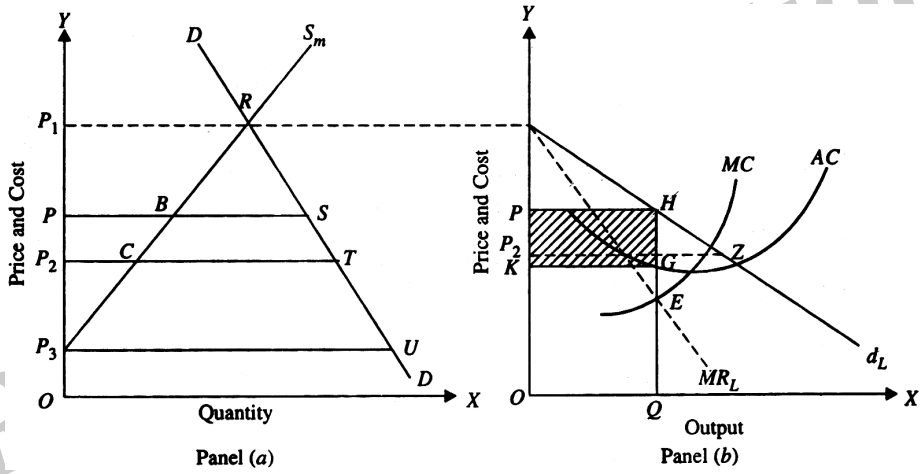


Fig. Price Leadership by Dominant Firm

It is worth noting that in order that profits of the leader are maximized it is not enough that followers should charge profit-maximizing price OP set by him, he will also have to ensure that they produce PB. If the followers produce more or less than this, given the market demand DD, the leader will be pushed to a non-profit maximizing position. This implies that if price- leadership is to remain, there must be some definite market-sharing agreement tacit though it may be.

Q26. Explain the difficulties involved in price leadership.

Ans :

Price leadership involves many difficulties in the real world.

First, the success of price leadership of a firm depends upon the correctness of his estimates about the reactions of his followers. If his estimates about the reactions of his rivals to price changes by it prove to be incorrect, then not only the success of his price policy but also his leadership in the market will be failure.

Secondly, when a price leader fixes a higher price than the followers would prefer, there is a strong tendency for the followers to make hidden price cuts in order to increase their shares of the market without openly challenging the price leader.

A good number of devices which amount to secret price cutting are used by business firms. Some of these secret price-cutting devices are the offer of rebates, favourable credit terms, 'money back' guarantees, after-delivery free services, sale on the payment of price in easy installments with low rates of interest etc., and liberal entertainment of the buyers. Price leaders are generally fed up with the increasing number of con-cessions granted by their rivals and they make an open price cut to prevent further fall in their share of the market.

Another important difficulty of maintaining price leadership is the tendency on the part of the rivals to indulge in non-price competition to increase sales while go on charging the price set by the price leader.

The devices used under 'non-price competition' include advertising and other methods of the sales promotion, like improvement of the quality of the product, besides the hidden price-product concessions mentioned above. While charging the same price, the rivals try to increase their share of the market by increasing the advertisement expenditure.

As a result of this non-price competition, the price leader has also to adopt similar devices to prevent the fall in its sales or has to make outright cut in price in order to achieve his objective. In view, of these facts, the price leader may not be able to maintain his leadership for a long time.

Further, there is a great limitation on the price leader to fix a high price of his product. This is because the high price will induce the rivals to make secret price cuts which will adversely affect the sales of the price leader.

Moreover, a high price fixed by the price leader will attract new competitors into the industry which may not accept his leadership.

Lastly, differences in costs also pose a problem. If the price leader has higher costs, then the high price fixed by him will, as mentioned above, induce the rivals to undercut price or will attract the entry of new firms into the industry.

5.8.3 Kinked Demand Model

Q27. What is Kinked Demand curve. How does the Kinked Demand curve hypothesis explain price stability under oligopoly?

(OR)

Explain the concept of Kinked Demand Model.

Ans : **(Dec.-20, Dec.-16)**

It has been observed that many oligopolistic industries exhibit an appreciable degree of price rigidity or stability. In other words, in many oligopolistic industries prices remain stick or inflexible, that is, there is no tendency on the part of the oligopolists to change the price even if the economic conditions undergo a change. Many explanations have been given of this price rigidity under oligopoly and most popular explanation is the so-called kinked demand curve hypothesis. The kinked demand curve hypothesis was put forward independently by Paul M. Sweezy, an American economist, and by Hall and Hitch Oxford economists.

It is for explaining price and output under oligopoly with product differentiation, that economists often use the kinked demand curve hypothesis. This is because when under oligopoly products are differentiated, it is unlikely that when a firm raises its price, all customers would leave it because some customers are intimately attached to it due to product differentiation.

As a result, demand curve facing a firm under differentiated oligopoly is not perfectly elastic. On the other hand, under oligopoly without product differentiation, when a firm raises its price, all its customers would leave it so that demand curve facing an oligopolist producing homogeneous product may be perfectly elastic.

Further, under oligopoly without product differentiation, there is a greater tendency on the part of the firms to join together and form a collusion, formal or tacit, and, alternatively, to accept one of them as their leader in setting their price. No doubt, kinked demand curve has a special relevance for differentiated oligopoly, but it has also been applied for explaining price and output under oligopoly without product differentiation.

The demand curve facing an oligopolist, according to the kinked demand curve hypothesis, has a 'kink' at the level of the prevailing price. The kink is formed at the prevailing price level because the segment of the demand curve above the prevailing price level is highly elastic and the segment of the demand curve below the prevailing price level is inelastic. A kinked demand curve dD with a kink at point K has been shown in Fig. The prevailing price level is OP and the firm is producing and selling the output OM. Now, the upper segment dK of the demand curve dD is relatively elastic and the lower segment KD is relatively inelastic. This difference in elasticities is due to the particular competitive reaction pattern assumed by the kinked demand curve hypothesis.

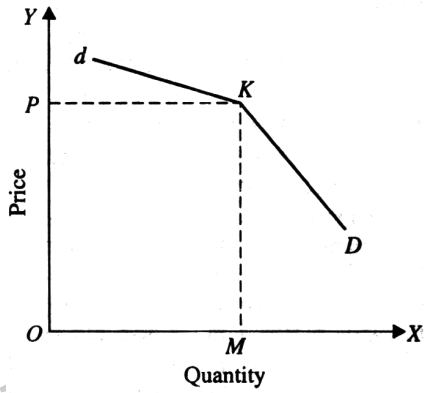


Fig. : Kinked Demand Curve under Oligopoly

The competitive reaction pattern assumed by the kinked demand curve oligopoly theory is as follows: Each oligopolist believes that if he lowers the price below the prevailing level, his competitors will follow him and will accordingly lower their prices, whereas if he raises the price above the prevailing level, his competitors will not follow his increase in price.

In other words, each oligopolistic firm believes that though its rival firms will not match his increase in price above the prevailing level, they will indeed match its price cut. These two different types of reaction of the competitors to the increase in price on the one hand and to the reduction in price on the other make the portion of the demand curve above he prevailing price level relatively elastic and the lower portion of the demand curve relatively inelastic. This is explained below:

(a) Price reduction

If the oligopolist reduces its price below the prevailing price level OP in order to increase his sales, the competitors will fear that their customers would go away from them to buy the product from the former oligopolist which has made a price cut. Therefore, in order to retain their customers they will be forced quickly to match the price cut. Because of the competitors quickly following the reduction in price by an oligopolist, he will gain in sales only very little. Very small increase in sales of an oligopolist following his reduction in price below the prevailing level means that the demand for him is inelastic below the prevailing price. Thus the segment KD of the demand curve in Fig. which lies below the prevailing price OP is inelastic showing that very little increase in sales can be obtained by a reduction in price by an oligopolist.

(b) Price increase

If an oligopolist raises his price above the prevailing level, there will be a substantial reduction in his sales. This is because as a result of the rise in his price, his customers will withdraw from him and will go to his competitors who will well-come the new customers and will gain in sales. These happy competitors will have therefore no motivation to match the price rise. The oligopolist who raises his price will be able to retain only those customers who either have a strong preference for his product (if the products are differentiated) or who cannot obtain the desired quantity of the product from the competitors because of their limited productive capacity. Large reduction in sales following an increase in price above the prevailing level by an oligopolist means that demand with respect to increases in price above the existing one is highly elastic. Thus, in Fig. the segment dK of the demand curve which lies above the current price level OP is elastic showing a large fall in sales if a producter raises his price.

It is now evident from above that each oligopolist finds himself placed in such a position that while, on the one hand, he expects his rivals to match his price cuts very quick he does not expect his rivals to match his price increases on the other. Given this expected competitive reaction pattern, each oligopolist will have a kinked demand curve dD with the upper segment dK being relatively elastic and the lower segment KD being relatively inelastic.

5.8.4 Price Rigidity

Q28. What is meant by Price Rigidity? Why are Price Rigid under oligopoly? Explain with the help of a model.

(OR)

Explain the concept of price rigidity.

Ans : **(Dec.-20, Dec.-16)**

In a kinked demand curve will have no incentive to raise its price or to lower it. Since the oligopolist will not gain a large share of the market by reducing his price below the prevailing level, and will have substantial reduction in sales by increasing his price above the prevailing level, he will be extremely reluctant to change the prevailing price. In other words, each oligopolist will adhere to the prevailing price seeing no gain in changing it. Thus, rigid prices are explained in this way by the kinked demand curve theory. In Fig. the prevailing price is OP at which kink is found in the demand curve dD. The price OP will tend to remain stable or rigid as every member of the oligopoly will not see any gain in lowering it or in increasing it. It should be noted that if the prevailing price OP is greater than average cost, more than normal profits will be made.

Further, it is worth mentioning that the oligopolist confronting a kinked demand curve will be maximizing his profits at the current price level. For finding the profit-maximizing price-output combination, marginal revenue curve MR corresponding to the kinked demand curve dD has been drawn. It is worth mentioning that the marginal revenue curve associated with a kinked demand curve is discontinuous, or in other words, it has a broken vertical portion. The length of the discontinuity depends upon the relative elasticities of two segments dK and KD of the demand curve at point K. The greater the difference in the two elasticities, the greater the length of the discontinuity. In Fig. marginal revenue curve MR corresponding to the kinked demand curve dD has been drawn which has a discontinuous portion or gap HR. Now, if the marginal cost curve of the oligopolist is such that it passes anywhere through the discontinuous portion HR of the marginal revenue curve MR, as shown in Fig. the oligopolist will be

maximizing his profits at the prevailing price level OP, that is, he will be in equilibrium at point E or at the prevailing price OP. Since the oligopolist is in equilibrium, or in other words, maximizing his profits at the prevailing price level, it will have no incentive to change the price. Furthermore, even if there are changes in costs, the price will remain stable so long as the marginal cost curve passes through the gap HR in the marginal revenue curve. In Fig. when the marginal cost curve shifts upward from MC to MC due to the rise in cost, the equilibrium price and output remain unchanged since the new marginal cost MC also passes through the gap HR.

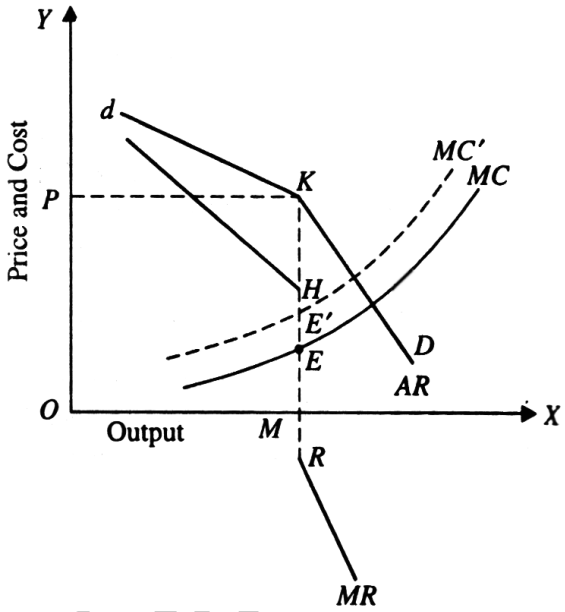


Fig. : Changes in costs within limits do not affect the oligopoly price

Likewise, the kinked demand curve theory explains that even when the demand conditions change, the price may remain stable. When the demand for the oligopolist increases and if the given marginal cost curve MC also cuts the new marginal revenue curve within the gap the same price continues to prevail in the oligopolistic market.

Short Question and Answers

1. Define market.

Ans :

The term "market" refers to a particular place where goods are purchased and sold. But, in economics, market is used in a wide perspective. In economics, the term "market" does not mean a particular place but the whole area where the buyers and sellers of a product are spread.

Definition of Market

According to Prof. R. Chapman, "The term market refers not necessarily to a place but always to a commodity and the buyers and sellers who are in direct competition with one another".

According to A.A. Cournot, "Economists understand by the term 'market', not any particular place in which things are bought and sold but the whole of any region in which buyers and sellers are in such free intercourse with one another that the price of the same goods tends to equality, easily and quickly".

According to Benham, "Any area over which buyers and sellers are in such close touch with one another, either directly or through dealers, that the prices obtainable in one part of the market affect the prices paid on other parts".

2. What do you understand by market structure ?

Ans :

Market structure is a set of market characteristics that determine the nature of market in which a firm operates. It refers to economically significant features of a market, which affects the behaviour and working of firm in the industry.

According to Pappas and Hirschey, "Market structure refers to the number and size distribution of buyers and sellers in the market for a goods or services".

Thus, market structure deals with the selected number of the characteristics through buyers and sellers.

1. Degree of Seller Concentration

One of the most important criteria to identify the market structure is the degree of seller concentration. The degree of seller concentration refers to the number of firms producing a particular type of product and their market share for that particular product in the market.

2. Extent of Product Differentiation

The extent of product differentiation is also an important criterian to identify the market structure. Product differentiation refers to the extent by which the product of one trader is differentiated from that of the other.

3. Nature of Entry Conditions

The nature for entry of new firms in the market or industry also determines the market structure. In a perfectly competitive market structure, it is assumed that there are no barriers on the entry of new firms. In a monopolistic competition, the entry of new firms in the market is accompanied by new brands of the product. It is the barriers on entry that reduces the number of firms in the market thereby causing imperfection in the competitive market structure.

3. What is Perfect Competition Market?

Ans :

A perfectly competitive market is one in which the number of buyers and sellers is very large, all engaged in buying and selling a homogeneous product without any artificial restrictions and possessing perfect knowledge of market at a time, e.g., fruit and vegetable market.

Definitions of Perfect Competition

According to A. Koutsoyiannis, "Perfect competition is a market structure characterized by a complete absence of rivalry among the individual firms".

According to R.G. Lipsey, "Perfect competition is a market structure in which all firms in an industry are price-takers and in which there is freedom of entry into, and exit from, industry".

4. Shut down decision.

Ans :

When a firm is incurring losses, there are two options open to it. (i) One option is to continue to produce at the least unprofitable (minimum losses) output (ii) Another option is to shut down operations and produce nothing.

In the short-run, the firm may prefer to stay in business if the price covers at least the average variable cost. Since short run represents a time period during which the firm can not change its fixed capital it continues to incur fixed costs, even if it stops production completely. If the firm stops production, it can avoid only variable costs. The firm will continue to stay in the industry in the short run if the market price covers atleast its average variable costs. We therefore, conclude that as long as price exceeds average variable costs, the firm should continue to produce in the short-run.

5. Define monopoly.

Ans :

Introduction

A natural monopoly is defined in economics as an industry where the fixed cost of the capital goods is so high that it is not profitable for a second firm to enter and compete. There is a "natural" reason for this industry being a monopoly. It is an extreme imperfect form of market. In ancient times, common salt was responsible for natural monopolies, till the time people learned about winning sea-salt. Regions facing scarcity of transport facilities and storage were most prone to notorious acceleration of commodity prices and uneven distribution of daily-use products and services.

The characteristics of monopoly are solitary to the condition generated by intent. Monopoly symbolizes domination over a product to the extent that the enterprise or individual dictates the terms of access and the markets for availability. The term is specific to a seller's market. A similar situation in the buyer's market is referred to as monopsony. It first appeared as an economics-related term in 'Politics' by Aristotle.

Meaning of Monopoly

The term 'Monopoly' has been derived from Greek term 'Monopolies' which means a single seller. Thus, monopoly is a market condition in which there is a single seller of a particular commodity who is called monopolist and has complete control over the supply of his product.

Definitions of Monopoly

According to D. Salvatore, "Monopoly is the form of market organization in which there is a single firm selling a commodity for which there are no close substitutes."

According to Ferguson and Kreps, "A pure monopoly exists when one and only one firm produces or sells the commodity in question. In other words, a monopoly is a one-firm industry"

According to Koutsoyiannis, "Monopoly is a market situation in which there is a single seller, there are no close substitutes for commodity it produces, there are barriers to entry."

In the words of Baumol, "A pure monopoly is defined as the firm that is also an industry. It is the only supplier of some particular commodity for which there exists no close substitute."

6. Advantages of monopoly.

Ans :

1. Research and Development

Supernormal Profit can be used to fund high cost capital investment spending. Successful research can be used for improved products and lower costs in the long term.

E.g.: Telecommunications and Pharmaceuticals.

2. Economies of Scale

Monopolies can produce at lower costs which makes them more efficient than smaller firms. This in turn increases output which leads to a decrease in average costs of production. These can be passed on to consumers in the form of lower prices.

3. Competition for Corporate Control

Monopolists are subject to the discipline of the financial markets. If a monopoly, with potentially low costs, fails to perform, then it may be a subject to takeover bid.

4. Stability of Prices

In a monopoly market the prices are most of the times stable. This happens because there is only one firm involved in the market that sets the prices if and when it feels like. In other types of market structures prices are not stable and tend to be elastic as a result of the competition that exists but this is not the case in a monopoly market as there is little or no competition at all.

5. Source of Revenue for the Government

The government gets revenue in form of taxation from monopoly firms.

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7. Allocative inefficiency.

Ans :

Major inefficiencies associated with monopolies include :

1. **Allocative inefficiency -** prices will tend to be higher, and output lower, than what would exist in a market with low barriers to entry. Prices will tend to be higher than both marginal costs and average total cost.
2. **Weakened market forces -** when consumers of a product have many alternatives, producers must serve their customers efficiently in order to stay in business. If consumers can't purchase competitive products easily, the monopolist doesn't need to worry a lot about losing customers when poor service or a poor quality good is provided.
3. **Rent or favor seeking -** firms and/or individuals will put a great deal of effort into obtaining or maintaining high entry barriers; by doing so, they hope to achieve monopoly-type profits. Such efforts enrich some people, at the expense of many others.

8. Price discrimination.

Ans :

Price discrimination takes place when the seller sells the same product at more than one price.

Example

A cloth seller may sell the same cloth to different consumers at different prices.

An airlines company can sell the tickets of a certain flight at the different prices. It may charge high prices to business travellers and low to college students.

Price discrimination also takes place when same products are sold at prices which are in different ratios to their marginal costs. In price discrimination, the differences in the price between same products should display cost differences.

The Basic of Price Discrimination

The following are the factors that determine the degree of price discrimination.

a) Purchasing power

The firm is likely to charge a high price from a customer who has the ability to pay a higher price. Urgency, quality consciousness, indispensability, high quality living, and so forth are some of the factors that compel the rich customers to pay a high price.

b) Quantity bought

A customer buying large number of units is relatively charged a lower rate per unit.

c) Customers from different market conditions

If the goods are bought fro further processing or resale, the buyer may be charged a lower price. If the goods are bought for ultimate consumption, the buyer may be charged relatively higher.

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9. What is monopolistic competition?

Ans :

Monopolistic competition refers to a market situation where there are many firms selling a differentiated product. "There is competition which

is keen, though not perfect, among many firms making very similar products". No firm can have any perceptible influence on the price-output policies of the other sellers nor can it be influenced much by their actions. Thus, monopolistic competition refers to competition among a large number of sellers producing close but not perfect substitutes for each other.

Definition

According to J.S. Bains, "Monopolistic competition is market structure where there is a long number of small sellers, selling differentiated but close substitute products".

According to Baumoul, "The term monopolistic competition refers to the market structure in which the sellers do have a monopoly (they are the only sellers) of their own product, but they are also subject to substantial competitive pressures from sellers of substitute product".

Monopolistic competition is the main form of imperfect competition. Thus, imperfect competition is a market situation wherein one or more conditions of perfect competition are absent.

10. Define oligopoly.

Ans :

Oligopoly is situation where a few large firms compete against each other and there is an element of interdependence in the decision-making of these firms. Each firm in the oligopoly recognizes this interdependence. Any decision one firm makes (be it on price, product or promotion) will affect the trade of the competitors and so results in countermoves. As a result, one's competitor's behaviour depends on one's own behaviour, and this must be taken account of when decisions are made. A major policy change on the part of one firm will have obvious and immediate effects on its competitors.

Definitions of Oligopoly

- **According to P.C. Dooley,** "An oligopoly is a market of only a few sellers, offering either homogenous or differentiated products. There are so few sellers that they recognize their mutual dependence."
- **According to Mansfield,** "Oligopoly is a market structure characterized by a small number of firms and a great deal of interdependence."
- **According to Grinols, "**An oligopoly is a market situation in which each of a small number of interdependent, competing producers influences but does not control the market".
- **According to Mc Connell,** "Oligopoly is a market situation in which number of firms in an industry is, so small that each must consider the reactions of rivals in formulating its price policy."

11. Features of Oligopoly.

Ans :

1. Few Firms

Oligopoly is the market in which few firms compete with each other. The simplest model of oligopoly is duopoly. Duopoly is the market structure when only two firms produced and supply the product.

2. Nature of the Product

All the new firms produce an identical product. Such market is called pure or perfect oligopoly. Where product differentiation is there then it is called imperfect oligopoly.

3. Interdependence of Firms

There is interdependence among firms. Each firm threats the other firms as its rivals.

4. Indeterminateness

The oligopoly firm's demand curve for the product is in determinant because the firm cannot assume that the rival firms will not change their prices in response to change in price effected by it.

5. Complex Market Structure

The market structure of oligopoly is quite complex. On one hand there is a rival and

on the other hand there may be collusion. Cartel is an example of collusive oligopoly. The non-collusive oligopoly is the other form of complex market structure.

6. Selling Costs

Each firm pursues an aggressive and defensive marketing strategy to gain a greater share in the market. Advertising is an important method used by oligopolist to gain larger share in the market. The costs incurred on advertisements are selling costs.

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12. Price Leadership

Ans :

Price leadership is an important oligopoly problem and is similar to collusive oligopoly model. Price leadership comes into existence either through tacit or formal agreement. But as the formal or open agreement to establish price leadership are generally illegal, price leadership is established as a result of informal and tacit understanding between the oligopolists. The competing oligopolists in an informal meeting choose a leader and agree to follow him in setting price.

Types of Price Leadership

1. Price leadership by a low-cost firm

Price leadership is of various types. Firstly, there is a price leadership by a low-cost firm. In order to maximize profits the low-cost firm sets a lower price than the profit-maximizing price of the high-cost firms. Since the high-cost firms will not be able to sell their product at the higher price, they are forced to agree to the low price set by the low-cost firm. Of course, the low-cost price leader has to ensure that the price which he sets must yields some profits to the high-cost firms—their followers.

2. Price leadership of the dominant firm

Secondly, there is a price leadership of the dominant firm. Under this one of the few firms in the industry may be producing a vary large proportion of the total production of the industry and may therefore dominate the market for the product. This dominant firm wields a great influence over the market for the product, while other firms are small and are incapable of making any impact on the market. As a result, the dominant firm estimates its own demand curve and fixes a price which maximizes its own profits. The other firms which are small having no individual effects on the price, follow the dominant firm and accepting the price set by it adjust their output accordingly.

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13. Characteristics of Perfect Competition?

Ans :

(a) Large number of buyers and sellers

There should be significantly large number of buyers and sellers in the market. The number should be so large that it should not make any difference in terms of price or quantity supplied even if one enters the market or one leaves the market.

(b) Homogeneous products or services

The products and services of each seller should be homogeneous. They cannot be differentiated from that of one another. It makes no difference to the buyer whether he buys from firm X or firm Z. In other words, the buyer does not have any particular preference to buy the goods from a particular trader or supplier. The price is one and the same in every firm. There are no concessions or discounts.

(c) Freedom to enter or exit the market

There should not be any restrictions on the part of the buyers and sellers to enter the market or leave the market. There should not be any barriers. The buyers can enter the market or leave the market whenever they want.

(d) Perfect information available to the buyers and sellers

Each buyer and seller has total knowledge of the prices prevailing in the market at every given point of time, quantity supplied, costs, demand, nature of product, and other relevant information. There is no need for any advertisement expenditure as the buyers and sellers are fully informed.

14. Kinked Demand curve.

Ans :

It has been observed that many oligopolistic industries exhibit an appreciable degree of price rigidity or stability. In other words, in many oligopolistic industries prices remain stick or inflexible, that is, there is no tendency on the part of the oligopolists to change the price even if the economic conditions undergo a change. Many explanations have been given of this price rigidity under oligopoly and most popular explanation is the so-called kinked demand curve hypothesis. The kinked demand curve hypothesis was put forward independently by Paul M. Sweezy, an American economist, and by Hall and Hitch Oxford economists.

It is for explaining price and output under oligopoly with product differentiation, that economists often use the kinked demand curve hypothesis. This is because when under oligopoly products are differentiated, it is unlikely that when a firm raises its price, all customers would leave it because some customers are intimately attached to it due to product differentiation.

As a result, demand curve facing a firm under differentiated oligopoly is not perfectly elastic. On the other hand, under oligopoly without product differentiation, when a firm raises its price, all its customers would leave it so that demand curve facing an oligopolist producing homogeneous product may be perfectly elastic.

Further, under oligopoly without product differentiation, there is a greater tendency on the part of the firms to join together and form a collusion, formal or tacit, and, alternatively, to accept one of them as their leader in setting their price. No doubt, kinked demand curve has a special relevance for differentiated oligopoly, but it has also been applied for explaining price and output under oligopoly without product differentiation.

Choose the Correct Answer

1. Under which market structure the control of firm over price is nilo. [a]
   (a) Perfect competition (b) Monopoly
   (c) Oligopoly (d) Monopolistic
2. Shares traded in the stock market depict characteristic close to . [a]
   (a) Prefect competition (b) Oligopoly
   (c) Monopolistic (d) Monopoly
3. Price leadership is form of [c]
   (a) Monopolistic (b) Monopoly
   (c) Non-collusive oligopoly (d) Perfect composition
4. Which of the following is exact opposite to perfect competition. [b]
   (a) Monopolist (b) Monopoly
   (c) Oligopoly (d) Duopoly
5. The firm can sell as much as it wants at the market price. This situation related to. [a]
   (a) Perfect competition (b) Monopoly
   (c) Monopolistic (d) Oligopoly
6. Durable good will have _____ market. [a]
   (a) Wider (b) Narrow
   (c) Local (d) None
7. The monopoly firm is a . [d]
   (a) Price fixed (b) Price market
   (c) Price searches (d) All of the above
8. Oligopoly is caused by . [d]
   (a) Huge capital investment
   (b) Absolute cost advantage to existing firms
   (c) Oligopoly don of match price rises
   (d) All the above
9. Monopoly is caused by . [d]
   (a) Control of resource (b) Legal barriers
   (c) Economics of scale (d) All the above
10. The market with single buyer. [b]
   (a) Monopoly (b) Unil lateral monopsony
   (c) Bilateral (d) Discriminating

Fill in the blanks

1. An extreme version of imperfect market's _____ .
2. Based on degree of competition, the markets can be divided into _____ and _____.
3. Large number of seller produce differentiated product is exist in _____ market.
4. Only two buyer exist in _____ .
5. _____ products exist in perfect competition
6. Large number of buyers and large number of sellers exist in _____ market.
7. _____ refers to a position where the firm maximum and it has no incentives either to reduce or increase its output levels.
8. _____ include economies of scale capital requirements, cost advantage, and technological superiority.
9. _____ in unique feature of monopolistic competition.
10. _____ is based on the condition of absence of transport cost.

ANSWERS

1. Monopoly
2. Perfect & markets, imperfect market
3. Monopolistic competition
4. Duopsony
5. Homogenous products
6. Perfect competition
7. Equilibrium point
8. Economic business
9. Selling cost
10. Perfect competition

FACULTY OF COMMERCE

M.Com. I - Semester (CBCS) (New) Examination

December - 2020

MANAGERIAL ECONOMICS

Time : 2 Hours] [Max. Marks : 80

PART - A (4 × 5 = 20 Marks)

Note : Answer any four questions.

ANSWERS

1. Objectives of Firm **(Unit-I, SQA - 11)**
2. Demand **(Unit-II, SQA - 1)**
3. Cobb Douglas Production Function **(Unit-III, SQA - 3)**
4. Long Run Costs **(Unit-IV, SQA - 11)**
5. Perfect Competition **(Unit-V, SQA - 3)**

PART - B (5 × 12 = 60 Marks)

[Essay Answer Type]

Note: Answer all questions by using internal choice in not exceeding 4 pages each.

6. (i) Explain the nature and scope of Managerial Economics. **(Unit-I, Q.No. 2, 3)**

   (ii) Given the Total Cost Function TC = 6 + $4q^2$ derive the Marginal Cost Function and Average Cost Function. **(Unit-I, Prob. 3)**

7. (i) Discuss the scope and significance of Managerial Economics in decision making. **(Unit-I, Q.No. 7)**

   (ii) Given the total revenue function TR = 1000Q – $10Q^2$

   Where Q is the rate of output per period. Determine the rate of output that results in maximum total revenue. **(Unit-I, Prob. 9)**

8. (i) What do you understand by Income Elasticity of Demand ? How do you classify goods depending upon the Income Elasticity? **(Unit-II, Q.No. 28, 29)**

   (ii) Given the Demand Equation:

   Q = 9,000 – 1.5 P

   (a) What is Q when P = Rs. 1,200

   (b) Calculate the Total Revenue when P = Rs. 1,200 **(Unit-II, Prob. 12)**

9. (i) Distinguish between Individual Demand and Market Demand. Describe the various determinants of Market Demand. **(Unit-II, Q.No. 8)**

   (ii) If the quantity demanded of rice is 4 kgs at an income of Rs. 1000 p.m and 5 kgs at an income of Rs. 1,500 p.m. Find the Income elasticity of Demand **(Unit-II, Prob. 13)**

10. (i) What do you understand by Production Function? Describe the various stages of a Total Production function with the help of a diagram **(Unit-III, Q.No. 3, 9)**

(ii) The following table shows the quantity of output of mangoes and the quantity of labour used per acre of land.

(a) Calculate the marginal revenue product of labour at each rate of input used if mangoes sell for Rs. 10 each.

(b) If the wage rate is Rs. 40, what is the optimal rate of use of labour ? Explain. **(Unit-III, Prob. 9)**

11. (i) Explain the meaning of Isoquant and Isocost. How are they useful in determining the expansion path of a firm ? **(Unit-III, Q.No. 12, 16, 18)**

(ii) Given the following data for two periods :

$Q_1 = 500$ $K_1 = 20$ $L_1 = 40$ $r = 2$

$Q_2 = 600$ $K_2 = 22$ $L_1 = 43$ $w = 3$

Find out the factor productivity for the two periods and interpret the results. **(Incomplete Question)**

12. (i) Describe the various short run cost functions. **(Unit-IV, Q.No. 5)**

(ii) If $TC = 12,000 + 150Q - 5Q^2 + 0.05Q^3$. Determine the rate of output that results minimum average variable cost. **(Unit-IV, Prob. 16)**

13. (i) What do you understand by Profit Contribution Analysis? Explain graphically the difference between Linear and Non-Linear Break-Even Analysis. **(Unit-IV, Q.No. 15, 14)**

(ii) Consider the following Total cost Functions

(a) $TC = 120 + 0.5Q + 0.002Q^2$

(b) $TC = 120Q + 0.5Q^2 + 0.02Q^3$

Determine whether they are short-run or long run cost functions and explain the reasons for your answer. **(Unit-IV, Prob. 17)**

14. State the characteristics of Monopolistic Market and describe how price and output will be determined in the Monopolistic Market. **(Unit-V, Q.No. 19, 20)**

15. What are the characteristics of Oligopoly Market? Explain the concepts of Price Rigidity and kinked Demand Curve in this type of Market. **(Unit-V, Q.No. 22, 27, 28)**

FACULTY OF COMMERCE

M.Com. I - Semester (CBCS) Examination

January - 2020

MANAGERIAL ECONOMICS

Time : 3 Hours] [Max. Marks : 80

Note: Answer All questions from Part - A and any Five questions from Part-B

PART - A (5 × 4 = 20 Marks)
[Short Answer Type]

Answer all questions in not more than one page each

1. Economic Profit Vs Accounting Profit **(Unit-I, SQA - 12)**
2. What is cross elasticity? **(Unit-II, SQA - 9)**
3. Expansion Path **(Unit-III, SQA - 9)**
4. Variable cost Vs Marginal cost **(Unit-IV, SQA - 10)**
5. Features of Oligopoly **(Unit-V, SQA - 11)**

PART - B (5 × 12 = 60 Marks)
[Essay Answer Type]

Note: Answer all questions by using internal choice in not exceeding 4 pages each.

6. (a) (i) What is the role of managerial economics in decision making. And also explain the process of decision making. **(Unit-I, Q.No. 7, 9)**

(ii) A M.Com Graduate quit his Rs. 5,00,000 salary job for starting a new business. He will invest Rs. 7,00,000 of his own money, which has been in a bank account earning 8 percent interest per year. He also plans to use building he own in Hyderabad that has been rented for Rs. 209,000 per month. Revenue in the new business during the first year was Rs. 12,00,000 while other expenses were.

Advertising	Rs. 1,00,000
Taxes / Licence fee	Rs. 75,000
Salaries	Rs. 3,50,000
Supplies	Rs. 50,000

Calculate the Accounting profit and economic profit. **(Unit-I, Prob. 7)**

OR

(b) (i) What is optimization? Explain the concepts of economic optimization and unconstrained optimization. **(Unit-I, Q.No. 18, 24)**

(ii) A firm's total revenue (TR) and total cost (TO) functions are

$TR = 110Q - 5Q^2$

$= 10Q - Q^2 + 0.33Q^3$

Determine

(a) Equations for marginal revenue and average revenue.

(b) The output rate that maximizes total revenue. **(Unit-I, Prob. 8)**

7. (a) (i) Explain the law which sales the inverse relationship between the price and demand for a product. Discuss the various types of price elasticities. **(Unit-II, Q.No. 12, 24)**

(ii) Give the following supply and demand equations

$Q_0 = 200 - P$ and $Qs = 20 + 5P$. determine the equilibrium price and quantity. **(Unit-II, Prob. 10)**

OR

(b) (i) What is Demand Forecasting? Explain the significance and methods of demand forecasting. **(Unit-II, Q.No. 39, 40, 43, 44, 45, 46)**

(ii) For each of the following equations, determine whether demand is elastic, inelastic or unitary elastic at the given prices.

$Q = 100 - 4P$ and P = Rs. 20

$Q = 1500 - 20P$ and P = Rs. 5

$P = 50 - 0.1Q$ and P = Rs. 20 **(Unit-II, Prob. 11)**

8. (a) (i) Explain the law of diminishing marginal returns with suitable examples and Graphs. **(Unit-III, Q.No. 9)**

(ii) The production of Crompton electronics is

$Q = 2K^{0.5}L^{0.5}$

Determine the optimal rate of labour to be hired when capital is fixed at 9 units, the price of output is Rs. 6 per unit and wage rate is Rs. 2 per unit. **(Unit-III, Prob. 10)**

OR

(b) (i) What do you understand by isoquants and iso-costs? Explain the use of isoquants in managerial decision making. **(Unit-III, Q.No. 12, 16)**

(ii) Calculate the factor of productivity from the following data:

$Q_1 = 700$ $k_1 = 25$ $L_1 = 50$

$Q_2 = 800$ $k_2 = 28$ $L_2 = 52$

$r_1 = 2$ $r_2 = 4$ **(Incomplete Problem)**

9. (a) (i) What are the costs that are relevant for decision making? Discuss. **(Unit-IV, Q.No. 2)**

(ii) Calculate the required sales for the desired profit of Rs. 20,000, when FC is Rs. 18,000, SP is Rs. 30 and AVC is Rs. 20. **(Unit-IV, Prob. 12)**

OR

(b) (i) Explain linear and non linear break even chart with examples. **(Unit-IV, Q.No. 10, 11)**

(ii) The total and marginal cost functions for Honda Ltd. Are

$$TC = 500 + 10Q - 0.06Q^2 + 0.003Q^3$$

$$MC = 10 - 0.12Q + 0.009Q^2$$

Determine the level of fixed cost and equations for average total cost, average variable cost and average fixed cost. And also determine the rate of output that results in minimum average variable cost. **(Unit-IV, Prob. 15)**

10. (a) State and explain the factors which are used as the basis for market classification. **(Unit-V, Q.No. 3)**

OR

(b) What are features of Monopoly market? How the profit will maximize in short run and long run in Monopoly market? **(Unit-V, Q.No. 10, 12, 13)**

FACULTY OF COMMERCE

M.Com. I - Semester Examination

December - 2016

MANAGERIAL ECONOMICS

Time : 3 Hours] [Max. Marks : 80

Note : Answer all the questions in not more than one page each.

SECTION - A (5 × 4 = 20 Marks)

Note : Answer all the questions in not more than one page each.

ANSWERS

1. Objectives of Firm. **(Unit-I, SQA - 11)**
2. Significance of Demand Estimation. **(Unit-II, SQA - 10)**
3. Production function. **(Unit-III, SQA - 2)**
4. Break Even point. **(Unit-IV, SQA - 6)**
5. Characteristics of Perfect Competition. **(Unit-V, SQA - 13)**

SECTION - B (5 × 12 = 60 Marks)

Note: Answer all the questions by using internal choice in not exceeding 4 pages each.

6. (a) (i) Explain the difference between **(Unit-I, Q.No. 17)**

Economic profit and Accounting profit

(ii) A carpenter makes 100 chairs per month and sells on them at Rs. 200 per piece. His expenses on rent of the shop, cost of the wood and other material are worth Rs. 5000. He employs two workers whose monthly wages are Rs. 1,200 per worker. He also pays electricity bill of about Rs. 500 p.m. He has invested Rs. 1,00,000 on machinery tools and inventory fo which Rs. 56,000 is from his own funds (earlier he used to get 6% p.a as interest) and the remaining Rs. 50,000 as a loan from bank @ 9% interest p.a. Further assume, imputed cost of his own time and his own premises at Rs. 3,000 and Rs. 1,000 p.m. respectively. Compute accounting profit and Economic profit. **(Unit-I, Prob. 4)**

OR

(b) (i) Explain the role of managerial economics in Decision making. **(Unit-I, Q.No. 7)**

(ii) Give the total cost function $TC = 6 + 4q^2$ derive the marginal cost function and average cost function. **(Unit-I, Prob. 3)**

7. (a) (i) Define the concepts of price elasticity, income elasticity, and cross elasticity. **(Unit-II, Q.No. 24, 28, 31)**

(ii) Meaning and significance of demand estimation. **(Unit-II, Q.No. 37)**

(b) (i) Explain the importance and various methods of demand estimation. **(Unit-II, Q.No. 38)**

(ii) If the Q_D of rice is 40 kgs at an income of Rs. 10,000 p.m. and 50 kgs at an income of Rs. 15000 p.m. find the income elasticity of demand. **(Unit-II, Prob. 14)**

8. (a) (i) Write about economies of scale and economies of scope. **(Unit-III, Q.No. 19, 21)**

(ii) Fill in the blanks in the following Table

Units of labour	Total product	Average product	Marginal product
1	-	40	-
2	-	-	48
3	138	-	-
4	-	44	-
5	-	-	24
6	210	-	-
7	-	29	-
8	-	-	27

(Unit-III, Prob. 8)

OR

(b) (i) Explain briefly about optimal employment of two inputs. **(Unit-III, Q.No. 17)**

(ii) Give the following MP_L function, a fixed capital stock of 64 units, wage rate of Rs. 10 and an output price of Rs. 5, determine the optimal combination of inputs $MP_L = 100 (K^{0.5}/L^{0.5})$ **(Unit-III, Prob. 3)**

9. (a) (i) Explain in detail the long run cost function with diagram. **(Unit-IV, Q.No. 8)**

(ii) The short run cost functions of a firm is

$TC = 120 + 6Q + 2Q^2$

Where TC = Total cost, Q = Quantity of output

Find the rate of output that results in minimum average variable cost. **(Unit-IV, Prob. 8)**

OR

(b) (i) Why is the long run average cost curve called an "envelop curve"? Why cannot the long run marginal cost curve be an envelopes as well? **(Unit-IV, Q.No. 8)**

(ii) Suppose that a local metal fabricator has estimated its short run total cost function and total revenue function is :

$TC = 1600 + 100 Q + 25Q^2$

$TR = 500 Q$

What is the breakeven amount of output? How might the company go about reducing the breakeven rate if its does not feel that it can sell the estimated amoutn in the market place? **(Unit-IV, Prob. 9)**

10. (a) What are the characteristics of an oligopoly market, explain the concepts of price rigidity and kinked demand curve in this type of market? **(Unit-V, Q.No. 22, 27, 28)**

OR

(b) State the characteristics of monopoly and describe how a monopolist decides the price and output of his product. **(Unit-V, Q.No. 10, 20)**

FACULTY OF COMMERCE

M.Com. I - Semester Examination

June - 2016

MANAGERIAL ECONOMICS

Time : 3 Hours] [Max. Marks : 80

Note : Answer all the questions in not more than one page each.

SECTION - A (5 × 4 = 20)

(Short Answer Types)

ANSWERS

1. Economic Profit **(Unit-I, SQA - 13)**
2. Demand equation and demand curve **(Unit-II, SQA - 13)**
3. Expansion path **(Unit-III, SQA - 9)**
4. Assumptions of non-linear break-even analysis **(Unit-IV, SQA - 9)**
5. Kinked demand curve **(Unit-V, SQA - 14)**

SECTION - B (5 × 12 = 60)

(Essay Answer Types)

6. (a) (i) "Managerial Economics is the application of micro economic principles to managerial decision making" – Explain. **(Unit-I, Q.No. 7)**

   (ii) A study indicated that the average cost function for a high school is $AC = 10.3 - 0.4Q + 0.00012Q^2$ where Q is the number of students in the school.

   What number of the students results is minimum average cost. Find equation for marginal and total cost? **(Unit-I, Prob. 10)**

   (OR)

   (b) (i) What is firm? Explain the objectives and theories of firm. **(Unit-I, Q.No. 10)**

   (ii) Given the total cost function $TC = 150 + 7Q + 3Q^2 + Q^3$. Find the total cost, marginal cost and variable cost if the level of output is 10 units. **(Unit-I, Prob. 2)**

7. (a) (i) What is price elasticity of demand? Discuss types of price elasticity of demand and their role in decision making? **(Unit-II, Q.No. 24)**

   (ii) Suppose demand for car in Bombay as a function of income is given by the following equation:

   $Q = 20000 + 5M$. Find out the income elasticity of demand when per capita level of income (M) is Rs. 15,000. **(Unit-II, Prob. 15)**

   (OR)

   (b) (i) Discuss income elasticity of demand and its role. **(Unit-II, Q.No. 28)**

(ii) The demand function equation faced by HCL for its personal computer is given by P = 50000 – 4Q

Write the marginal revenue equation a what price and quantity marginal revenue will be zero. **(Unit-II, Prob. 16)**

8. (a) (i) Explain the concept of optimum input combination. **(Unit-III, Q.No. 17)**

(ii) Consider production function $Q = 5L^{0.5} K^{0.3}$. Does it represent increasing, decreasing or constant return to scale. **(Unit-III, Prob. 1)**

(OR)

(b) (i) Explain Cobb Douglas production function. **(Unit-III, Q.No. 6)**

(ii) The production function of a firm is given by $Q = 100 K^{0.5} L^{0.5}$, find out the efficient combination of inputs to produce 100 units when r = Rs. 1/- and w = Rs. 1/-. **(Unit-III, Prob. 2)**

9. (a) (i) Explain the various long-run and short-run cost functions and show the diagrams. **(Unit-IV, Q.No. 5, 8)**

(ii) Following is the short run total cost function

$$TC = 100 + 50Q – 12Q^2 + Q^3$$

Determine total variable cost function average variable cost function and marginal cost function. Calculate total cost, ATC, AVC and MC when firm produced 10 units of output. **(Unit-IV, Prob. 6)**

(OR)

(b) (i) Explain the linear and non-linear break even analysis with diagrams. **(Unit-IV, Q.No. 10, 11)**

(ii) Given the following TR and TC function

$$TR = 50 Q$$

$$TC = 10000 + 30 Q$$

Determine the break-even rate of output. Determine the output rate necessary to earn profit of Rs. 20,000. **(Unit-IV, Prob. 7)**

10. (a) (i) Explain how price of a commodity is determined under perfect competition? **(Unit-V, Q.No. 6, 7)**

(ii) A firm's total variable cost is given by the following:

$$TVC = 75Q – 10Q^2 + Q^3$$

Will the firm produce the product if the price of the product is Rs. 40/-? **(Unit-V, Prob. 7)**

(OR)

(b) (i) "A monopolist will never sell its product at a price less than its average total cost". Discuss. **(Unit-V, Q.No. 20)**

(ii) In Hyderabad the movie market is monopolistically competitive. In the lon-run, the demand for movies of Srinivasa Theatre is given by

$$P = 5\text{-}0.002\ Q$$

Q is the number of persons watching a movie per month. The AC function is given by

$AC = 6–0.004\ Q + 0.00\ 0001Q^2$. To maximize profit, what price should hte srinivasa Theatre charge? What will be the number of people buying the tickets. **(Unit-V, Prob. 10)**

FACULTY OF COMMERCE

M.Com. I - Semester Examination

December - 2015

MANAGERIAL ECONOMICS

Time : 3 Hours] [Max. Marks : 80

Note : Answer all the questions in not more than one page each.

SECTION - A (5 × 4 = 20)

1. Accounting profit vs. Economic profit. **(Unit-I, SQA - 12)**
2. Individual vs. Market Demand. **(Unit-II, SQA - 14)**
3. Production function. **(Unit-III, SQA - 2)**
4. Marginal vs. Incremental cost. **(Unit-IV, SQA - 12)**
5. Monopoly **(Unit-V, SQA - 5)**

SECTION - B (5 × 12 = 60)

6. (a) (i) Discuss the scope and importance of managerial economics. **(Unit-I, Q.No. 3, 4)**

(ii) Mr. X turned down a job offer of Rs. 5,00,000 per annum and started his own business. He invested Rs. 50,00,000 of his own money in the business by withdrawing the money from fixed deposit which was earning an interest of 7% per annum. He is using his own building for the business on which he was getting a rent of Rs. 15,000 per month.

The total revenue from the business during the first year was Rs. 85,69,000. The expenses were Rs. 60,62,000. Did Mr. X take correct decision by starting the business? **(Unit-I, Prob. 5)**

OR

(b) (i) Discuss the role of time perspective principle and principle and principle of discounting in managerial decisions. **(Out of Syllabus)**

(ii) Given a profit function $\pi = -100 + 160Q + 10Q^2$. Find the profit maximiation level of output. **(Unit-I, Prob. 11)**

7. (a) (i) What are the reasons for law of demand? Why demand curve slips downward? **(Unit-II, Q.No. 11)**

(ii) Assume a firm has the following total revenue of total cost functions:

TR = 320 Q + 2Q2

TC = 1800 + 5Q + 3Q2

Find :

(A) The level at output at which firm will be maximizing profit.

(B) The level at output at which total revenue will be maximum. **(Unit-II, Prob. 17)**

OR

(b) (i) Discuss the factors determining demand for a commodity. **(Unit-II, Q.No. 9)**

(ii) The following is the demand function for a product.

$Q = 40 - 2P$ where

$P = Rs. 5$

Determine :

(A) Price elasticity of demand

(B) What effect a rise in price would have on total revenue **(Unit-II, Prob. 18)**

8. (a) (i) Explain the law of returns to scale. **(Unit-III, Q.No. 19)**

(ii) The following production function is given:

$Q = 40\ K^{0.5}\ L^{0.5}$.

Find marginal product at labour and capital

Find out whether the firm is recurring increasing or decreasing or constant returns to scales. **(Unit-III, Prob. 4)**

OR

(b) (i) Explain how the firm optimizes employment of a variable factor of production in the short-run. **(Unit-III, Q.No. 17)**

(ii) Given the production function

$Q = 100\ K^{0.5}\ L^{0.5}$

Find out the expansion path of the firm.

Assume that $r = Rs. 5$ and

$W = Rs. 4$ per unit

What is the efficient combination of inputs if the production is 200 units. **(Unit-III, Prob. 6)**

9. (a) (i) Explain the short-run average cost functions anyhow the shut down point in the diagram. **(Unit-IV, Q.No. 5)**

(ii) Given the total cost function

$TC = 500 + 10Q - 0.9Q^2 + 0.04Q^3$

Find the rate of output that results in minimum average variable cost. **(Unit-IV, Prob. 13)**

OR

(b) (i) Explain cost output relationship in long-run **(Unit-IV, Q.No. 8)**

(ii) Given the following total cost and revenue function

$TC = 15000 + 45Q$

$TR = 75Q$

Find the breakeven are at output and the rate of output required to earn profit of Rs. 35,000. **(Unit-IV, Prob. 14)**

10. (a) (i) Discuss the features of perfect competition. **(Unit-V, Q.No. 4)**

(ii) A firm producing bread in operating in a perfectly competitive market. The firm's variable cost function is given by :

$$TVC = 150\ Q - 20Q^2 + Q^3$$

Determine below what price the firm should shut down production in the short run. **(Unit-V, Prob. 8)**

OR

(b) (i) Explain why marginal revenue of a monopolist is less than the price charged. **(Unit-V, Q.No. 20)**

(ii) A monopolist faces a demand curve P = 700 – 2Q. If the marginal cost is constant and is equal to 20. What is the amount at profit made by a monopolist ? What is dead weight welfare loss on account at monopoly? **(Unit-V, Prob. 9)**

FACULTY OF COMMERCE

M.Com. I - Semester (CBCS) Examination

Model Papers - I

MANAGERIAL ECONOMICS

Time : 3 Hours] [Max. Marks : 80

Note: Answer All questions from Part - A and any Five questions from Part-B

PART - A (5 × 4 = 20 Marks)

[Short Answer Type]

ANSWERS

1. Objectives of a Firm. **(Unit-I, SQA.11)**
2. Define law of Demand. **(Unit-II, SQA.4)**
3. Define production function. **(Unit-III, SQA.2)**
4. What are the differences between fixed cost and variable cost. **(Unit-IV, SQA.4)**
5. What is Perfect Competition Market ? **(Unit-V, SQA.3)**

PART - B (5 × 12 = 60 Marks)

[Essay Answer Type]

Note: Answer all questions by using internal choice in not exceeding 4 pages each.

6. (a) (i) Explain the nature of business decision making problem. How is an optimal business decision made. **(Unit-I, Q.No.7)**

   (ii) Given the total cost function TC = 150 + 7Q + $3Q^2$ + Q^3. Find the total cost, marginal cost and variable cost if the level of output is 10 units. **(Unit-I, Prob.2)**

   OR

   (b) (i) Discuss the scope of Managerial Economics. **(Unit-I, Q.No.3)**

   (ii) A study indicated that the average cost function for a high school is AC = 10.3 – 0.4Q + $0.00012Q^2$ where Q is the number of students in the school.

   What number of the students results is minimum average cost. Find equation for marginal and total cost ? **(Unit-I, Prob.10)**

7. (a) (i) Explain the factors determining demand. **(Unit-II, Q.No.9)**

   (ii) If the quantity demanded of rice is 4 kgs at an income of Rs.1000 p.m. and 5 kgs at an income of Rs. 1,500 p.m. Find the income Elasticity of Demand. **(Unit-II, Prob.13)**

OR

(b) What is price elasticity of demand ? Explain different types of price elasticity of Demand ? **(Unit-II, Q.No.24)**

8. (a) (i) What do you understand by Cobb Douglas production function. **(Unit-III, Q.No.6)**

(ii) Given the production function $Q = 30\ K^{0.5}\ L^{05}$ find out the efficient combination of inputs to produce 200 units W = 5 and R = 4. **(Unit-III, Prob.7)**

OR

(b) (i) Explain the Law of Diminishing marginal returns with suitable examples and graphs. **(Unit-III, Q.No.9)**

(ii) The production of Crompton electronics is

$Q = 2K^{0.5}\ L^{0.5}$

Determine te optimal rate of labour to be hired when capital is fixed at 9 units, the price of output is Rs. 6 per cent and wage rate is Rs. 2 per unit. **(Unit-III, Prob.10)**

9. (a) (i) Explain Cost-Output Relationship in the Short-Run. **(Unit-IV, Q.No.5)**

(ii) The short run cost functions of a firm is

$TC = 120 + 6Q + 2Q^2$

Where TC = Total cost, Q = Quantity of output

Find the rate of output that results in minimum average variable cost. **(Unit-IV, Prob.8)**

OR

(b) Explain different types of costs. **(Unit-IV, Q.No.2)**

10. (a) (i) What are the different types of Market Structure ? **(Unit-V, Q.No.3)**

(ii) Define monopoly. What are the characteristics of monopoly ? **(Unit-V, Q.No.10)**

OR

(b) (i) What is Kinked Demand curve. How does the Kinked Demand curve hypothesis explain price stability under oligopoly ? **(Unit-V, Q.No.27)**

(ii) What is monopolistic competition? Explain the Characteristics of monopolistic competition. **(Unit-V, Q.No.19)**

FACULTY OF COMMERCE

M.Com. I - Semester (CBCS) Examination

Model Papers - II

MANAGERIAL ECONOMICS

Time : 3 Hours] [Max. Marks : 80

Note: Answer All questions from Part - A and any Five questions from Part-B

PART - A (5 × 4 = 20 Marks)

[Short Answer Type]

ANSWERS

1. Define managerial economics. **(Unit-I, SQA.1)**
2. Exceptions of law of demand. **(Unit-II, SQA.5)**
3. Cobb Douglas production function. **(Unit-III, SQA.3)**
4. Assumptions of P/V Analysis **(Unit-IV, SQA.9)**
5. Price discrimination. **(Unit-V, SQA.8)**

PART - B (5 × 12 = 60 Marks)

[Essay Answer Type]

Note: Answer all questions by using internal choice in not exceeding 4 pages each.

6. (a) (i) Explain the various steps in Managerial Decision Making, at what step does the knowledge of economic theory and its method help a manager to arrive at an optimum strategy. **(Unit-I, Q.No.9)**

(ii) Fill in the blanks in the following Table

Units of labour	Total product	Average product	Marginal product
1	-	40	-
2	-	-	48
3	138	-	-
4	-	44	-
5	-	-	24
6	210	-	-
7	-	29	-
8	-	-	27

(Unit-I, Prob.1)

OR

(b) What is firm ? Explain the objectives and theories of firm. **(Unit-I, Q.No.10)**

7. (a) (i) How do you classify goods depending upon the Income Elasticity. **(Unit-II, Q.No.29)**

(ii) Give the following supply and demand equations.

$Q_0 = 200 - P$ and $Qs = 20 + 5P$. determine the equilibrium price and quantity. **(Unit-II, Prob.10)**

OR

(b) What is Demand Estimation? Explain the importance of Demand Estimation. **(Unit-II, Q.No.37)**

8. (a) (i) Explain the concept of Optimal employment to a factor of production. **(Unit-III, Q.No.10)**

(ii) Consider production function $Q = 5L^{0.5} K^{0.3}$. Does it represent increasing, decreasing or constant return to scale. **(Unit-III, Prob.1)**

OR

(b) Define isoquant. Explain how isoquants are used to represent a production function with two variable inputs. **(Unit-III, Q.No.12)**

9. (a) Explain Cost-Output Relationship in the Long-Run. **(Unit-IV, Q.No.8)**

OR

(b) What is Break even point ? Taking a linear Revenue and cost function, graphically show the level of output at which a firm break even. **(Unit-IV, Q.No.10)**

10. (a) (i) How is price determined under mono-poly in the long run market ? **(Unit-V, Q.No.13)**

(ii) What is meant by Price Rigidity? Why are Price Rigid under oligopoly ? Explain with the help of a model. **(Unit-V, Q.No.28)**

OR

(b) (i) Distinguish between Perfect Competition and Monopoly. **(Unit-V, Q.No.15)**

(ii) What is price discriminations ? Explain factors and different types of price discriminations. **(Unit-V, Q.No.18)**

FACULTY OF COMMERCE

M.Com. I - Semester (CBCS) Examination

Model Papers - III

MANAGERIAL ECONOMICS

Time : 3 Hours] [Max. Marks : 80

Note: Answer All questions from Part - A and any Five questions from Part-B

PART - A (5 × 4 = 20 Marks)

[Short Answer Type]

ANSWERS

1. What do you understand by Optimization? **(Unit-I, SQA.3)**
2. Differentiate between Individual demand and market demand. **(Unit-II, SQA.14)**
3. Expansion path. **(Unit-III, SQA.9)**
4. Marginal Cost Vs Variable cost. **(Unit-IV, SQA.10)**
5. Price Leadership **(Unit-V, SQA.12)**

PART - B (5 × 12 = 60 Marks)

[Essay Answer Type]

Note: Answer all questions by using internal choice in not exceeding 4 pages each.

6. (a) (i) Explain the differences between economic profit and accounting profit. **(Unit-I, Q.No.17)**

   (ii) Given the total revenue function $TR = 1000Q - 10Q^2$. Where Q is the rate of output per period. Determine the rate of output that results in maximum total revenue. **(Unit-I, Prob.9)**

   OR

   (b) Explain the Relationship between total, average and marginal product. **(Unit-I, Q.No.28)**

7. (a) (i) Explain the Significance of demand forecasting. **(Unit-II, Q.No.40)**

   (ii) What are the various methods of Demand Forecasting. **(Unit-II, Q.No.43)**

   OR

   (b) Assume a firm has the following total revenue of total cost functions:

   TR = 320 Q + 2Q2

   TC = 1800 + 5Q + 3Q2

   Find :

   (A) The level at output at which firm will be maximizing profit.

   (B) The level at output at which total revenue will be maximum. **(Unit-II, Prob.17)**

8. (a) Explain briefly about Optimal employment of two inputs. **(Unit-III, Q.No.17)**

OR

(b) (i) Define the law of returns to scale and explain its relevance in production management. **(Unit-III, Q.No.19)**

(ii) Explain briefly about Economies of scope. **(Unit-III, Q.No.21)**

9. (a) What is Profit contribution analysis ? **(Unit-IV, Q.No.15)**

OR

(b) Suppose that a local metal fabricator has estimated its short run total cost function and total revenue function is :

$TC = 1600 + 100\ Q + 25Q^2$

$TR = 500\ Q$

What is the breakeven amount of output? How might the company go about reducing the breakeven rate if its does not feel that it can sell the estimated amount in the market place ? **(Unit-IV, Prob.9)**

10. (a) (i) How is price output determined under monopolistic competition. **(Unit-V, Q.No.20)**

(ii) What is Perfect Competition Market? Explain the characteristics of Perfect Competition Market. **(Unit-V, Q.No.4)**

OR

(b) (i) Define oligopoly. Explain the Characteristics of oligopoly. **(Unit-V, Q.No.22)**

(ii) What are the different types of price leadership that may be established in oligopolistic market situation. **(Unit-V, Q.No.24)**