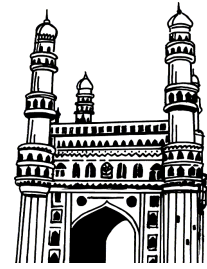


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C O N T E N T S

IT APPLICATIONS FOR MANAGEMENT

STUDY MANUAL

FAQ's and Important Questions	V - X
Unit - I	1 - 48
Unit - II	49 - 90
Unit - III	91 - 140
Unit - IV	141 - 180
Unit - V	181 - 216

SOLVED MODEL PAPERS

Model Paper - I	217 - 218
Model Paper - II	219 - 220
Model Paper - III	221 - 222

SYLLABUS

UNIT - I

INFORMATION SYSTEMS AND MANAGEMENT:

Computers – Definition, Characteristics, Components of Computers, Hardware, Software; Application and System Software, Programming Languages and their Classification, Role of IT in Business, Opportunities and Challenges in IT, Importance of IT in Business.

UNIT - II

EMERGING TRENDS IN IT:

Categories of IS, Management Information System (MIS), Decision Support System (DSS) - Types and architecture of DSS, Data Warehouse and Data Mining, Artificial Intelligence, Intelligent Systems, Cloud Computing, Mobile Apps and Computing, Big Data, Robotics, Virtual Reality, Internet of Things (IoT), 5G.

UNIT - III

COMMUNICATIONS AND NETWORKS:

Definition, Introduction to Networks, Overview of Networks, Types of Networks, Network Topologies, Components of Networks, Computer Network Models, Applications of Communications: Definition, Internet - Overview of Internet, Architecture and Functioning of Internet, WWW, FTP, Telnet, Gopher, Browsers and Search Engines, Teleconference, Web Conferencing platforms.

UNIT - IV

FUNCTIONAL AREAS OF INFORMATION SYSTEMS:

Management Levels and Functional Systems, Manufacturing, Production, Sales and Marketing Systems, Accounting, Finance and HR Systems,

ENTERPRISE SYSTEMS AND APPLICATIONS:

Concepts of ERP, SCM, CRM, CPFR, Knowledge Management Systems, System Development Life Cycle (SDLC), Electronic Fund Transfer (EFT).

UNIT - V

SECURITY AND ETHICAL CHALLENGES IN IT:

Need for Security - Security Threats and Attacks, Malicious Software, Hacking, Security Services - Security Mechanisms - Cryptography, Digital signature, Firewall - Types of Firewalls - Identification & Authentication - Biometric Techniques - Security policies - Need for legislation, cyber laws, cyber security issues, salient features of IT Act.

Contents

UNIT - I

Topic	Page No.
1.1 Computers	1
1.1.1 Definition, Characteristics	2
1.1.2 Components of Computers	4
1.2 Hardware	21
1.3 Software	31
1.3.1 Application and System Software	32
1.4 Programming Languages	36
1.4.1 Classification	36
1.5 Role of IT in Business	40
1.6 Opportunities and Challenges in IT	40
1.7 Importance of IT in Business	41
➤ Short Question and Answers	42 - 46
➤ Choose the Correct Answers	47 - 47
➤ Fill in the Blanks	48 - 48

UNIT - II

2.1 Categories of IS	49
2.2 Management Information System (MIS)	51
2.3 Decision Support System (DSS)	56
2.3.1 Types	57
2.3.2 Architecture of DSS	60
2.4 Data Warehouse and Data Mining	64
2.5 Artificial Intelligence	70
2.6 Intelligent Systems	72
2.7 Cloud Computing	74
2.8 Mobile Apps and Computing	77
2.9 Big Data, Robotics	79

Topic	Page No.
2.10 Virtual Reality, Internet of Things (IOT)	81
2.11 5G	83
➤ Short Question and Answers	85 - 88
➤ Choose the Correct Answers	89 - 89
➤ Fill in the Blanks	90 - 90

UNIT - III

3.1 Definition, Introduction to Networks, Overview of Networks	91
3.2 Types of Networks	92
3.3 Network Topologies	98
3.4 Components of Networks	105
3.5 Computer Network Models	112
3.5.1 OSI Model	112
3.5.2 TCP / IP Model	116
3.6 Applications of Communications	118
3.7 Definition, Internet - Overview of Internet, Architecture and Functioning of Internet	120
3.7.1 WWW	124
3.7.2 FTP	126
3.7.3 Telnet	126
3.7.4 Gopher	127
3.7.5 Browsers and Search Engines	127
3.8 Teleconference	130
3.9 Web Conferencing Platforms	131
➤ Short Question and Answers	135 - 138
➤ Choose the Correct Answers	139 - 139
➤ Fill in the Blanks	140 - 140

Topic	Page No.
-------	----------

UNIT - IV

4.1	Management Levels	141
4.2	Functional Systems	141
4.2.1	Manufacturing	142
4.2.2	Production	143
4.2.3	Sales and Marketing Systems	144
4.2.4	Accounting	145
4.2.5	Finance	146
4.2.6	HR Systems	147
4.3	Enterprise Systems and Applications	148
4.4	Concepts of ERP	149
4.5	Supply Chain Management (SCM)	156
4.6	Customer Relationship Management (CRM)	160
4.7	CPFR	162
4.8	Knowledge Management Systems	163
4.9	System Development Life Cycle(SDLC)	164
4.10	Electronic Fund Transfer (EFT)	167
➤	Short Question and Answers	174 - 177
➤	Choose the Correct Answers	178 - 179
➤	Fill in the Blanks	180 - 180

UNIT - V

5.1	Need for Security	181
5.2	Security Threats and Attacks	181
5.3	Malicious Software	184
5.4	Hacking	189
5.5	Security Services - Security Mechanisms	190
5.6	Cryptography	191

Topic	Page No.
5.7 Digital Signature	196
5.8 Firewall	197
5.8.1 Types of Firewalls	197
5.9 Identification & Authentication	199
5.9.1 Biometric Techniques	201
5.10 Security Policies	203
5.10.1 Need for Legislation	204
5.11 Cyber Laws	205
5.12 Cyber Security Issues	206
5.13 Salient Features of IT Act	207
➤ Short Question and Answers	211 - 214
➤ Choose the Correct Answers	215 - 215
➤ Fill in the Blanks	216 - 216

Important Questions

UNIT - I

1. Define computer and explain its characteristics?

Ans :

Refer Unit-I, Q.No. 1

2. Draw a block diagram of computer. Explain the working of various functional units.

Ans :

Refer Unit-I, Q.No. 3

3. Define Hardware. Explain the classification of hardware.

Ans :

Refer Unit-I, Q.No. 9

4. Compare and contrast RAM and ROM.

Ans :

Refer Unit-I, Q.No. 15

5. Define Software. State the features of software.

Ans :

Refer Unit-I, Q.No. 18

6. Define application softwares. State the uses of application softwares.

Ans :

Refer Unit-I, Q.No. 21

7. Explain the role of IT in business.

Ans :

Refer Unit-I, Q.No. 29

8. Explain the various challenges of IT ?

Ans :

(Imp.)

Refer Unit-I, Q.No. 30

9. Explain the importance of IT in Business.

Ans :

(Imp.)

Refer Unit-I, Q.No. 31

UNIT - II

- 1. Define management information system. Explain the characteristics of management information system.**

Ans :

Refer Unit-II, Q.No. 3

- 2. Explain the various types of decision support system.**

Ans :

Refer Unit-II, Q.No. 11

- 3. Explain the architecture of DSS.**

Ans :

Refer Unit-II, Q.No. 13

- 4. What are the differences between DSS and MIS?**

Ans :

Refer Unit-II, Q.No. 16

- 5. Discuss the concept of data warehouse and its design process.**

Ans :

Refer Unit-II, Q.No. 17

- 6. What is data mining? Explain the scope of data mining.**

Ans :

Refer Unit-II, Q.No. 20

- 7. Discuss about artificial intelligence.**

Ans :

Refer Unit-II, Q.No. 24

- 8. Describe various Types of Artificial Intelligence System.**

Ans :

Refer Unit-II, Q.No. 27

- 9. What is Big data? State the characteristics of big data.**

Ans :

Refer Unit-II, Q.No. 24

UNIT - III

- 1. List the advantages and disadvantages of each of the LAN Topologies Bus, Star, and Ring.**

Ans :

Refer Unit-III, Q.No. 11

- 2. Explain the various components of Network.**

Ans :

Refer Unit-III, Q.No. 12

- 3. Describe briefly the function of each layer of the OSI Model.**

Ans :

Refer Unit-III, Q.No. 20

- 4. Explain briefly about TCPI / IP Model.**

Ans :

Refer Unit-III, Q.No. 21

- 5. State the various Applications of Communications.**

Ans :

Refer Unit-III, Q.No. 22

- 6. Explain briefly about internet Addressing and architecture.**

Ans :

Refer Unit-III, Q.No. 27

- 7. Explain the Architecture of www.**

Ans :

Refer Unit-III, Q.No. 31

- 8. Explain various Web Conferencing platforms**

Ans :

Refer Unit-III, Q.No. 40

UNIT - IV

1. Discuss about levels of management.

Ans :

Refer Unit-IV, Q.No. 1

2. Discuss briefly about manufacturing information system.

Ans :

Refer Unit-IV, Q.No. 3

3. What is production information system?

Ans :

Refer Unit-IV, Q.No. 4

4. Discuss about the Marketing information system (MKIS).

Ans :

Refer Unit-IV, Q.No. 5

5. Discuss about Human resources information system.

Ans :

Refer Unit-IV, Q.No. 8

6. Discuss how to develop ERP System.

Ans :

Refer Unit-IV, Q.No. 11

7. Explain the various modules of ERP.

Ans :

Refer Unit-IV, Q.No. 12

8. Explain the issues related to ERP maintenance and support.

Ans :

Refer Unit-IV, Q.No. 14

9. Elucidate the Evolution of supply chain management?

Ans :

Refer Unit-IV, Q.No. 17

10. State the functions of Supply chain management?

Ans :

Refer Unit-IV, Q.No. 19

11. Explain about customer relationship management.

Ans :

Refer Unit-IV, Q.No. 20

12. What are the various stages of System Development? Explain in detail each stages.

Ans :

Refer Unit-IV, Q.No. 26

13. Explain the different categories of Feasibility study.

Ans :

Refer Unit-IV, Q.No. 27

UNIT - V

1. Explain various security threats in business.

Ans :

Refer Unit-V, Q.No. 2

2. Explain various security attacks in business.

Ans :

Refer Unit-V, Q.No. 3

3. Define malicious software. Explain about the different types of malicious software .

Ans :

Refer Unit-V, Q.No. 4

4. Define hacking. What are the various types of hacking.

Ans :

Refer Unit-V, Q.No. 6

5. Define the term cryptography. Explain in detail the three cryptographic schemes.

Ans :

Refer Unit-V, Q.No. 9

6. What is the significance of key in security?

Ans :

Refer Unit-V, Q.No. 12

7. Explain the concept of digital signature.

Ans :

Refer Unit-V, Q.No. 13

8. What is firewall ? Discuss various types of firewalls.

Ans :

Refer Unit-V, Q.No. 14

9. Explain in brief about the emerging biometric technologies.

Ans :

Refer Unit-V, Q.No. 18

10. What is Cyber Law? Explain the need for Cyber Laws in India.

Ans :

Refer Unit-V, Q.No. 22

11. State the features of IT Act 2008.

Ans :

Refer Unit-V, Q.No. 27

UNIT I

INFORMATION SYSTEMS AND MANAGEMENT:

Computers – Definition, Characteristics, Components of Computers, Hardware, Software; Application and System Software, Programming Languages and their Classification, Role of IT in Business, Opportunities and Challenges in IT, Importance of IT in Business.

1.1 COMPUTERS

1.1.1 Definition, Characteristics

Q1. Define computer and explain its characteristics?

Ans : (Imp.)

Meaning

A computer is an electronic device that has the ability to store, retrieve, and process data, and can be programmed with instructions that it remembers. The physical parts that make up a computer (the central processing unit, input, output, and memory) are called hardware. Programs that tell a computer what to do are called software. A set of instructions that perform a particular task is called a program, software program, or software. Peripherals are any hardware device connected to a computer, any part of the computer outside the CPU and working memory. Some examples of peripherals are keyboards, the mouse, monitors, printers, scanners, disk and tape drives, microphones, speakers, joysticks, plotters, and cameras. Computer is an advanced electronic device that takes raw data as input from the user and processes these data under the control of set of instructions (called program) and gives the result (output) and saves output for the future use. It can process both numerical and non-numerical (arithmetic and logical) calculations.

Definition

- A computer is an electronic device that operates under the control of a set of instructions that is stored in its memory unit.

- A computer can be more accurately defined as an electronic device that takes data as input, stores and processes it and displays the output according to the given instructions.

Characteristics

Increasing popularity of computers has proved that it is a very powerful and useful tool. The power and usefulness of this popular tool are mainly due to its following characteristics:

1. Automatic

An automatic machine works by itself without human intervention. Computers are automatic machines because once started on a job, they carry out the job (normally without any human assistance) until it is finished. However, computers being machines cannot start themselves and cannot go out and find their own problems and solutions. We need to instruct a computer using coded instructions that specify exactly how it will do a particular job. Some of the other characteristics of computers (such as speed and accuracy) are because they are automatic and work on a problem without any human intervention.

2. Speed

A computer is a very fast device. It can perform in a few seconds, the amount of work that a human being can do in an entire year - if he/she worked day and night and did nothing else. In other words, a computer can do in a few minutes what would take a man his entire lifetime.

3. Accuracy

In addition to being very fast, computers are very accurate. Accuracy of a computer is consistently high and the degree of its accuracy depends upon its design. A computer performs every calculation with the same accuracy.

4. Diligence

Unlike human beings, a computer is free from monotony, tiredness, and lack of concentration. It can continuously work for hours without creating any error and without grumbling. Hence, computers score over human beings in doing routine type of jobs that require great accuracy. If ten million calculations have to be performed, a computer will perform the last one with exactly the same accuracy and speed as the first one.

5. Versatility

Versatility is one of the most wonderful things about a computer. One moment it is preparing results of an examination, next moment it is busy preparing electricity bills, and in between, it may be helping an office secretary to trace an important letter in seconds. All that is required to change its talent is to slip in a new program (a sequence of instructions for the computer) into it. In brief, a computer is capable of performing almost any task, if the task can be reduced to a finite series of logical steps.

6. Power of Remembering

As a human being acquires new knowledge, his/her brain subconsciously selects what it feels to be important and worth retaining in memory. The brain relegates unimportant details to back of mind or just forgets them. This is not the case with computers. A computer can store and recall any amount of information because of its secondary storage (a type of detachable memory) capability. It can retain a piece of information as long as a user desires and the user can recall the information whenever required. Even after several years, a user can recall

exactly the same information that he/she had stored in the computer several years ago. A computer forgets or loses certain information only when a user asks it to do so. Hence, it is entirely up to the user to make a computer retain or forget some information.

7. No I. Q

A computer is not a magical device. It possesses no intelligence of its own. Its I. Q. is zero, at least until today. It has to be told what to do and in what sequence. Hence, only a user determines what tasks a computer will perform. A computer cannot take its own decision in this regard.

8. No Feelings

Computers are devoid of emotions. They have no feelings and no instincts because they are machines. Although men have succeeded in building a memory for computer, but no computer possesses the equivalent of a human heart and soul. Based on our feelings, taste, knowledge, and experience we often make certain judgements in our day-to-day life whereas, computers cannot make such judgements on their own. They make judgements based on the instructions given to them in the form of programs that are written by us (human beings).

Q2. Explain the evolution of computers.

Ans :

Computers were invented because of man's search for fast and accurate calculating devices.

Blaise Pascal invented the first mechanical adding machine in 1642. Later, in the year 1671, Baron Gottfried Wilhelm von Leibniz of Germany invented the first calculator for multiplication. Keyboard machines originated in the United States around 1880 and we use them even today. Around the same period, Herman Hollerith came up with the concept of punched cards that were extensively used as input medium in computers even in late 1970s. Business machines and calculators made their appearance in Europe and America towards the end of the nineteenth century.

Charles Babbage, a nineteenth century Professor at Cambridge University, is considered the father of modern digital computers. He had employed a group of clerks for preparing mathematical and statistical tables. Babbage had to spend several hours checking these tables because even utmost care and precautions could not eliminate human errors. Soon he became dissatisfied and exasperated with this type of monotonous job. As a result, he started thinking about building a machine that could compute tables guaranteed to be error-free.

In this process, Babbage designed a "Difference Engine" in the year 1822 that could produce reliable tables. In 1842, Babbage came out with his new idea of a completely automatic Analytical Engine for performing basic arithmetic functions for any mathematical problem at an average speed of 60 additions per minute. Unfortunately, he was unable to produce a working model of this machine because the precision engineering required to manufacture the machine was not available during that period. However, his efforts established a number of principles that are fundamental to the design of any digital computer. In order to have a better idea of the evolution of computers it is worthwhile to discuss some of the well-known early computers. These are as follows:

1. The Mark I Computer (1937-44)

It is also known as Automatic Sequence Controlled calculator, this was the first fully automatic calculating machine designed by Howard A. Aiken of Harvard University in collaboration with IBM (International Business Machines) Corporation. It was an electro-mechanical device (used both electronic and mechanical components) based on the techniques already developed for punched card machines.

Although this machine proved to be extremely reliable, it was very complex in design and huge in size. It used over 3000 electrically actuated switches to control its operations and was approximately 50 feet long and 8 feet high. It was capable of performing five basic arithmetic operations: addition, subtraction, multiplication, division, and table reference on numbers as big as 23 decimal digits. It took approximately 0.3 second to add two numbers and 4.5 seconds for multiplication of two numbers. Obviously, the machine was very slow as compared to today's computers.

2. The Atanasoff-Berry Computer (1939-42)

Dr. John Atanasoff developed an electronic machine to solve certain mathematical equations. The machine was called the Atanasoff-Berry Computer, or ABC, after its inventor's name and his assistant, Clifford Berry. It used 45 vacuum tubes for internal logic and capacitors for storage.

3. The ENIAC (1943-46)

The Electronic Numerical Integrator And Calculator (ENIAC) was the first all electronic computer. It was constructed at the Moore School of Engineering of the University of Pennsylvania, U.S.A. by a design team led by Professors J. Presper Eckert and John Mauchly.

The team developed ENIAC because of military needs. It was used for many years to solve ballistic related problems. It took up wall space in a 20 x 40 square feet room and used 18,000 vacuum tubes. It could add two numbers in 200 microseconds and multiply them in 2000 microseconds.

4. The EDVAC (1946-52)

A major drawback of ENIAC was that its programs were wired on boards that made it difficult to change the programs. Dr. John Von Neumann later introduced the "stored program" concept that helped in overcoming this problem.

The basic idea behind this concept is that a sequence of instructions and data can be stored in the memory of a computer for automatically directing the flow of operations. This feature considerably influenced the development of modern digital computers because of the ease with which different programs can be loaded and executed on the same computer. Due to this feature, we often refer to modern digital computers as stored program digital computers.

The Electronic Discrete Variable Automatic Computer (EDVAC) used the stored program concept in its design. Von Neumann also has a share of the credit for introducing the idea of storing both instructions and data in binary form (a system that uses only two digits - 0 and 1 to represent all characters), instead of decimal numbers or human readable words.

5. The EDSAC (1947-49)

Almost simultaneously with EDVAC of U.S.A., the Britishers developed the Electronic Delay Storage Automatic Calculator (EDSAC). The machine executed its first program in May 1949. In this machine, addition operations took 1500 microseconds and multiplication operations took 4000 microseconds. A group of scientists headed by Professor Maurice Wilkes at the Cambridge University Mathematical Laboratory developed this machine.

6. The UNIVAC I (1951)

The Universal Automatic Computer (UNIVAC) was the first digital computer that was not "one of a kind". Many UNIVAC machines were produced, the first of which was installed in the Census Bureau in 1951 and was used continuously for 10 years. The first business use of a computer, a UNIVAC I, was by General Electric Corporation in 1954.

In 1952, the International Business Machines (IBM) Corporation introduced the IBM-701 commercial computer. In rapid succession, improved models of the UNIVAC I and other 700-series machines were introduced. In 1953, IBM produced the IBM-650, and sold over 1000 of these computers.

UNIVAC marked the arrival of commercially available digital computers for business and scientific applications.

1.1.2 Components of Computers

Q3. Write about the components of Computer.

(OR)

Draw a block diagram of computer. Explain the working of various functional units.

Ans :

(Imp.)

A typical computer system irrespective of its size, class or type consists of hardware and software, integrated and synchronized together to perform computational work or data processing. Computer Anatomy is concerned with the way the various functional units operate and how they are connected together to form the computer system.

A computer system consists of the following functional units :

- i) Input Unit
- ii) Memory / Storage Unit
- iii) CPU (Central Processing Unit)
- iv) Output Unit

The block structure of a computer is shown in Fig. below depicts the working of computer and its various functional units.

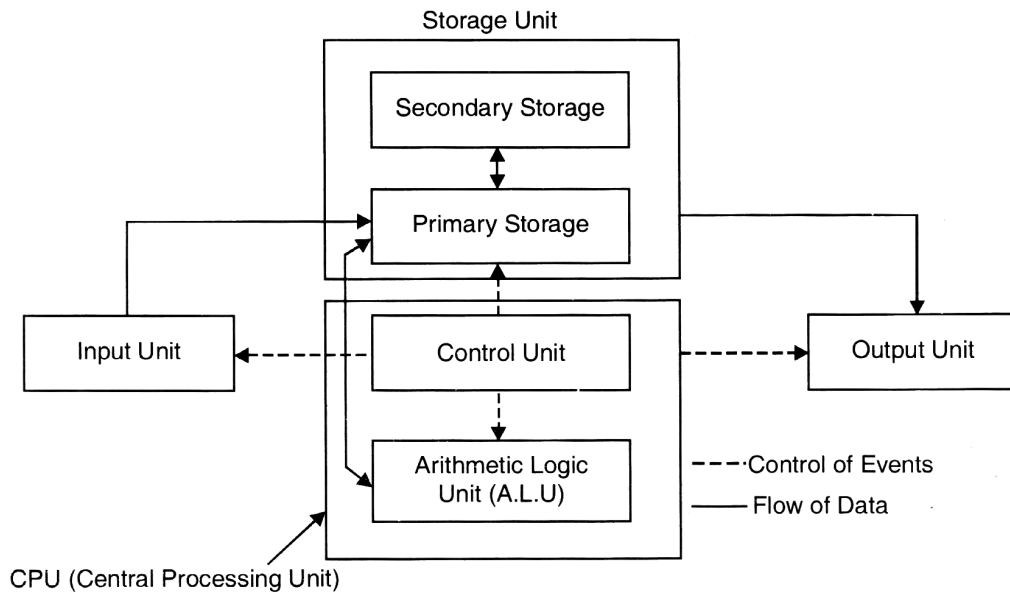


Fig.: Block Diagram of a Computer

i) Input Unit

As the computer process the data according to the instructions given to it and produces the results. The input unit is used to feed the data as well as instructions to the computer. The commonly used input devices are keyboard, mouse, scanner, joystick etc.

In brief, an input unit performs the following functions:

- It accepts or reads the list of data and instructions from the user.
- It converts these data and instructions in computer acceptable form.
- It supplies the converted data and instructions to the computer system for further processing.

ii) Memory/Storage Unit

The basic function of this unit is to store the data, instructions and final results in the system so that it can deliver them on demand to the user or other computer units at a later time. The data and instructions are transferred to other computer units or devices from the main storage under the supervision of control unit. It also referred as the primary storage.

Primary Storage : Primary storage is a direct access storage device, consisting of a number of storage locations. Each location in the storage has a unique number, called Storage Address. The system assigns a unique location to each data element. Once the data is assigned to the location, the system accesses it directly by means of the address of the particular storage locations.

The various types of primary storages are:

- a) RAM (Random Access Memory)
- b) ROM (Read Only Memory)
- c) Cache Memory
- d) Virtual Memory

Secondary Storage

The data and instructions in primary storage (RAM) are temporary in nature and they are erased automatically as soon as the power is switched off. The secondary storage is used to store the data permanently. The user can access the data from secondary storage whenever required.

Some commonly used secondary storage devices that are used to store the data permanently are:

- (a) Floppy Disk
- (c) Compact Disk
- (b) Hard Disk
- (d) Magnetic Tape

iii) Central Processing Unit (CPU)

CPU is considered as the "Brain of the computer". It is also called as microprocessor. It is the fastest and costly unit of the computer system. All major calculations and comparisons are made inside the CPU. CPU converts all the supplied input into required output as per the instructions supplied by the user. The performance and the speed of the computer mainly depend upon the type of microprocessor installed in it.

Within CPU, there exists a temporary storage location known as Registers. These are used for storage of smaller data (up to 64 bits). Registers are being used for faster data supply to processor for processing. The number, size and capacity of register in a CPU can affect the processing power.

The CPU further contains two units :

- (a) Control Unit
- (b) ALU (Arithmetic and Logical Unit)

(a) Control Unit

- A Control unit is a major component of the computer which helps in the functioning of the central processing unit and in turn runs the whole computer.
- Control. Unit works as a supervisor or monitor in the system. It supervises or controls all the activities of various functional units of the computer.

- It fetches (transfers) the required instructions from the main memory, interprets them and then sends them to ALU for processing.
- It controls the execution of instructions in a sequential order.
- It works as a central nervous system for the computer. It controls the flow of data to and from the main memory.
- It sends and receives control signals from various peripheral devices.
- It ensures that data reaches the correct place at the correct time.

In brief, control unit acts as monitor that tells the other components what to do, when to do and how to do.

b) ALU (Arithmetic & Logical Unit)

- The function of ALU is to perform the actual calculations in the computer. It performs arithmetic (addition, subtraction, multiplication & division) and logical (comparisons or decisions) calculations in the computer.
- Under the control of the control unit, the data and instructions stored in the primary storage are transferred to ALU for processing. ALU performs the calculations and sends intermediate and final results to the main memory i.e. no processing is done in the primary storage unit.
- In some computer processors, the ALU is divided into two distinct parts, the AU and the LU. The AU performs the arithmetic operations and the LU performs the logical operations.
- ALU has internally two temporary registers into which the incoming data from memory is loaded and then operated inside ALU.

iv) Output Unit

During data processing, computer process the data according to the instructions applied to it and produce the result or output. The

output unit is used to provide the results to the user. The commonly used output devices are monitor or VDU (Visual Display Unit), printer, plotter, speakers etc.

In brief, an output unit performs the following functions:

- It accepts the results produced by the computer that are in binary form.
- It converts these binary coded results to human acceptable form.
- Finally, it supplies the converted results to the user.

Q4. Explain the various generations of computer.

Ans :

“Generation” in computer talk is a step in technology. It provides a framework for the growth of computer industry. Originally, the term “generation” was used to distinguish between varying hardware technologies but it has now been extended to include both hardware and software that together make up a computer system.

The custom of referring to computer era in terms of generations came into wide use only after 1964. There are totally five computer generations known till today. Below we describe each generation along with its identifying characteristics. Although there is a certain amount of overlap between different generations, the approximate period shown against each are normally accepted.

1. First Generation (1942 – 1955)

The first generation computers used vacuum tubes these computers were very big and heavy. They large number of internal circuits However, They stored small amount of information.



Fig. : A Vacuum Tube

Characteristics

- a. They were the fastest calculating devices of their time.
- b. They were too bulky in size, requiring large rooms for installation.
- c. They used thousands of vacuum tubes that emitted large amount of heat and burnt out frequently. Hence, the rooms/areas in which these computers were located had to be properly air-conditioned.
- d. Each vacuum tube consumed about half a watt of power. Since a computer typically used more than ten thousand vacuum tubes, power consumption of these computers was very high.

- e. As vacuum tubes used filaments, they had a limited life. Because a computer used thousands of vacuum tubes, these computers were prone to frequent hardware failures.
- f. Due to low mean time between failures, these computers required constant maintenance.
- g. In these computers, thousands of individual components were assembled manually by hand into electronic circuits. Hence, commercial production of these computers was difficult and costly.
- h. Since these computers were difficult to program and use, they had limited commercial use.

2. Second Generation 1955 - 1964

John Bardeen, William Shockley, and Walter Brattain invented a new electronic switching device called transistor at Bell Laboratories in 1947. Transistors soon proved to be a better electronic switching device than vacuum tubes due to their following properties :

- a. They were more rugged and easier to handle than tubes since they were made of germanium semiconductor material rather than glass.
- b. They were highly reliable as compared to tubes since they had no parts like a filament that could burn out.
- c. They could switch much faster (almost ten times faster) than tubes. Hence, switching circuits made of transistors could operate much faster than their counterparts made of tubes.
- d. They consumed almost one-tenth the power consumed by a tube.
- e. They were much smaller than a tube.
- f. They were less expensive to produce.
- g. They dissipated much less heat as compared to vacuum tubes.

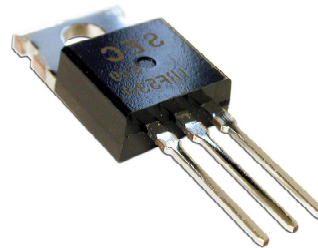


Fig. : A Transistor

Characteristic features of second-generation computers are as follows

- a. They were more than ten times faster than the first-generation computers.
- b. They were smaller than first-generation computers and required smaller space.
- c. They consumed less power and dissipated less heat than the first-generation computers. The rooms/areas in which the second-generation computers were located still required to be properly air- conditioned.
- d. They were more reliable and less prone to hardware failures than the first-generation computers.
- e. They had faster and larger primary and secondary storage as compared to first-generation computers.
- f. They were easier to program and use than the first-generation computers. Hence, they had wider commercial use.
- g. In these computers, thousands of individual transistors had to be assembled manually by hand into electronic circuits making commercial production of these computers difficult and costly.

3. Third Generation (1964-1975)

In 1958, Jack St. Clair Kilby and Robert Noyce invented the first integrated circuit. Integrated circuits (called ICs) are circuits consisting of several electronic components like transistors, resistors, and capacitors grown on a single chip of silicon eliminating wired interconnection between components.

The IC technology was also known as “microelectronics” technology because it made it possible to integrate larger number of circuit components into very small (less than 5 mm square) surface of silicon, known as “chip”. Initially the integrated circuits contained only about ten to twenty components. This technology was named small scale integration (SSI). Later with the advancement in technology for manufacturing ICs, it became possible to integrate up to about hundred components on a single chip. This technology came to be known as medium scale integration (MSI).



Fig. : An IC Chip

Characteristic features of third-generation computers are as follows :

- a. They were more powerful than second-generation computers. They were capable of performing about 1 million instructions per second.
- b. They were smaller than second-generation computers requiring smaller space.
- c. They consumed less power and dissipated less heat than second-generation computers. The rooms/areas in which third-generation computers were located still required to be properly air- conditioned.
- d. They were more reliable and less prone to hardware failures than second-generation computers requiring lower maintenance cost.
- e. They had faster and larger primary and secondary storage as compared to second-generation computers.
- f. They were general-purpose machines suitable for both scientific and commercial applications.
- g. Their manufacturing did not require manual assembly of individual components into electronic circuits resulting in reduced human labor and cost involved at assembly stage. Hence, commercial production of these systems was easier and cheaper. However, highly sophisticated technology and expensive setup was required for the manufacture of IC chips.
- h. Standardization of high-level programming languages allowed programs written for one computer to be easily ported to and executed on another computer.
- i. Timesharing operating system allowed interactive usage and simultaneous use of these systems by multiple users.
- j. Timesharing operating system helped in drastically improving the productivity of programmers cutting down the time and cost of program development by several fold.
- k. Timesharing operating system also made on-line systems feasible resulting in usage of these systems for new on-line applications.
- l. Unbundling of software from hardware gave users of these systems an opportunity to invest only in software of their need and value.
- m. Minicomputers of third-generation made computers affordable even by smaller companies.

4. Fourth Generation (1975-1989)

Average number of electronic components packed on a silicon chip doubled each year after 1965. This progress soon led to the era of large scale integration (LSI) when it was possible to integrate over 30,000 electronic components on a single chip, followed by very large scale integration (VLSI) when it was possible to integrate about one million electronic components on a single chip. This progress led to a dramatic development - creation of a microprocessor.

A microprocessor contains all circuits needed to perform arithmetic logic and control functions,

the core activities of all computers, on a single chip. Hence, it became possible to build a complete computer with a microprocessor, a few additional primary storage chips, and other support circuitry. It started a new social revolution - personal computer (PC) revolution. Overnight computers became incredibly compact. They became inexpensive to make, and suddenly it became possible for anyone to own a computer)



Fig. : Microprocessor

Characteristic features of fourth-generation computers are as follows:

- a. PCs were smaller and cheaper than mainframes or minicomputers of third generation.
- b. Although the fourth-generation mainframes required proper air-conditioning of the rooms/areas in which they were located, no air-conditioning was required for PCs.
- c. They consumed less power than third-generation computers.
- d. They were more reliable and less prone to hardware failures than third-generation computers requiring negligible maintenance cost.
- e. They had faster and larger primary and secondary storage as compared to third-generation computers.
- f. They were general-purpose machines.
- g. Their manufacturing did not require manual assembly of individual components into electronic circuits resulting in reduced human labor and cost involved at assembly stage. Hence, commercial production of these systems was easier and cheaper. However,

highly sophisticated technology and expensive setup was required for manufacturing LSI and VLSI chips.

- h. Use of standard high-level programming languages allowed programs written for one computer to be easily ported to and executed on another computer.
- i. Graphical user interface (GUI) enabled new users to quickly learn how to use computers.
- j. PC-based applications made PCs a powerful tool for both office and home usage.
- k. Network of computers enabled sharing of resources like disks, printers, etc. among multiple computers and their users. They also enabled several new types of applications involving interaction among computer users at geographically distant locations. Computer Supported Cooperative Working (CSCW), or groupware is one such application in which multiple members working on a single project and located at distant locations cooperate with each other by using a network of computers.
- l. In addition to unbundled software, these systems also used add-on hardware feature that allowed users to invest only in the hardware configuration and software of their need and value.
- m. PCs of fourth generation made computers affordable even by individuals for their personal use at home.

5. Fifth Generation (1989-Present)

The trend of further miniaturization of electronic components, dramatic increase in power of microprocessor chips, and increase in capacity of main memory and hard disk continued during fifth generation. VLSI technology became ULSI (Ultra Large Scale Integration) technology in fifth generation resulting in production of microprocessor chips having ten million electronic components. In fact, the speed of microprocessors and the size of main memory and hard disk doubled almost every eighteen months. As a result, many features found in the CPUs of large mainframe systems of third- and fourth-generation systems became part of microprocessor architecture in fifth generation. This ultimately resulted in availability of very powerful

and compact computers becoming available at cheaper rates and death of traditional large mainframe systems.

Due to this fast pace of advancement in computer technology, we see more compact and more powerful computers being introduced almost every year at more or less the same price or even cheaper. Notable among these are portable notebook computers that give the power of a PC to their users even while travelling, powerful desktop PCs and workstations, powerful servers, and very powerful supercomputers.



Fig. : Artificial Intelligence (ROBOT)

Characteristic features of fifth-generation computers are as follows

- a. Portable PCs (called notebook computers) are much smaller and handy than PCs of fourth generation allowing users to use computing facility even while travelling.
- b. Fifth-generation desktop PCs and workstations are several times more powerful than PCs of fourth generation.
- c. Although fifth-generation mainframes require proper air-conditioning of the rooms/areas in which they are located, no air-conditioning is normally required for notebook computers, desktop PCs. and workstations.
- d. They consume less power than their predecessors do.
- e. They are more reliable and less prone to hardware failures than their predecessors were, requiring negligible maintenance cost.
- f. Many of the large-scale fifth-generation systems have hot-plug feature that enables a failed component to be replaced with a new one without the need to shutdown the system. Hence, the uptime of these systems is very high.
- g. They have faster and larger primary and secondary storage as compared to their predecessors.
- h. They are general-purpose machines.
- i. Their manufacturing does not require manual assembly of individual components into electronic circuits resulting in reduced human labor and cost involved at assembly stage. Hence, commercial production of these systems is easier and cheaper. However, highly sophisticated technology and expensive setup (affordable only by a few organizations in the world) is required for manufacturing ULSI chips.
- j. Use of standard high-level programming languages allows programs written for one computer to be easily ported to and executed on another computer.
- k. More user-friendly interfaces with multimedia features make the systems easier to learn and use by anyone, including children.
- l. Newer and more powerful applications, including multimedia applications, make the systems more useful in every occupation.
- m. Explosion in the size of the Internet coupled with Internet-based tools and applications have made these systems influence the life of even common people.
- n. These systems also use the concept of unbundled software and add-on hardware allowing the users to invest only in the hardware configuration and software of their need and value.
- o. With so many types of computers in all price ranges today, we have a computer for almost any type of user whether the user is a child or a world fame scientist.

Q5. Explain the classification of computers based on size and working principle.

Ans :

1. Classification of Computers Based on Size

Computers can be classified by their physical size and appearance. By size, we can classify computers into following types:

a) Micro Computer

- A microcomputer is a small, relatively inexpensive computer with a micro-processor as its central processing unit.
- A microcomputer is a computer designed for individual use.
- This is the smallest category of digital computers, in which a single micro-processor performs the function of ALU (Arithmetic logic unit) and Control unit.
- In micro computers, microprocessor is connected with primary memory (RAM & ROM), input, output and secondary storage devices.
- Microcomputers are supported by single user operating systems.
- Home computers and personal computers are the best examples of Microcomputers.



Fig. : Micro Computer

b) Mini Computer

- Mini Computers are general purpose computers, which are more expensive than the microcomputers.

- They also use 16 bit or 32-bit micro-processor as their main CPU. Intel 80386, 80486 and Pentium are some processors of these computers.
- The capabilities of mini computers lie somewhat between the mainframes and personal computers.
- They can support multiple input- output devices.
- They contain less memory and processing capabilities than a mainframe.
- A large number of computers can be connected to a network with a mini computer acting as a server.
- Mini Computers can be used for systems like- ticket reservation or banking.
- Most commonly used operating system on such computers is UNIX.



Fig. : Mini Computer

c) Programmable Computer

- Programmable computers are the smallest computers that can be programmed by the user.
- Personal Digits Assistants (PDA), latest mobiles and address books fall under this category.
- These computers have capabilities of keeping track of appointments, meetings, call lists, SMS, image and video capturing etc.
- They also contain accessories like calculator, notepad, MP3 players, Bluetooth communication etc.



Fig. : PDA - A programmable Computer

d) Laptop

- Laptop computers are so small that they can be placed on our lap.
- These computers can work while traveling and even without any power connection.
- These computers are commonly used at homes or offices to perform commonly used operations like word processing, spreadsheets and presentations.
- These computers are light in weight and compact in size.
- They contain all features of desktops or personal computers.
- Laptop computers generally have LCD (Liquefied Crystal Display) screens and pointing sensors. Today, Laptop computers are coming with LED (Light Emitting Diodes) screens also.

e) Desktop or Personal Computer (PC)

- Personal Computers are the most widely used computers in the world.
- These computers are normally placed on the top of the desk, so they are also known as the Desktop computers.
- These computers are equipped with huge volumes of main and secondary memories.
- They are mainly used for managing personal data of a company or an individual, that's why they are called Personal computers.

- Number of softwares can be installed on these computers to perform various kinds of data processing operations.
- The size of desktop computers is greater than laptops.
- We can manage accounts, design graphics or images, surf internet, write letters and listen to music or watch movies on these computers.

f) Mainframe Computer

- A mainframe computer is a very large size computer capable of handling and processing very large amounts of data quickly.
- Mainframe computers have more main and secondary storage and contain multiple processing units (CPUs).
- These computers are generally used in large organizations like government agencies, banks, flight scheduling, ticket reservations and insurance companies where a large number of people need frequent access to the same data which is usually organized into one or more huge databases.
- In a mainframe, several computer terminals which basically contain keyboard and monitor are plugged into a single mainframe. These terminals act as an input/output device to the mainframe.
- Mainframe computers occupy a lot of space and require proper air-conditioning.
- Mainframes are so called because the earliest ones were housed in large metal frames.
- A typical mainframe system can support hundreds of users at the same time.
- With the technological advances in personal computers, the need for mainframe computing has significantly reduced over the years. The computing power of a typical desktop computer today is greater than that of a mainframe system.



Fig. : Mainframe Computer

g) Super Computer

- Super Computers are the most powerful computers typically used for scientific and engineering applications that must handle very large databases or do a great amount of computation.
- Super computers are the fastest and most expensive computers ever built by humans.
- These computers contain multiple processors that work together to solve a single problem at a time.
- The size of these computers is hundreds of times bigger than a personal computer.



Fig. : Super Computer

- These computers have huge main memories and secondary storage.
- These computers cost in millions of dollars and owned by countries or very large business organizations.

- Supercomputers are used for very complex jobs such as nuclear research or forecasting weather patterns.
- The major difference between a supercomputer and a mainframe is that a supercomputer channels all its power into executing a few programs as fast as possible, whereas a mainframe uses its power to execute many programs concurrently.

2. Classification of Computers based on Working Principles

On the basis of Working Principles, computers can be classified as:

a) Digital Computer

- Digital Computers are the computers that work on discontinuous or discrete data.
- These computers convert the inputs into binary language of 0's & 1's.
- They carry out operations on binary data at a very fast rate and generate output in user understandable language.
- These computers basically work by counting and adding the binary digits.
- These computers are more accurate, faster and reliable than analog computers.
- They are the most commonly used computers in homes and offices.
- The real life example of a digital computer is a digital watch. Now days, computer used for the purpose of business and education are also example of digital computers.
- In digital computers, data flows in the form of clock pulses as shown below :

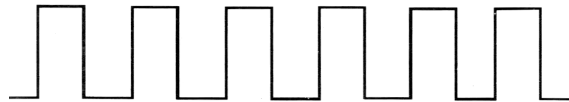


Fig.: (Clock Pulses)

b) Analog Computer

- Analog computers are the computers that work on continuous data.
- Analog computers are used to measure the physical quantities like pressure, temperature, speed etc.
- These computers accept input data in the form of signals and convert them to numeric values. For example: A thermometer does not perform any calculations but measures the temperature of the body.
- Analog computers are mainly used for scientific and engineering purposes, because they deal with quantities that vary constantly.
- Analog computers are faster than digital computers but they are not as accurate as digital computers. That's why they are less commonly used.
- The representation of flow of data in analog computer is shown as:

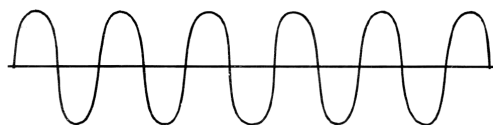


Fig.: Data flow in Analog Computer

c) Hybrid Computer

- Hybrid computers employ both the features of digital and analog computers i.e. they can work on continuous as well as discontinuous data.
- These computers are useful in those environments, where both digital & analog signals are used in processing.
- The uses of hybrid computers are increasing day by day as there are number of areas in the real world where we need both analog and digital computers. For example: In a hospital, here may be number of devices like E.C.G. machine etc. which are used to measure the patient's heart beat, temperature and other information. This is done by analog computers. The information received from these analog computers is then supplied to digital computers to generate reports. Thus, this whole system uses hybrid computers.

Q6. Explain the classification of computers based on purpose of use and function.

Ans :

1. Classification of Computers Based on Purpose of Use

There are some needs that are specific to a particular environment or a particular user. Depending upon the purpose of use, computers can be classified as :

a) Special Purpose Computer

- These computers are specially designed to perform a specific task of a specific environment. That's why these computers are not versatile.
- The instructions used by these computers are permanently stored in the machine.
- These computers are generally embedded in various automatic devices. For example: A computer that has been designed to count the telephone call

pulses and display the amount payable can only serve this purpose. It cannot be used for other purposes.

b) General Purpose Computer

- These computers can be used for all general needs of all environments & users.
- These are the versatile computers that can perform a variety of jobs for a variety of environments i.e. general-purpose computers can be used anywhere to solve any problem. For example: A general purpose computer can be used to calculate accounts, data, writing letters, drawing pictures, playing games, listening music, watching movies and accessing internet etc.

2. Classification of Computers based on Function

Computers can be classified into following four basic categories based on the functions they can perform :

a) Server

- Server refers to a computer that is dedicated to provide some services to the other computers (*called clients*).
- Some servers are committed to a specific task; often referred to as dedicated. As a result, there are a number of dedicated server categories, like database servers, file servers and print servers.
- Servers are named depending on the type of service they offer. For example, a computer dedicated to a database may be called a "database server". A computer manages a large collection computer files may be called a "File server".
- As servers are commonly used to deliver services that are required constantly, so most of the servers are never turned off.
- They are bit different because high performing servers are set-up with high configuration hardwares and softwares.

b) Workstation

- A workstation is a computer intended for individual use i.e. primarily to be used by one person at a time.
- A high-performance computer typically used for software development, audio/video editing and scientific applications.
- It is mainly designed for business or professional use rather than home use.
- A workstation has advanced graphics capabilities, large storage capacity, and a powerful microprocessor.
- Workstations are commonly connected to a local area network and run multi-user operating systems.
- In terms of computing power, workstations lie between personal computers and minicomputers.

c) Embedded Computer

- Embedded computers are fixed inside various electronic devices to automate and control their working.
- Various modern electronic devices like Microwave, washing machine, televisions and many other devices contain embedded computers. For example - A small computer fitted in a digital washing machine controls the washing cycle of the machine.
- The user could not program these computers. The manufacturer of these computers programs them.
- The central processing units (CPUs) used in embedded computers are often sufficient only for the computational requirements of the specific application and may be slower and cheaper than CPUs found in a personal computer.

d) Information Appliances

- Information appliances are easy-to-use portable computing devices which are designed to perform a limited set of tasks like basic calculations, playing multimedia, browsing internet, photography, editing text etc.

- Many information appliances will be connected to service providers that provide various services for a monthly subscriber fee.
- They are generally referred as the mobile devices having limited functionality.

Q7. Explain the application of Information Technology in different field.

Ans :

1. Office Automation

Office automation is the process of automating office tasks using computers. In simple terms, Office automation is the use of computer systems to execute a variety of office operations, like- decision-making, data manipulation, document handling, communication and storage. A number of computer technologies such as word processing, electronic filing, accounting, and e-mail are used to perform these operations in an office easily. Basically Office automation uses computer software and hardware solutions to ease your workload.

2. Business

Today, Computers have become a necessity in the business world. Computers can easily perform duties that are tedious and timely for humans. Computers and the software applications that run on them basically control a well organized business. Every major company is equipped with a computer, or network that connects through different branches throughout the firm. Many businesses use accounting software and ledgering systems to ensure the accuracy of their financial status. Every type of business involves transactions with suppliers, employees or customers. Computers effectively process these transactions.

3. Education

Computers have brought a revolution in the field of education. In addition to conventional chalkboards, teachers of today rely increasingly on digital media. Digital lessons, being attractive and interesting, hold the interest of young audience and help students

to understand concepts more effectively. Computer-based tutorial software is also used as a teaching aid to supplement classroom learning. Today, we can find a computer in a classroom, laboratories or in a library. There is no need of carrying huge books, as books are available in the form of CDs or DVDs etc. Computers make the concept of learning very interactive with the involvement of real life pictures, animations, audios and videos.

4. Health Care

Computers are widely used in the field of medicine. Several computer- controlled medical equipments or machines help to diagnose the disease, monitor the patients, capture and transmit photographs of internal problems which are difficult to detect otherwise. Big hospitals make use of computer systems to maintain patient records. It is often necessary to maintain detailed records of the medical history of patients. This information can be effectively stored in a computer database. Computers can keep track of prescriptions and billing information. They can be used to store the information about the medicines prescribed to a patient as well as those, which cannot be prescribed to him/her. The computers are also helpful in training the doctors for surgery.”

5. Banking

Computers are used in banks for a variety of reasons. They help bank personnel operate more efficiently and effectively. Banks use computers to track customer information such as name, address, phone number, date of birth, social security number, account number and place of employment. This information is used to stay in touch with customers and notify them of any changes in bank policy. Computers help tellers or bankers keep a record of all transactions for the day. A bank can use computers for new loan applications and credit card applications also. Without computers, it would be very hard for a bank to offer good customer service day in and day out. Computers help a bank to save time and money, and can be used as an aid to generate profits.

6. E-Commerce

E-Commerce is a new generation of commerce or business that uses computer systems for different transactions. It means conducting business on the Internet i.e. selling and purchasing on internet by using computers. With this a customer has no need to go to the showroom to purchase a particular product. Instead he/she can just open the website of the manufacturer to see the details of the products and place the order. The product will be delivered to customer's place. The mode of payment can be credit cards, demand drafts and cash on delivery. So, E-Commerce helps a businessman as well as a customer by saving time that will be wasted otherwise in going and selecting the product from a vast range of different companies and then comparing and deciding about which one to buy.

7. Weather Forecasting

Computers are widely used for national or international level weather forecasting. Modern computers (super computers) make forecast more accurate than ever, and weather satellites orbiting the earth take photographs of clouds from space and send them to the controlling computers. The computers analyze the information coming from the satellites and predict the change in weather i.e. change in temperature, pressure and humidity etc.

8. Science and Technology

Computers are now essential tools in even branch of science. Scientists use complex mathematical relationships and large volumes of data, which is too impossible to manage without the help of computers. Scientists use computers in various scientific techniques like they use computers to record, analyze, and capture experimental data. They use computers to automate calculations and create simulations to test hypotheses. Computers can also be used by scientists for visualization.

9. Industry

Computers are widely used in manufacturing industries. The traditional machines produce products at a very slow speed but a computerized machine works several times faster than traditional machines. Computers are being used in manufacturing of vehicles like bikes and cars. Even various companies are using several special purpose computers (Robots) during manufacturing. A computer-controlled machine can perform the work of several machines in minimum possible time. The manufacturing industries also use computers for creating models of future products. These models are designed with specialized software before creating the actual products. This technique is called CAD (Computer Aided Designing). The output from a CAD system may be the input to CAM (Computer Aided Manufacturing) system. CAM is the computerized system, which simply controls machine tools and related machinery used in the manufacturing of products. CAM may also refer to the use of a computer to assist in all operations of a manufacturing plant, including planning, management, transportation and storage.

10. Airlines

In the airline industry, many different systems interact in order to ensure that planes stay on schedule and that they fly safely. Nearly all of these systems rely on computers to some degree. Computers are involved in everything from the passenger's initial travel arrangements to the functioning of an airport and the airplanes that fly into it. When we book a flight, regardless of the method, our reservation information is processed and stored by the airline's computer system. If we book this online, then our registration information is directly stored in the company's computer. If we book our flight over the phone, then a customer service representative will enter this information into his/her computer. This computer-based reservation system allows us to easily modify travel arrangements at any airport, and even to use multiple airline companies over the course

of a single trip. Computers allow air traffic controllers to visualize and track the location of planes in the air and then instruct pilots as to the correct course of action. The autopilot, which many modern airplanes are equipped with, frequently employs a computer. This relieves the pilots of many in-flight tasks, allowing the plane to process navigational data and flight control systems.

11. Railways

Computers are widely used in the railway system to manage various railway operations such as scheduling, controlling, fault detection, reservation and monitoring. Computer along with networking or internet made it so easy to keep track of the information such as the number of train, the respective train name, number of seats in first, second and general class, the number of seats available on a particular date, to book tickets from anywhere with the help of e- ticket rather than to stand in a queue. Computers can also be used to monitor and control railway traffic.

12. Word Processing

Computers are most frequently used in word processing area. Word processing software provides a set of tools and commands for entering, editing and formatting the text. Most common example of this type of software is Microsoft Word. (MS Word). By using quality word processing software, businesses and individuals can trim their costs as well as time without sacrificing quality. The great advantage of word processing over using a typewriter is that we can make changes without retyping the entire document. If we make a typing mistake, then we simply back up the cursor and correct our mistake. If we want to delete any paragraph, we simply remove it, without leaving a trace. It is equally easy to insert a word, sentence, or paragraph in the middle of a document. Word processors also make it easy to move sections of text from one place to another within a document, or between documents. Since typewriter does not have any memory.

A document typed two days ago will have to be typed again, if required today. But, with the help of computer, document can be saved in the computer's memory and can be reopened whenever required. When we have made all the changes we want, we can send the document file to a printer to get hardcopy of the document. Due to these benefits, demand of computers in word processing areas has been increasing day by day.

13. Communications

Today, computer is available in many offices and homes and therefore there is a need to share data and programs among various computers with the advancement of data communication facilities. The communication between computers has increased and thus it has extended the power of computer beyond the computer room. Now a user sitting at one place can communicate computers of any remote sites through communication channel. Students might use computers to communicate with their classmates about homework assignments, group projects, or other school-related activities. They may also use them to submit homework assignments and presentations to their teachers. The modern form of communication like e-mail and Internet is possible only because of computer networking.

14. Engineering

In modern times, computers have closely connection with everyone, especially with engineers. Computer programs can now solve difficult problems in a fraction of the time it used to take. Computer-Aided engineering is a powerful tool and necessary for engineering design and manufacture. Nowadays, you no longer have to write your own software programs to use computers effectively. In chemical engineering, a lot of softwares are used in the process of chemical operation. The use of computers in

engineering has helped to make machines more productive and efficient.

15. Accountancy

Using computer in accounting is a very important activity in today's highly competitive business environment. Most business employ computer-based accounting systems instead rather than manual systems to record financial information, because computers became cheaper, easier to use, and more powerful.

The variety of accounting tasks such as invoices, ledger accounts, cash book, daybooks, stock checks, purchase orders, prepare payroll, purchase progress reports, accounting vouchers, budgets for future expenditure, sales figures for different products or areas can be made easily with the help of computers. These standardized document forms can be shared between computer systems directly for automatic processing. There are accounting software packages (like-Tally) that can be purchased by a firm to accomplish the various mentioned accounting tasks.

The various advantages of computer-based accounting are :

- It is tremendously easier and more efficient.
- It performs complex calculations, thus saving time.
- It is much more accurate and safer than traditional methods.
- It is easy to keep track of data.
- It saves money as it is cheap, paperless and instant.
- It properly analyzes and uses data for calculations when it's stored digitally.
- It offers ample features to analyze data using charts, graphs, year-to- year comparisons and much more, with only the click of a button.

Q8. What are the benefits and limitations of a computer ?

Ans :

Benefits

Computer has several benefits given as follows:

- It can solve complex calculations quickly which takes a long time to solve manually.
- It is a self-directing machine. This means that the user provides all the instructions to the computer at initial stage and the later it proceeds without any human intervention.
- It saves and retrieves information. It can store huge amount of data and gives out the same data when needed.
- It communicates with the user and other machines. It can display error messages on the screen about the user's instructions or data thereby avoiding incorrect output or results.
- It can perform the same operation repeatedly for number of times in exactly the same way and with same processing speed.
- All electronic items have some form of Computing functions.

Limitations

Despite its various benefits, a computer does have the following limitations :

- A computer has no intelligence of its own. It depends upon user's instructions for any kind of task. It can not replace a human brain.
- It works only on stored procedures and cannot think on its own. It does only those tasks which are already instructed to it.
- It can not correct invalid input. If mistakenly given incorrect data or instructions, it does not have the ability to correct it.
- It does not have feelings. It does not turn on itself or programming itself.
- Prolonged or improper computer use can lead to injuries or disorders of the hands, wrists, elbows, eyes, necks, and back. Computer users can protect themselves from these health risks through proper workplace design, good posture while at the computer, and appropriately spaced work breaks.
- Adults, teen, and children around the world are using computers to share publicly their photos, videos, journals, music, and other personal information. Some of these unsuspecting, innocent computer users have fallen victim to crimes committed by dangerous strangers.

1.2 HARDWARE**Q9. Define Hardware. Explain the classification of hardware.**

Ans :

(Imp.)

Meaning

Computer hardware refers to the physical parts of a computer and related devices. Internal hardware devices include motherboards, hard drives, and RAM. External hardware devices include monitors, keyboards, mice, printers, and scanners.

The internal hardware parts of a computer are often referred to as components, while external hardware devices are usually called peripherals. Together, they all fall under the category of computer hardware. Software, on the other hand, consists of the programs and applications that run on computers. Because software runs on computer hardware, software programs often have system requirements that list the minimum hardware required for the software to run.

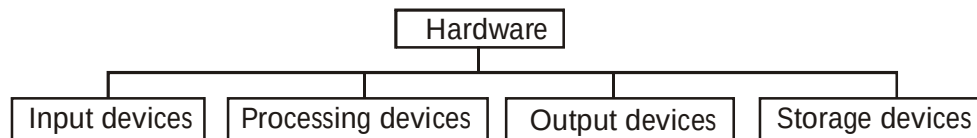


Fig.: Types of Hardware

Types

- (i) **Input devices :** The hardware that is used to supply input to the computer is called as input device. For example: keyboard, mouse, scanner etc.
- (ii) **Processing devices:** The hardware that is used to process the data is called as processing device. For example: CPU.
- (iii) **Output devices:** The hardware that is used to present output of the computer is called as output device. For example: monitor, printer, speaker etc.
- (iv) **Storage devices:** The hardware that is used to store input or output in the computer is called as storage device. For example: RAM, Hard disk, CD, DVD, Pen drive etc.

Q10. Explain the various types of Input Devices.

Ans :

Input devices are used to enter data and instructions into computer memory from external world. Examples include: Keyboard, Mouse, Track ball, Track Pad, Joy stick, Touch Screen, Light pen, Touch Screen, Scanner, Digital Camera, Microphone, Graphics tablet. They perform three main functions.

1. Receive data from user
2. Convert data into binary form the language of 0 and 1 also called the machine language. Machine language is the only language, a computer can understand directly.
3. Provide converted data to computer memory for processing.

Types

Following are the introduction to some popular types of input devices:

1. Key board



Keyboard is the most familiar input device. It is most widely used input device to enter data and instructions into the computer. Keyboard has a set of keys like a typewriter. It has alphabetic keys for A,B,C...Z or a,b,c,...z. It has numeric keys like 0,1,2,3,...9. It has function keys F1,F2,...F12 used to perform specific tasks.

It has other keys used for editing like Delete, Backspace, Home, End, etc.

2. Mouse



Mouse is an input device used to control motion of pointer on screen. A mouse has two or three buttons called Left, Right and Middle button. Buttons are used to perform different functions. It has a rubber or metal ball inside its body. Mouse is rolled over a flat surface called mouse pad. The movement of ball is detected by internal circuits of mouse. These circuits convert this movement into digital signals, which are sent to computer. Mouse is used in graphical applications. It is also used for playing video games on computer.

3. Track Ball



Track Ball is an input device like a mouse. It is used in Lap top computers to control motion of pointer on screen. It is a pointing device like upside down mouse. It has a ball

on its upper side. This ball is moved by fingers or thumb and the pointer moves accordingly on screen.

4. Track Pad



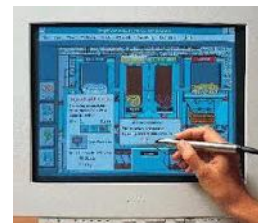
Track pad is a pointing input device. It is used in Lap top computers to control motion of pointer on screen. Track pad is a stationary input device. It has a flat surface of 1.5 to 2 square inch. Finger is moved on this surface to move pointer on screen.

5. Joy stick



Joystick is an input device used to play games on computer. It is used to control motion of an object quickly in game with the help of a hand held stick. This stick can be moved forward, backward or side ways. This stick is mounted on a ball. When stick is moved then ball is moved and signals are sent to the computer.

6. Light Pen



Light pen is an input device consisting of a special pen that is connected to a computer's monitor. The user points at the screen with the pen and selects items or chooses commands either by pressing a clip on the

side of the light pen or by pressing the light pen against the surface of the screen (the equivalent of performing a mouse click).

7. Microphone



Microphone is an input device used to enter sounds into the computer. We can record sounds in computer with the help of microphone and sound card.

8. Scanner



Scanner is an input device. It is used to save pictures or text on paper into computer memory. It converts picture or text on paper in to binary form and saves it in computer memory. With the help of scanner we may save our time to type a lot of text. For example, if we have a book and wish to enter the whole text of book in to computer. It will be a long, tedious and time consuming job. But if we use a scanner, we can do this with in less time. We can scan each page of book. Editing of the scanned text is also possible. So our job will become very easy with the help of a scanner.

9. Graphics tablet / digitizer



A graphics tablet consists of a special pen called stylus and a flat pad. The image is created on the monitor screen as the user draws it on the pad with the help of stylus (special pen). Graphics tablet is also called a digitizer.

10. Touch Screen



In ATM and in latest smart phones, touch screen is used to receive input from the user. The user enters data by the touch of his finger on different menu options or icons present on touch screen.

11. Digital Camera



A digital camera is one of the latest input devices. We can take pictures with the help of digital camera. These pictures are saved on digital camera's internal memory. There is no need of a film role as used in traditional cameras. Later on we can easily input these pictures with the help of a data cable into computer's memory. Latest digital cameras can take still snapshots and can record video as well.

Q11. Explain the various types of output devices.

Ans :

Output devices are used to display results of processing to the user. They perform the following functions :

1. Receive results from memory
2. Convert data into human readable form
3. Display results to the user

Examples include: Monitor, printer, plotter, speaker, and multimedia projector.

Different Types of Output Devices**1. Monitor**

LCD Monitor



CTR Monitor

Monitor is the most commonly used output device used to display results of processing. It has a TV like shape. Pictures on monitor are formed with picture elements called PIXEL. Monitors may be Monochrome that will display results in Black & White. Color Monitors are also available. They display results in multi colors. Monitor produces soft copy output.

2. Printers

Printers are used to produce hard copy output. They print processing results on paper. Printers are divided into two main categories:

- Impact Printers
- Non Impact printers



These printers do not use striking mechanism for printing. They use electrostatic and laser technology. Quality and speed of these printers is better than Impact printers. For example Laser printer and Inkjet printers are non-impact printers.

3. Speaker**Speakers for Desktop Computer**

Speaker produces sound output. We can listen recorded voices, sounds or music with the help of speaker. Speaker produces sound output with the help of sound card.

4. Plotter



Plotters are used to draw different designs of buildings or internal structure of machines. Mostly Engineers and Architects use plotters.

5. Multimedia Projector



Multimedia projector is used to produce computer output on a big screen. These are used in meeting rooms or in classrooms of educational institutes.

Q12. Define memory.

(OR)

Give a classification of memory devices.

Ans :

Memory is the storage area of computer where all the inputs are stored before processing and the outputs are stored after processing of inputs.

The data and instructions (input) that are entered into the computer by using the input devices need to be stored in the computer's memory before the actual processing.

The intermediate results during processing and the final results after processing also need to be stored in the computer's memory.

So, computer's memory basically provides the space for storing of the data and instructions before processing, during processing and after processing.

As there can be many input devices attached with a computer, all these devices may supply input at a time but the CPU may not be able to process all the inputs in one go. Therefore, a place is required to queue up these inputs and then process them one by one. All these inputs are queued up in the memory. The same case is there with the outputs produced by the CPU. If the output device is busy in producing an output, the other outputs are queued up in the memory.

The memory of a computer can be divided into two broad categories:

1. Primary Storage
2. Secondary Storage

1. Primary Storage

Primary storage, also known as main storage or main memory is a direct access storage device, consisting of a number of storage locations. Each location in the storage has a unique number, called Storage Address. The system assigns a unique memory location to each data element. Once the data element is assigned to the location, the system accesses it directly by means of the address of the particular storage location.

Some of the important features of primary storage are:

- Primary storage is mainly used by CPU, so it is termed as primary memory or main memory.
- As primary memory or main memory is directly connected to the CPU, so the data transfer between CPU and main memory can be accomplished directly.
- It has limited storage capacity.
- It is typically high speed memory and very costly.
- It is a type of memory that is available in the form of silicon chips.

The various types of primary storages are:

- (i) RAM (Random Access Memory)
- (ii) ROM (Read Only Memory)
- (iii) CACHE Memory
- (iv) Virtual Memory

2. Secondary Storage

The data and instructions in primary storage (RAM) are purely temporary in nature and they are erased automatically as soon as the power is switched off. The secondary storage is used to store the data permanently. The user can access the data from secondary storage whenever required.

Some of the important features of secondary storage are:

- Secondary storage, also called Auxiliary memory or mass storage. This memory is not directly accessible by the CPU.
- It stores data, programs and information that are not currently being used by CPU but may be required later for processing.
- It has slower access time than primary memory. The time to read or write information in memory is called access time.
- The secondary storage devices offer huge storage volumes with high speed and reliability.
- It is non-volatile storage media i.e. the contents are not erased when the power is switched off.
- Like primary memory, many secondary memory devices are capable of storing information as well as retrieving it. Magnetic technology devices (such as hard disk, floppy disks and magnetic tape) have this read-write capability.

The various types of secondary storages are:

- (i) Hard Disk
- (ii) Floppy Disk
- (iii) Magnetic Tape
- (iv) Optical Disk

Q13. What is Random accesses memory ? Explain different types of RAM.

Ans : (Imp.)

Whenever user enters any kind of data into the computer system, it moves into primary memory for storage. This type of primary memory is known as RAM. It is the most randomly access storage type among all types of storage.

The main features of RAM are:

- (a) The word “random” refers to the fact that any piece of data can be returned quickly, and in a constant time, regardless of its physical location and whether or not it is related to the previous piece of data.
- (b) RAM is volatile in nature i.e. once the system is switched off, the contents of RAM will automatically be erased.
- (c) RAM stores the data purely on temporary basis i.e. user can remove the previous data and write new information into it whenever required.
- (d) RAM is small, both in terms of its physical size and in the amount of data it can hold.
- (e) Every computer application demands a particular amount of memory from RAM in order to execute.
- (f) All kinds of displays on the display device (monitor) will be possible because of RAM i.e. if we remove the RAM chip from the system then there will be no display on the monitor's screen.
- (g) RAM is also referred as read and write memory of the computer i.e. user can read the data from RAM as well as write the data into RAM.
- (h) A small amount of RAM is also integrated with the CPU, but this is usually referred to as “Cache Memory”, rather than RAM.
- (i) RAM is a semiconductor memory so it is very costly. Still many people use large amount of RAM in order to increase the speed of the computer.

- (j) The disadvantage of RAM over physically moving media is cost and the loss of data when power is turned off.
- (k) The storage capacity of RAM varies. Today, it is available in Megabytes (MB). (Like - 512MB) and also in Gigabytes (GB) (Like - 1GB, 2GB, 4GB, 8GB).



Fig. : Random Access Memory - RAM Chip

Types of RAM

There are mainly two types of RAM:

- i) Static RAM (SRAM)
- ii) Dynamic RAM (DRAM)

i) Static RAM (SRAM)

- The word "static" indicates that the memory retains its contents as long as power remains applied, unlike dynamic RAM (DRAM) that needs to be periodically refreshed. Data are lost when the circuit gets powered down, however, which makes static RAM a volatile memory.
- The Static RAM consumes more power. There are six transistors needed to form a memory cell of static RAM.
- Static RAM is more expensive and holds less data than dynamic RAM.

ii) Dynamic RAM (DRAM)

- The term "dynamic" indicates that the memory must be constantly refreshed because Dynamic RAM (DRAM) loses its stored information in a few milliseconds even though its power supply is ON.

- It stores information in the form of charge on a capacitor, which leaks away in a very short time. Therefore its contents must be periodically refreshed after every two milliseconds.
- The Dynamic RAM consumes less power and is cheaper than the Static RAM.

Q14. What is Read only Memory? Explain different types of ROM.

(OR)

Write an explanatory note on popular variations of ROM's.

Ans :

ROM is "built-in" computer memory also known as Firmware. Instructions that are required all the time in the system for running the computer are stored in the ROM.

The main features of ROM are :

- (a) It consists of small chip located near CPU on the motherboard.
- (b) It is the read only memory i.e. user can only read the instructions but cannot write into it.
- (c) The instructions stored in it are permanent in the nature and are usually designed by the manufacturer of the computer.
- (d) ROM is non-volatile in nature i.e. data does not get erased when the computer's power is switched off.
- (e) Instructions that are stored in the ROM, execute as soon as the computer is switched on. For example: when we switch on the system all the instructions stored in the ROM load and get executed automatically and make the system ready to load the operating system in the memory.
- (f) The memory organization of ROM is exactly the same as that of RAM.
- (g) ROM chips are used not only in computers, but in most other electronic items as well (like: calculator).
- (h) In ROM, it is not possible to randomly select and store the information.

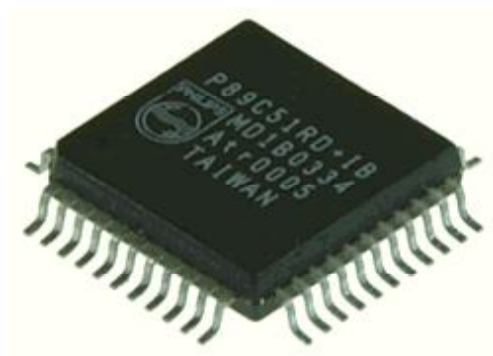


Fig. : Read Only Memory - ROM Chip

Types of ROM

There are mainly three types of ROM :

- i) PROM (Programmable Read Only Memory)
- ii) EPROM (Erasable Programmable Read Only Memory)
- iii) EEPROM (Electrically Erasable Programmable Read Only Memory).

Q15. Compare and contrast RAM and ROM.

Ans :

(Imp.)

Sl.No.	Nature	Random Access Memory(RAM)	Read Only Memory(ROM)
1.	Volatility	RAM is volatile in nature as it automatically erased when computer shutdowns.	ROM is non-volatile since it is never erased when there is any shutdown or restart of computer.
2.	Accessibility	RAM can be directly accessed by the processor.	ROM can't be directly accessed by the processor since it is transferred into RAM where it is executed by the processor.
3.	Storage	RAM is used to store the temporary information for limited time.	ROM is used to store permanent information which can't be deleted.
4.	Hardware structure	RAM is in form of chip while	ROM is generally optical drives made of magnetic tapes
5.	Cost	Costlier than ROM	Cheaper than RAM
6.	Size	Chip Size is larger than ROM	Chip Size is smaller than ROM
7.	Writing speed	Writing data to a RAM chip is a faster process.	Writing data to a ROM chip is a slow process.
8.	Storage Limit	A RAM chip can store multiple gigabytes (GB) of data, up to 16 GB or more per chip	A ROM chip typically stores only several megabytes (MB) of data, up to 4 MB or more per chip
9.	Examples	Static and dynamic RAM	PROM, EPROM and EEPROM are types of ROM

Q16. What is hard disks ? Explain the different types of hard disks.

Ans :

Meaning

Hard disks are the primary on-line secondary storage device for most computer systems today. They are made of rigid metal (frequently aluminum) platters and come in many sizes ranging from 1 to 14-inch diameter.

Types

Depending on how they are packaged, hard disks are normally categorized into three types:

1. Zip / Bernoulli Disk

It consists of a single hard disk platter encased in a plastic cartridge. The disk is commonly of 3 1/2-inch size having storage capacity of about 100 MB. The storage capacity slightly varies depending on the formatting style used by a computer system with which it is used. Its disk drive, called zip drive, may be of portable or fixed type. The fixed type is part of a computer system permanently connected to it. The portable type can be brought and connected to a computer system for the duration of use and can then be disconnected and taken away. A zip disk can be easily loaded/unloaded into a zip drive just as we insert/remove a floppy disk in a floppy disk drive or a video cassette in a VCR

2. Disk Pack

It consists of multiple (two or more) hard disk platters mounted on a single central shaft. All the disks revolve together at the same speed. Its disk drive has a separate read/write head for each usable disk surface (recall that when multiple disks are used together in a disk device, the upper surface of the topmost disk and the lower surface of the bottommost disk are sometimes not used). Its disk drive is of interchangeable type and allows loading/unloading of different disk packs as and when they are to be used. When not in use, a disk pack is stored off-line in a plastic case (see Figure). This gives virtually unlimited storage capacity to disk packs.

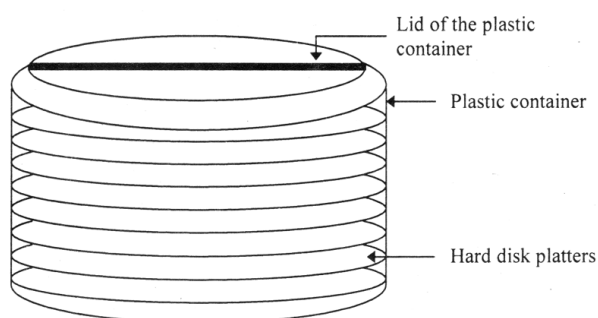


Fig. : A disk pack

3. Winchester Disk

A Winchester disk consists of multiple (two or more) hard disk platters mounted on a single central shaft. However, unlike a disk pack drive, a Winchester disk drive is of fixed type. That is, its hard disk platters and disk drive are sealed together in a contamination-free container and cannot be separated from each other. Hence, Winchester disks have limited capacity. However, for the same number of disk platters of the same size, Winchester disks can have larger storage capacity than disk packs due to following reasons:

- (a) As both disk platters and disk drive are permanently sealed together, all surfaces of all disk platters (including the upper surface of the topmost platter and the lower surface of the bottommost platter) are used for data recording in a Winchester disk. That is, for a Winchester disk with four platters there are eight usable surfaces as opposed to six surfaces in case of a disk pack with four platters.
- (b) The contamination-free environment allows Winchester disks to employ greater precision of data recording and accessing, resulting in greater data storage density than interchangeable disk packs.

Winchester disks were so named after the 30-30 Winchester rifle because the early Winchester disk systems had two 30-MB disks. Storage capacity of today's Winchester disks ranges from a few tens of megabytes to a few gigabytes (10^9 bytes).

Q17. Define processor. Explain different types of processor.**Ans :****Meaning**

The term processor is used interchangeably with the term central processing unit (CPU). A processor (CPU) is the logic circuitry that responds to and processes the basic instructions that drive a computer. The CPU is seen as the main and most crucial integrated circuitry (IC) chip in a computer, as it is responsible for interpreting most of computers commands. CPUs will perform most basic arithmetic, logic and I/O operations, as well as allocate commands for other chips and components running in a computer.

Processors can be found in PCs, smart phones, tablets and other computers.

Types

- (a) Intel® computer processor
- (b) AMD computer processor

(a) Intel® Computer Processor

The main features of Intel® computer processor are:

- The Intel computer processor is exclusively designed by Intel.
- Its latest and most popular models include Intel® Pentium® 4 processor, Intel® Pentium® 4 processor with HT Technology, and Intel® Celeron® processor.
- The Intel® Pentium® 4 processor is a powerful processor that can handle demanding applications such as DVD authoring, 3D gaming, and other multimedia applications.
- The Intel® Pentium® 4 processor with Hyper-Threading (HT) technology is designed for running multiple applications simultaneously with a fast and efficient response.
- The Intel® Celeron® processor is compatible with almost all leading computer hardware and software brands.

(b) AMD Computer Processor

The main features of AMD computer processor are:

- The Intel computer processor is exclusively designed by Intel.
- The AMD computer processor is exclusively made by Advanced Micro Devices, Inc. (AMD).
- It provides excellent performance and value. It is compatible with most off-the-shelf computer programs and applications.
- Some AMD computer processors are programmed with built-in anti-virus protection.
- Its most popular models are AMD Athlon™ XP and AMD Athlon™ 64. The AMD Athlon™ 64 processor is designed for more advanced computers especially those with 64-bit programs. It allows the execution of complex software and games.

1.3 SOFTWARE**Q18. Define Software. State the features of software.****Ans :****(Imp.)**

A computer cannot do anything on its own. It must be instructed to do a job desired by us. Hence, it is necessary to specify a sequence of instructions a computer must perform to solve a problem. Such a sequence of instructions written in a language understood by a computer is called a computer program. A program controls a computer's processing activity, and the computer performs precisely what the program wants it to do. When a computer is using a program to perform a task, we say, it is running or executing that program.

The term software refers to a set of computer programs, procedures, and associated documents (flowcharts, manuals, etc.) describing the programs, and how they are to be used.

A software package is a group of programs that solve a specific problem or perform a specific type of job.

For example, a word-processing package may contain programs for text editing, text formatting, drawing graphics, spelling checking, etc. Hence, a multipurpose computer system, like's personal computer in your home, has several software packages, one each for every type of job it can perform.

Features**(i) Functionality**

It refers to the degree of performance of the software against its intended purpose. It basically means are the required functions.

(ii) Reliability

A set of attribute that Bear on the capability of software to maintain its level of performances understated conditions for a stated period of time.

(iii) Efficiency

It refers to the ability of the software to use System Resources in the most Effective and Efficient Manner. The software should make effective use of storage space and executive commands as per desired timing requirement.

(iv) Usability

It refers to the extent to which the software can be used with ease. Or the amount of effort or time required to learn how to use the software should be less.

(v) Maintainability

Refers to the ease with which the modifications can be made in a software system to extend its functionality, improvement, performance or correct errors.

(vi) Portability

A set of attributes that bears on the ability of the software to be transferred from one environment to another, without or minimum changes.

1.3.1 Application and System Software**Q19. Explain the software classification.**

Ans : (Imp.)

Although the range of software available today is vast and varied, most software can be divided into two major categories:

1. System software
2. Application software

1. System Software

System software is a set of one or more programs designed to control the operation and extend the processing capability of a computer system. In general, a computer's system software performs one or more of the following functions:

1. Supports development of other application software.
2. Supports execution of other application software.
3. Monitors effective use of various hardware resources such as CPU, memory, peripherals, etc.
4. Communicates with and controls operation of peripheral devices such as printer, disk, tape, etc.

Hence, system software makes the operation of a computer system more effective and efficient. It helps the hardware components work together, and provides support for the development and execution of application software (programs). The programs included in a system software package are called system programs. The programmers who prepare system software are referred to as system programmers.

2. Application Software

Application software is a set of one or more programs designed to solve a specific problem, or do a specific task.

For Example, payroll processing software, examination results processing software, railway / airline reservation software, computer games software are all application software. Similarly, a program written by a scientist to solve a research problem is also application software. The programs included in an application software package are called application programs. The programmers who prepare application software are referred to as application programmers.

Q20. Explain briefly about Systems Software.

Ans : (Imp.)

System software consists of several programs, which are directly responsible for controlling, integrating, and managing the individual hardware components of a computer system. You must have

noticed that a new computer system is always accompanied by some software, either stored in a floppy or CD, which is supplied by the manufacturer. This software manages and supports the computer system and its information processing activities.

System software is more transparent and less noticed by the users, they usually interact with the hardware or the applications this software provides a programming environment in which programmers can create applications to accommodate their needs. This environment provides functions that are not available at the hardware level and performs the tasks related to the execution of an application program. Hence, system software acts as an interface between the hardware of the computer and the software application.

In simple terms, system software makes the computer functional. They provide basic functionality like file management, visual display, and keyboard input are used by application software to accomplish these functions.

Some examples of system software are:

1. Operating system
2. Device drivers
3. Language translators
4. System utility

1. Operating System

It is the first layer of software loaded into computer memory when it starts up. As the first software layer, all other software that gets loaded after it depends on it for various common core services. These common core services include disk access, memory management, task scheduling, and user interfacing. In addition the operating system ensures that different programs executing at the same time do not interfere with each other. It provides a software platform on top of which other programs can run. In simple words, the operating system organizes and controls the hardware. Examples of operating systems are Windows XP, UNIX, and Linux. The basic functions of an operating system are:

(a) Process Management

It handles the creation, deletion, suspension, resumption, and synchronization of process.

(b) Memory Management

It handles allocation and de-allocation of memory space as required by various programs.

(c) File Management

It is responsible for creation and deletion of files and directories. It also organizes, stores, retrieves, names, and protects all the files.

(d) Device Management

It manages all the devices of the computer system such as printers and modems. If any device fails, it detects the device failure and notifies the same to the user.

(e) Security Management

Protects system resources and information against destruction and unauthorized use.

(f) User interface

Provides the interface between the user and the hardware.

2. Device Drivers

Device drivers are system programs, which are responsible for proper functioning of devices. Every device, whether it is a printer, monitor, mouse or keyboard, has a driver program associated with it for its proper functioning. Whenever a new device is added to the computer system, a new device driver must be installed before the device is used. A device driver is not an independent program; it assists and is assisted by the operating system for the proper functioning of the device.

3. Language Translators

Computers only understand a language consisting of 0s and 1s called machine language. To ease the burden of programming entirely in 0s and 1s, special programming languages called high-level programming languages were developed that resembled natural languages like English. Language translators help in converting programming

languages into machine language. To be precise, they convert programming statements into the 0s and 1s that the computer is able to process.

Depending on the programming language used, language translators are divided into three major categories: compilers, interpreter, and assembler.

(a) Compiler

The programs written in any high-level programming language (C or Pascal) needs to be converted into machine language. This is achieved by using a compiler.

(b) Interpreter

An interpreter analyses and executes the source code in line-by-line manner, without looking at the entire program. In other words, an interpreter translates a statement in a program and executes the statement immediately, before translating the next source language statement.

(c) Assembler

Compared to all the types of programming languages, assembly language is closest to the machine code. It is fundamentally a symbolic representation of machine code. The assembly language program must be translated into machine code by a separate program called an assembler. The assembler program recognizes the character strings that make up the symbolic names of the various machine operations, and substitutes the required machine code for each instruction. In short, an assembler converts the assembly codes into machine codes, making the assembly program ready for execution.

4. System Utility

System utility programs perform day-to-day tasks related to the maintenance of the computer system. They are used to support, enhance, and secure existing programs and data in the computer system. They are generally small programs, having specific tasks to perform:

(a) File Management

These utilities make it easier to manage data files. Many programs are written to help users to find the files, create and organize directories, copy, move, and remove files.

(b) Backup

It may happen that sometime data files are corrupted, or accidentally deleted. In such a case, data backups become very useful. A backup system utility is essential for those organizations, which want to keep their data intact.

(c) Data Recovery

It is the process of retrieving deleted or inaccessible data from failed electronic storage media such as computer hard disk drives, removable media, optical devices, and tape cartridges.

(d) Virus Protection

Anti-virus programs are essential system utilities for a computer system functioning in a network. They provide the security to the system from viruses that can damage the computer system.

(e) Disk Management

Disk management program includes various system softwares like disk defragmenter, data compressor and disk formatting tools. Defragmentation implies putting fragments of files in a sequential order onto the disk which reduces the time to access the file.

(f) Firewall

It is commonly used to protect information such as e-mail and data files within a physical building or organization. Essentially, a firewall is designed to protect a computer from unauthorized access, especially via network.

(g) Disk Cleanup

To keep a computer running smoothly, regular maintenance is vital. Therefore, one should use the disk cleanup utility, which easily determines which files on hard drive are no longer needed, then delete those files.

Q21. Define application softwares. State the uses of application softwares.

Ans : (Imp.)

Meaning

Applications softwares are dependent on system softwares. A system software (like operating system) acts as an interface between the user and the computer hardware, while application software performs specific tasks. Applications are pieces of software that perform tasks for the user besides helping the computer operate, which is the tasks of system software.

Applications softwares are controlled by system software, which manages hardware devices and performs background tasks for them. The distinction between the two is important. Without system software, the computer will not run, and without application software, the computer, no matter how powerful, will not be helpful in meeting user requirements. Think of it this way applications apply the computer's thinking power to business tasks such as tracking the general ledger or billing your customers.

Application software ranges from games, calculators, and word processors (document creating programs), to programs that "paint" images on screen (image editors). Applications represent real world tasks. They can be easily divided by looking at exactly what function they serve.

Uses

Some of the most commonly used application software is discussed below:

1. Word processor

A word processor is software used to compose, format, edit, and print electronic documents. Word processing is one of the earliest applications for office productivity and the personal computer. It involves not only typing, but also checking the spelling and grammar of the text and arranging it correctly on the page. A variety of different typefaces is available for a variety of effects. It is possible to include pictures, graphs, charts and many other things within the text of the document. It also allows for changes in margins, fonts, and colour. Nowadays, virtually all personal

computers are equipped with a word processing program, which has the same function as a typewriter for writing letters, reports or other documents, and printing. Examples of some well-known word processors are Microsoft Word and Word Perfect.

2. Spreadsheets

One of the first commercial uses of computers was in processing payroll and other financial records, so the programs were designed to generate reports in the standard "spreadsheet" format bookkeepers and accountants used. A spreadsheet application is a rectangular grid, which allows text, numbers, and complex functions to be entered into a matrix of thousands of individual cells. The spreadsheet provides sheets containing cells each of which may contain text and / or numbers. Cells may also contain equations that calculate results from data placed in other cells or series of cells. A simple example might be a column of numbers totaled in a single cell containing an equation relating to that column. Spreadsheet software are used predominantly for accounting and other numerically-based tasks, because financial and mathematical data and analysis are often managed in a tabular style, with columns of financial figures being manipulated and then influencing other data computations. Microsoft Excel and Lotus 1-2-3 are examples of spreadsheet applications.

3. Image Editors

Image editor programs are designed specifically for capturing, creating, editing, and manipulating images. These graphics programs provide a variety of special features for creating and altering images. In addition to offering a host of filters and image transformation algorithms, some image editors also enable the user to create and superimpose layers. Most graphic programs have the ability to import and export one or more graphic file formats. These computer programs enable the user to adjust an image to improve its appearance. With image editing software, one can darken or lighten

an image, rotate it, adjust its contrast, crop out extraneous detail, and much more. Examples of these programs are Adobe Photoshop, Adobe Illustrator and CorelDraw.

4. Database Management Systems

Database management software is a collection of computer programs that allow storage, modification, and extraction of information from a database in an efficient manner. It supports the structuring of the database in a standard format and provides tools for data input, verification, storage, retrieval, query, and manipulation. When such software is used, information systems can be changed much more easily as the organization's information requirements change. New categories of data can be added to the database without disrupting the existing system. It also controls the security and integrity of the database from unauthorized access. FoxPro and Oracle are database management systems.

5. Presentation Applications

A presentation is a means of assessment, which requires presentation providers to present their work orally in the presence of an audience. It combines both visual and verbal elements. Presentation software allows the user to create presentations by producing slides or handouts for presentation of projects. Essentially, such computer programs allow users to create a variety of visually appealing electronic slides for presentation. Microsoft PowerPoint is one of the most famous presentation applications.

6. Desktop Publishing Software

The term desktop publishing is usually used to describe the creations of printed documents using a desktop computer. It is a technique of using a personal computer to design images and pages, and assemble type and graphics, then using a laser printer or image-setter to output the assembled pages onto paper, film, or printing plate. These softwares are used for creating magazines, books, newsletters, and so on. Such software assist in creating sophisticated documents

including complicated page designs, detailed illustrations, and camera-ready types faces. Quark Express and Adobe PageMaker are desktop publishing software.

1.4 PROGRAMMING LANGUAGES

1.4.1 Classification

Q22. What is Programming Language?

Ans :

As human beings need a common language to communicate, a language is also needed by computer to communicate with user. A computer language is the means by which data and instructions are transmitted to computers. In another way, computer languages are the interface between a computer and a human being.

A programming language is a computer language used to write instructions for the computer in a well-defined format. The set of instructions is technically termed as program and the process of creating programs is called programming.

Q23. What is Machine Language?

Ans :

- First generation computers relied on machine language, the lowest-level programming language understood by computers, to perform various input/output operations.
- The set of instruction codes, which can be directly understood by the CPU of a computer system without the help of any translating program, is called machine code or object code and the programming language which contains the machine code, is called Machine language.
- All information in the computer is handled using electrical components like the integrated circuits (ICs), semiconductors etc. All of which can recognize only two states - presence or absence of an electrical signal.

Two symbols used to represent these two states are 0 and 1, and are known as BITS or Binary Digits. 0 represents the absence of a signal, 1 represents the presence of a signal.

As computer machine use these two binary digits (0 and 1) to handle inputs/outputs, so its language is also known as binary language.

- Machine language differs from machine to machine because the internal design or structure of every computer varies from computer to computer. The programs written in machine language for one computer model will not run on a computer of different model.
- Although machine language can be easily used by the computer, but it is difficult to read and understand by the users.
- The only advantage of machine language is that program of machine language run very fast because no translation program is required for the CPU.

Q24. What are the advantages and disadvantages of machine language ?

Ans :

Advantage Machine Language

The only advantage is that program of machine language run very fast because no translation program is required for the CPU.

Disadvantages Machine Language

1. It is very difficult to program in machine language. The programmer has to know details of hardware to write program.
2. The programmer has to remember a lot of codes to write a program which results in program errors.
3. It is difficult to debug the program.

Q25. What is Assembly Language?

Ans :

- Assembly language was the next higher level of computer programming languages, which we categorized under second- generation languages.
- Assembly language is easier to understand and use as compare to machine language because certain English-based words (mnemonics) are used for performing specific

operations. Like: 'ADD' used for addition, 'SUB' used for subtraction etc.

- Assembly language is machine dependent i.e. assembly language program is specific to particular machine, because each instruction in the symbolic language is translated into exactly one machine language instruction.
- A translating program called assembler is used to translate the instructions written in assembly language to the machine language and vice versa.
- Assembly language statements are written one per line, where each statement contains a mnemonic.
- One of the main benefits of assembly language is that programmers need not keep track of the storage locations of the data and instructions while writing an assembly language program.
- Programming in assembly languages requires extensive knowledge of computer architecture.

Q26. What are the advantages and disadvantages of assembly language ?

Ans :

Advantages

1. Easier to understand and use

Due to the use of mnemonics instead of numeric op-codes and symbolic names for data locations instead of numeric addresses, assembly language programs are much easier to understand.

2. Easier to locate and correct errors

Due to the use of mnemonic op-codes and symbolic names for data locations and also because programmers need not keep track of storage locations of the data and instructions, fewer errors are made while writing programs in assembly language, and those that are made are easier to find and correct. Additionally, assemblers automatically detect and indicate errors for use of an invalid mnemonic op-code or a name that has not been defined.

3. Easier to modify

Since they are easier to understand, it is easier to locate, correct, and modify instructions of an assembly language program than a machine language program. Moreover, insertion or removal of certain instructions in a program does not require change in the address part of the instructions following that part of the program.

4. Easily relocatable

The availability of pseudo-instructions for instructing the system how we want the program to be assembled inside the computer's memory makes assembly language programs easily re-locatable because their location can be easily changed by suitably changing the pseudo- instructions.

Disadvantages**1. Machine dependent**

Since each instruction of an assembly language program is translated into exactly one machine language instruction, assembly language programs are machine dependent. That is, assembly languages differ from computer to computer, and an assembly language program can be executed only on the computer in whose assembly language it has been written. Hence, a decision to change to another computer will require learning a new language and conversion of all existing programs into assembly language of the new computer.

2. Knowledge of hardware required

Since assembly languages are machine dependent, an assembly language programmer must have a good knowledge of the characteristics and logical structure of his/her computer to write good assembly language programs.

3. Machine level coding

In case of an assembly language, instructions are still written at the machine- code level. That is, one assembly language instruction is substituted for one machine language instruction. Hence, like machine language programs, writing assembly language programs is also time-consuming and difficult.

Q27. What is High Level Language?

Ans :

- Third generation language was the next improvement in the field of computer programming languages. It refers to a high-level programming language such as FORTRAN, COBOL, BASIC, Pascal, C, C++ and Java, which enables programmers to develop software applications.
- High-level language use syntax (language rule) that is very easy to understand, but the syntax of each high level language is different from the other high level languages.
- The programs written in high-level language are shorter in length as compared to that of low-level languages.
- Translators like compilers and interpreters are used to translate the program(s) written in high-level languages into machine language and vice-versa.
- High-level languages are *machine independent*. The programs written in high-level language for one computer will run on a computer of different model.
- High-level languages are easy to learn. High-level languages use common English words as their keywords.
- It is easier to modify and maintain programs written in high-level languages.

Q28. What are the advantages and disadvantages of High Level Language?

Ans :

Advantages

High-level languages enjoy following advantages over assembly and machine languages:

1. Machine independence

A program written in a high-level language can be executed on many different types of computers with very little or practically no effort of porting it on different computers. This means that a company changing computers, even to one from a different manufacturer, will not be required to rewrite

all the programs that it is currently using. This also means that commercial software will have a larger market because it need not be restricted to one type of computer. Hence, the time and effort spent on software development are better rewarded with high-level language programming.

2. Easier to learn and use

High-level languages are easier to learn because they are very similar to the natural languages used by us in our day-to-day life. They are also easier to use because a programmer need not know the internal details of a computer for programming in a high-level language.

3. Fewer errors

While programming in a high-level language, a programmer need not worry about how and where to store the instructions and data of the program, and need not write machine-level instructions for the steps to be carried out by the computer. This allows the programmer to concentrate more on the logic of the program under development. All these factors lead to fewer programming errors during program development. Furthermore, compilers and interpreters detect and indicate syntax errors automatically. Hence, syntax errors, if any, in a program can be located and corrected easily by the programmer.

4. Lower program preparation cost

Writing programs in high-level languages requires less time and effort, ultimately leading to lower program preparation cost. Generally, the cost of all phases of program preparation (coding, debugging, testing, etc.) is lower with a high-level language than with a machine/assembly language.

5. Better documentation

Statements of a program written in a high-level language are very similar to natural language statements used by us in our day-to-day life. Hence, a programmer familiar with the problem domain can easily understand them. As a result, very few, or practically no separate comment statements are required in programs written in high-level

languages. Due to this reason, high-level languages are sometimes also referred to as *self-documenting languages*.

6. Easier to maintain

Programs written in high-level languages are easier to maintain than assembly/machine language programs. This is because they are easier to understand, and hence, it is easier to locate, correct, and modify instructions whenever desired. Insertion or removal of certain instructions from a program is also possible without any complication. Hence, major changes can be incorporated with very little effort.

Limitations

Two main limitations of high-level languages are:

1. Lower efficiency

Generally, a program written in a high-level language has lower efficiency than one written in a machine/assembly language to do the same job. That is, programs written in high-level languages result in multiple machine language instructions that may not be optimized, taking more time to execute and requiring more main memory space. Hence, when a program's efficiency is important, its performance critical parts are written in assembly language and non-critical parts are written in a high-level language. However, with the advent of efficient and optimizing compilers this problem is now becoming a non-issue.

2. Less flexibility

Generally, high-level languages are less flexible than assembly languages because they do not normally have instructions or mechanism to control a computer's CPU, memory, and registers. An assembly language provides the programmers access to all the special features of the machine they are using. Certain types of operations that are easily programmed using the machine's assembly language are impractical to attempt using a high-level language. This lack of flexibility means the some tasks cannot be done or can be done only with great difficulty in a high-level language.

1.5 ROLE OF IT IN BUSINESS

Q29. Explain the role of IT in business.

Ans : (Imp.)

Information technology has become very important in the business world. no matter small or big business, IT has helped the organization, manager, and workers in a more efficient management, to inquire about a particular problem, conceive its complexity, and generate new products and services; thereby, improving their productivity and output.

Information technology can help through:

1. Communication
2. Inventory management
3. Management Information Systems
4. Customer Relationship Management

1. Communication

In the business world, communication plays an important role in maintaining the relationship between employees, suppliers, and customers. Therefore, the use of IT we can simplify the way to communicate through e-mail, video chat rooms or social networking site.

2. Inventory Management

Organizations need to maintain enough stock to meet demand without investing in more than they require. Inventory management systems identify the quantity of each item a company maintains, an order of additional stock by using a way of inventory management. It is become more important because organization need to maintain enough stock to meet customer demand. By using in IT in inventory management, it also will helps in track quantity of each item a company maintains, triggering when it comes to managing inventory.

3. Management Information Systems

Information data is very important for an organization and a valuable resource requirement for the safe and effective care.

Data used is as part of a strategic plan for achieving the purpose and mission. then, the company should use the management information system (MIS) to enable the company to track sales data, expenditure and productivity as well as information to track profits from time to time, maximizing return on investment and recognize areas of improvement.

4. Customer Relationship Management

Companies are using IT to improving the way of design and manage customer relationship. Customer Relationship Management (CRM) systems capture every relations a company has with a customer, so that a more experience gain is possible. If a customer makes a call to centre and report an issue, the customer relation officer will be able to see what the customer has purchased, view shipping information, call up the training manual for that item and effectively respond to the issue.

1.6 OPPORTUNITIES AND CHALLENGES IN IT

Q30. Explain the various challenges of IT ?

Ans : (Imp.)

Although there are a vast number of IT challenges:

➤ Security

One of the main challenges IT has to face today is the safety or cybersecurity. The amount of data, identities and personal information that we share, and with which we interact daily, is so high that making it safe has become a challenge, given the very high value of said assets and the potential damage of getting this wrong.

➤ Accessibility

Data accessibility and availability is crucial, especially for senior profiles in an organization. Making data accessible for all the parties would be very easy with interoperability. However, although the benefits that it can bring are well-known, there are still many tasks that IT have to solve to be able to empower users.

➤ **Strong networks**

Secure strong internal networks that are resilient and scalable are both essential and a great challenge as well. Solutions should not only satisfy current necessities, but they must also be focused on the future and take account of potential technological advancements to minimise obsolescence in the organization.

➤ **System integration**

Making sure that the different services, written in different technologies or languages, integrate correctly is an implementation IT challenge in many organizations. Although the advantages of system and service integration are many more.

➤ **Cost reduction**

There is a constant pressure for IT leaders to reduce costs, whilst continuing to deliver innovation and productivity gains. When competitive organisations find ways to deliver the same functionality for less cost, they are able to focus their investment on innovation. As IT continues to advance and evolve at pace, new ways to deliver more for less will continue to emerge and organizations must ensure they are ahead of the curve on this issue.

1.7 IMPORTANCE OF IT IN BUSINESS

Q31. Explain the importance of IT in Business.

Ans :

(Imp.)

1. Globalization of Business

The information technology in business helps in achieving a good reach in the global marketing. With this, the companies can do business from anywhere in the world. The globalization of business improves the international trade and provides collaboration in real-time.

2. Enhanced Security of the Company

The information technology in business helps in protecting the important data. The implementation of high-level security measures diverts the cyber criminals. It also provides various technologies like encryption and tokenization in order to prevent the loss of data.

3. Efficient Operations

The information technology in business can optimize the operations of a company by avoiding the errors, duplications also the delays in the workflows. By optimizing the operations, companies can save the time, cost and can increase the productivity.

4. Optimization of Management

The information technology in business can change the usage of resource and the process of work irrespective of the industry and its size. In such a way that, small companies can compete with the large companies by embedding the latest technologies.

Short Question and Answers

1. Define computer.

Ans :

Meaning

A computer is an electronic device that has the ability to store, retrieve, and process data, and can be programmed with instructions that it remembers. The physical parts that make up a computer (the central processing unit, input, output, and memory) are called hardware. Programs that tell a computer what to do are called software. A set of instructions that perform a particular task is called a program, software program, or software. Peripherals are any hardware device connected to a computer, any part of the computer outside the CPU and working memory. Some examples of peripherals are keyboards, the mouse, monitors, printers, scanners, disk and tape drives, microphones, speakers, joysticks, plotters, and cameras. Computer is an advanced electronic device that takes raw data as input from the user and processes these data under the control of set of instructions (called program) and gives the result (output) and saves output for the future use. It can process both numerical and non-numerical (arithmetic and logical) calculations.

Definition

- A computer is an electronic device that operates under the control of a set of instructions that is stored in its memory unit.
- A computer can be more accurately defined as an electronic device that takes data as input, stores and processes it and displays the output according to the given instructions.

2. Central Processing Unit (CPU)

Ans :

CPU is considered as the “Brain of the computer”. It is also called as microprocessor. It is the fastest and costly unit of the computer system. All major calculations and comparisons are made

inside the CPU. CPU converts all the supplied input into required output as per the instructions supplied by the user. The performance and the speed of the computer mainly depend upon the type of microprocessor installed in it.

Within CPU, there exists a temporary storage location known as Registers. These are used for storage of smaller data (up to 64 bits). Registers are being used for faster data supply to processor for processing. The number, size and capacity of register in a CPU can affect the processing power.

The CPU further contains two units :

- (a) Control Unit
- (b) ALU (Arithmetic and Logical Unit)

3. Define Hardware.

Ans :

Meaning

Computer hardware refers to the physical parts of a computer and related devices. Internal hardware devices include motherboards, hard drives, and RAM. External hardware devices include monitors, keyboards, mice, printers, and scanners.

The internal hardware parts of a computer are often referred to as components, while external hardware devices are usually called peripherals. Together, they all fall under the category of computer hardware. Software, on the other hand, consists of the programs and applications that run on computers. Because software runs on computer hardware, software programs often have system requirements that list the minimum hardware required for the software to run.

4. Explain the various types of Input Devices.

Ans :

Input devices are used to enter data and instructions into computer memory from external world. Examples include: Keyboard, Mouse, Track ball, Track Pad, Joy stick, Touch Screen, Light pen,

Touch Screen, Scanner, Digital Camera, Microphone, Graphics tablet. They perform three main functions.

1. Receive data from user
2. Convert data into binary form the language of 0 and 1 also called the machine language. Machine language is the only language, a computer can understand directly.
3. Provide converted data to computer memory for processing.

5. Define memory.

Ans :

Memory is the storage area of computer where all the inputs are stored before processing and the outputs are stored after processing of inputs.

The data and instructions (input) that are entered into the computer by using the input devices need to be stored in the computer's memory before the actual processing.

The intermediate results during processing and the final results after processing also need to be stored in the computer's memory.

So, computer's memory basically provides the space for storing of the data and instructions before processing, during processing and after processing.

6. What is Random accesses memory ? Explain different types of RAM.

Ans :

Whenever user enters any kind of data into the computer system, it moves into primary memory for storage. This type of primary memory is known as RAM. It is the most randomly access storage type among all types of storage.

The main features of RAM are:

- (a) The word "random" refers to the fact that any piece of data can be returned quickly, and in a constant time, regardless of its physical location and whether or not it is related to the previous piece of data.
- (b) RAM is volatile in nature i.e. once the system is switched off, the contents of RAM will automatically be erased.

- (c) RAM stores the data purely on temporary basis i.e. user can remove the previous data and write new information into it whenever required.
- (d) RAM is small, both in terms of its physical size and in the amount of data it can hold.
- (e) Every computer application demands a particular amount of memory from RAM in order to execute.
- (f) All kinds of displays on the display device (monitor) will be possible because of RAM i.e. if we remove the RAM chip from the system then there will be no display on the monitor's screen.
- (g) RAM is also referred as read and write memory of the computer i.e. user can read the data from RAM as well as write the data into RAM.
- (h) A small amount of RAM is also integrated with the CPU, but this is usually referred to as "Cache Memory", rather than RAM.
- (i) RAM is a semiconductor memory so it is very costly. Still many people use large amount of RAM in order to increase the speed of the computer.

7. What is Read only Memory?

Ans :

ROM is "built-in" computer memory also known as Firmware. Instructions that are required all the time in the system for running the computer are stored in the ROM.

The main features of ROM are :

- (a) It consists of small chip located near CPU on the motherboard.
- (b) It is the read only memory i.e. user can only read the instructions but cannot write into it.
- (c) The instructions stored in it are permanent in the nature and are usually designed by the manufacturer of the computer.
- (d) ROM is non-volatile in nature i.e. data does not get erased when the computer's power is switched off.

- (e) Instructions that are stored in the ROM, execute as soon as the computer is switched on. For example: when we switch on the system all the instructions stored in the ROM load and get executed automatically and make the system ready to load the operating system in the memory.
- (f) The memory organization of ROM is exactly the same as that of RAM.

8. Compare and contrast RAM and ROM.

Ans :

Sl.No.	Nature	Random Access Memory(RAM)	Read Only Memory(ROM)
1.	Volatility	RAM is volatile in nature as it automatically erased when computer shutdowns.	ROM is non-volatile since it is never erased when there is any shutdown or restart of computer.
2.	Accessibility	RAM can be directly accessed by the processor.	ROM can't be directly accessed by the processor since it is transferred into RAM where it is executed by the processor.
3.	Storage	RAM is used to store the temporary information for limited time.	ROM is used to store permanent information which can't be deleted.
4.	Hardware structure	RAM is in form of chip while	ROM is generally optical drivers made of magnetic tapes
5.	Cost	Costlier than ROM	Cheaper than RAM

9. Define Software.

Ans :

A computer cannot do anything on its own. It must be instructed to do a job desired by us. Hence, it is necessary to specify a sequence of instructions a computer must perform to solve a problem. Such a sequence of instructions written in a language understood by a computer is called a computer program. A program controls a computer's processing activity, and the computer performs precisely what the program wants it to do. When a computer is using a program to perform a task, we say, it is running or executing that program.

The term software refers to a set of computer programs, procedures, and associated documents (flowcharts, manuals, etc.) describing the programs, and how they are to be used.

A software package is a group of programs that solve a specific problem or perform a specific type of job.

For example, a word-processing package may contain programs for text editing, text formatting, drawing graphics, spelling checking, etc. Hence, a multipurpose computer system, like's personal computer in your home, has several software packages, one each for every type of job it can perform.

10. System Software

Ans :

System software is a set of one or more programs designed to control the operation and extend the processing capability of a computer system. In general, a computer's system software performs one or more of the following functions:

1. Supports development of other application software.
2. Supports execution of other application software.
3. Monitors effective use of various hardware resources such as CPU, memory, peripherals, etc.
4. Communicates with and controls operation of peripheral devices such as printer, disk, tape, etc.

Hence, system software makes the operation of a computer system more effective and efficient. It helps the hardware components work together, and provides support for the development and execution of application software (programs). The programs included in a system software package are called system programs. The programmers who prepare system software are referred to as system programmers.

11. Application Software

Ans :

Application software is a set of one or more programs designed to solve a specific problem, or do a specific task.

For Example, payroll processing software, examination results processing software, railway / airline reservation software, computer games software are all application software. Similarly, a program written by a scientist to solve a research problem is also application software. The programs included in an application software package are called application programs. The programmers who prepare application software are referred to as application programmers.

12. What is Programming Language?

Ans :

As human beings need a common language to communicate, a language is also needed by computer to communicate with user. A computer language is the means by which data and instructions are transmitted to computers. In another way, computer languages are the interface between a computer and a human being.

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Ans :

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- Assembly language is machine dependent i.e. assembly language program is specific to particular machine, because each instruction in the symbolic language is translated into exactly one machine language instruction.
- A translating program called assembler is used to translate the instructions written in assembly language to the machine language and vice versa.
- Assembly language statements are written one per line, where each statement contains a mnemonic.

15. Explain the importance of IT in Business.

Ans :

1. Globalization of Business

The information technology in business helps in achieving a good reach in the global marketing. With this, the companies can do business from anywhere in the world. The globalization of business improves the international trade and provides collaboration in real-time.

2. Enhanced Security of the Company

The information technology in business helps in protecting the important data. The implementation of high-level security measures diverts the cyber criminals. It also provides various technologies like encryption and tokenization inorder to prevent the loss of data.

3. Efficient Operations

The information technology in business can optimize the operations of a company by avoiding the errors, duplications also the delays in the workflows. By optimizing the operations, companies can save the time, cost and can increase the productivity.

Choose the Correct Answer

1. The brain of the computer system [c]
(a) ALU (b) Memory
(c) CPU (d) control Unit
2. Computers are helpfu in [d]
(a) Teaching (b) Learning
(c) Business (d) All
3. The computer that process both analog and digital signal is called [b]
(a) Analog computer (b) Hybrid computer
(c) Digital computer (d) Mainframe computer
4. A pointing device that can be directly used to draw lines on the screen is called [b]
(a) Trackball (b) Lightpen
(c) Joy stock (d) Moose
5. Dot Matrix is a type of [b]
(a) tape (b) printer
(c) disk (d) plotter
6. Storage in Floppy disk is ? [b]
(a) Internal (b) Extenal
(c) both (d) None
7. Which of the following disk is a fixed disk ? [a]
(a) Hard disk (b) Flash disk
(c) Blue - Ray disk (d) DVD
8. A byte consist of [c]
(a) 1 bit (b) 4 bits
(c) 8 bits (d) 16 bits
9. The two kinds of main memory are [c]
(a) primary and secondary (b) random and sequential
(c) ROM and RAM (d) All
10. What do you get after processing of data ? [a]
(a) Information (b) Input
(c) Output (d) Data

Fill in the blanks

1. A _____ is an electronic device that has the ability to store, retrieve, and process data, and can be programmed with instructions that it remembers.
2. _____ is considered as the "Brain of the computer".
3. A _____ unit is a major component of the computer which helps in the functioning of the central processing unit and in turn runs the whole computer.
4. The function of _____ is to perform the actual calculations in the computer.
5. Computer _____ refers to the physical parts of a computer and related devices.
6. _____ is an input device like a mouse.
7. _____ devices are used to display results of processing to the user.
8. Primary storage, also known as _____.
9. Secondary storage, also called _____ memory or mass storage.
10. A _____ package is a group of programs that solve a specific problem or perform a specific type of job.
11. _____ is a set of one or more programs designed to control the operation and extend the processing capability of a computer system.
12. _____ is a set of one or more programs designed to solve a specific problem, or do a specific task.

ANSWERS

1. Computer
2. CPU
3. Control
4. ALU
5. Hardware
6. Track Ball
7. Output
8. Main storage
9. Auxiliary
10. Software
11. System software
12. Application software

UNIT II

EMERGING TRENDS IN IT:

Categories of IS, Management Information System (MIS), Decision Support System (DSS) - Types and architecture of DSS, Data Warehouse and Data Mining, Artificial Intelligence, Intelligent Systems, Cloud Computing, Mobile Apps and Computing, Big Data, Robotics, Virtual Reality, Internet of Things (IoT), 5G.

2.1 CATEGORIES OF IS

Q1. Explain about various types of information system.

Ans :

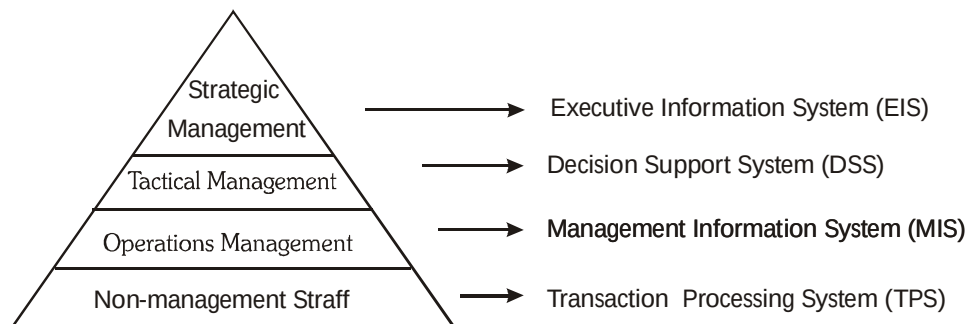
A common approach to examining the types of information systems used within organizations, is to categorize Information System (IS) applications by the roles they play at various levels in the organizational structure. This is known as the vertical approach.

In this case the organization is viewed as a management pyramid with four levels:

- At the lowest level, non-management staff attends to routine daily business transactions such as selling goods and issuing receipts for payment.
- Operational management is responsible for monitoring the transactions that are occurring, and dealing with any problems that may arise.
- Tactical management decides on budgets, set targets, identify trends and develop short term plans for the business.
- At the top of the pyramid, strategic management is responsible for defining the long term goals of the company, and how it intends to position itself within its particular industry.

These levels of management generate four different types of information systems :

1. Transaction Processing System
2. Management Information System
3. Decision Support System
4. Executive Information System



1. **Transaction Processing System (TPS):** At the lowest level of the organizational hierarchy, we find the transaction processing systems (TPS) that support the day-to-day activities of the business. These systems are mainly used by clerical staff in the organization to perform regular business activities such as invoicing and issuing of stock etc. The users of transaction processing systems tend to work at the lowest level of detail as they process or query one transaction at a time, using computer systems to capture the raw data which reflects the business processes of the organization.

Example: The itemized bill slip from a supermarket is produced by the transaction processing systems (TPS), and details of each individual item sold will be recorded in the store's database.

2. **Management Information System (MIS):** The next level in the organizational hierarchy is occupied by low level managers and supervisors. This level contains computer systems that are intended to assist operational management in monitoring and controlling the transaction processing activities that occur at clerical level. Management information systems (MIS) use the data collected by the TPS to provide supervisors with the necessary control reports.

Example: In a debtors system, the individual responsible for collection of unpaid accounts could extract a listing from the computer of customers whose accounts have been outstanding for more than three months. At this level, output reports generally contain summarized totals of the TPS data, produced either on a weekly or monthly basis or on request.

The main focus of MIS is to avoid using huge volumes of detailed data, instead using control totals and exceptions to identify problems.

3. **Decision Support System (DSS):** Tactical management occupies the next level in the organizational hierarchy. These managers are responsible for ensuring that plans and targets set by senior management are achieved. They tend to focus not on the progress of individual transactions but on the bigger picture.

For example, the relative sales performance of different sales areas in the organization. To achieve this they need to receive regular reports from the MIS with summary totals and comparison between prior months and years, or planned activity levels.

4. **Executive Information System (EIS):** The highest level in the organizational structure is that of strategic management, and once again its information requirements are unique. These managers are charged with the task of setting the strategy for the organization. They require an information system that will enable them to identify problems, opportunities and trends that may enhance their organization's competitive position.

Q2. Bring out the differences between operational, tactical and strategic IS.

Ans :

Sl.No.	Characteristics	Operational IS	Tactical IS	Strategic IS
1.	Nature of Data	Highly Structured	Some Unstructured Data	Highly Unstructured
2.	Accuracy	Highly Accurate Data	Some Subjective Data	Highly Subjective Data
3.	Typical User	First-line Supervisors	Middle Managers	Top Management
4.	Level of Decision	Task Oriented	Oriented towards	Goal Oriented control and resource allocation

2.2 MANAGEMENT INFORMATION SYSTEM (MIS)

Q3. Define management information system. Explain the characteristics of management information system.

Ans : (Imp.)

Meaning

A management information system (MIS) is a computer-based system that provides the information necessary to manage an organization effectively. An MIS should be designed to enhance communication among employees, provide an objective system for recording information and support the organization's strategic goals and direction.

Definitions

- (i) "A Management Information System is an integrated user-machine system, for providing information, to support the operations, management, analysis and decision-making functions in an organization
- (ii) **According to Kenn Evans**, MIS is an organized method of providing past, present and projection information relating to internal operations and external intelligence.
- (iii) **According to Gordon B. Davis**, MIS is an integrated man/machine system for providing information to support the operations management and decision making functions of an organization.
- (iv) **According to Robert G. Mardick**, MIS is the System intended to provide information for decision making, planning, organizing and controlling the operations of the subsystems of the firm and to provide a Synergistic organization in the process.

Characteristics

MIS generally has the following characteristics.

(a) Management Oriented

Beyond any doubt is the fact that MIS is a management oriented system. This could be understood from the terminology itself. The information processing carried out by MIS if always attempting at helping the management.

(b) Management Directed

Similarly, all the activities of MIS are initiated by the management. It is the management's need that the MIS strives to satisfy. Hence, MIS is management directed.

(c) User-machine System

The concept of user-machine system implies that some tasks of MIS are done by the users while others are best done by machines. There is co-existence of both men and machines in MIS.

(d) Integrated System

MIS hopes to provide the basis of integration of information processing. This leads to common data flows. Even tough applications in a system are implemented one at a time, their design is guided by an overall plan. In essence information system is designed as a federation of small systems.

(e) Involves Large Planning

The concept of MIS goes only with planning. There is a huge amount planning coupled with the installation and maintenance of MIS.

(f) Sub Systems

Naturally, a vast system like the MIS will be having plenty of sub systems which are mutually related with defined with definite relationships and properly ordered. It is based on subsystem concept.

(g) Use of Models

MIS uses scientific and mathematical models for planning, organizing, directing and controlling for its analysis.

(h) Data base

One of the prerequisites for installing, implementing and successful operating of MIS is data. Hence, there has to be a way to maintain data in data in data bases and there has to be a central database.

(i) Information as a resource

MIS transforms data into information and the management is behind MIS. MIS provides procedure for measuring and matching cost of obtaining and using information.

(j) Flexibility in use

MIS is so designed that it is flexible and adaptable to user requirements.

(k) Others

MIS is predictive and related to organizational levels.

Q4. Explain the Need for MIS.

Ans :

When any organization wishes to establish the MIS, it must be very clear about the need of information required may the different levels of management. Following are the reasons for the adoption of the MIS :

- To store and manage data efficiently from all the functional areas of the business.
- To process the collected data and derive information out of them.
- To provide information quickly as and when required.
- To collect and store the data for the purpose of internal research.
- To provide the information regarding the financial health of the business organization.
- To provide information regarding production and inventory.
- To provide information for planning, organizing and controlling purposes.
- To speed up the execution of the results with the reliable data available.
- To smooth up the flow of data thorough various levels of the organization.

Q5. What are the Objectives of MIS ?

Ans :

The goals of an MIS are to implement the organizational structure and dynamics of the enterprise for the purpose of managing the organization in a better way and capturing the potential of the information system for competitive advantage.

Following are the basic objectives of an MIS :

1. Capturing Data

Capturing contextual data, or operational information that will contribute in decision making from various internal and external sources of organization.

2. Processing Data

The captured data is processed into information needed for planning, organizing, coordinating, directing and controlling functionality at strategic, tactical and operational level. Processing data means:

- making calculations with the data
- sorting data
- classifying data and
- summarizing data

3. Information Storage

Information or processed data need to be stored for future use.

4. Information Retrieval

The system should be able to retrieve this information from the storage as and when required by various users.

5. Information Propagation

Information or the finished product of the MIS should be circulated to its users periodically using the organizational network.

Q6. Explain the component of MIS.

Ans :

A management information system is made up of five major components namely people, business processes, data, hardware, and software. All of these components must work together to achieve business objects.

1. People

These are the users who use the information system to record the day to day business transactions. The users are usually qualified professionals such as accountants, human resource managers, etc. The ICT department usually has the support staffs who ensure that the system is running properly.

2. Business Procedures

These are agreed upon best practices that guide the users and all other components on how to work efficiently. Business procedures are developed by the people i.e. users, consultants, etc.

3. Data

It refers to the recorded day to day business transactions. For a bank, data is collected from activities such as deposits, withdrawals, etc.

4. Hardware

Hardware is made up of the computers, printers, networking devices, etc. The hardware provides the computing power for processing data. It also provides networking and printing capabilities. The hardware speeds up the processing of data into information.

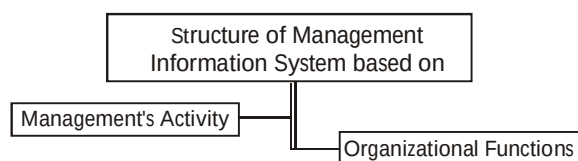
5. Software

These are programs that run on the hardware. The software is broken down into two major categories namely system software and applications software. System software refers to the operating system i.e. Windows, Mac OS, and Ubuntu, etc. Applications software refers to specialized software for accomplishing business tasks such as a payroll program, banking system, point of sale system, etc.

Q7. Explain the structure of MIS.

Ans :

MIS Structure based on Management Activity

**1. Management information systems support management activity**

It means that the structure of an information system can be classified in terms of a hierarchy of management planning and control activities. MIS structure has to be designed to satisfy various hierarchical information requirements. There are four levels of hierarchy:

i) Strategic Planning (Top Management)

Strategic planning deals with long-range considerations. The decisions to be made are concerned with the choice of business direction, market strategy, product mix, etc.

ii) Management Control and Tactical Planning (Senior Management)

Management control and tactical planning has a medium-term planning horizon. It includes acquisition and organization of resources, structuring of work, and acquisition and training of personnel. It is reflected in the capital expenditure budget, the three-year staffing plan, etc.

iii) Operations Planning and Control (Middle and Junior Management)

Operational planning and control is related to short-term decisions for current operations. Pricing, production levels, inventory levels, etc., are a result of operational planning and control activities.

iv) Transaction Processing (Clerical Staff and Workers)

A Transaction Processing is a computerized system that performs and records the daily routine transaction necessary to the conduct of the business.

For example, sales order entry. MIS helps the clerical personnel in the transaction processing and answers their queries on the data pertaining to the transaction, the status of a particular record and reference on a variety of documents.

At each level of management, the nature of information in terms of details, conciseness, frequency, interpretations, decision supporting/decision giving capabilities etc is different and MIS structure should support it.

2. MIS Structure based on Organizational Function

The structure of an information system can also be described in terms of the organizational functions which use information. There is no standard classification of functions, but a typical set of functions in a manufacturing organization includes production, sales and marketing, finance and accounting, logistics, personnel, and , information systems. Top management can also be considered as a separate function.

A management information system (MIS) is essentially a federation of information systems that are designed to support the functional subsystems of the organization. Within each functional subsystem, there will be applications for transaction processing, operational control, managerial control, and strategic planning (figure).

Activities	Sales and Marketing	Production	Logistics	Personnel	Finance and accounting	Information processing	Top management
Strategic control							
Management control							
Operational control							
Transaction processing							

Fig.: Matrix of Functional Subsystems and Management Activities

i) Sales and Marketing Subsystems

The sales and marketing function generally includes all activities related to the promotion and sales of products or services.

ii) Production Subsystem

The responsibilities of the production or manufacturing function include product engineering, planning of production facilities, scheduling and operation of production facilities, employment and training of production personnel, and quality control and inspection.

iii) Logistics Subsystem

The logistics function encompasses such activities as purchasing, receiving, inventory control, and distribution.

iv) Personnel Subsystem

The personnel subsystem includes hiring, training, record keeping, payment, and termination of personnel.

v) Finance and Accounting Sub-system

- Finance and accounting are somewhat separate functions but are sufficiently related to be described together
- Finance is responsible for ensuring adequate organizational financing at as low a cost as possible (in a manner consistent with other objectives).
- Accounting covers the classification of financial transactions and summarization into the standard financial reports (income statement and balance sheet), the preparation of budgets, and classification and analysis of cost data.

vi) Information Processing Subsystem

The information processing function is responsible for ensuring that the other functions are provided the necessary information processing services and resources.

vii) Top Management Subsystem

The top management function (chief executive officer plus staff) operates separately from the functional areas, but also includes the functional vice presidents acting in a top management capacity such as in management committees.

Q8. State the advantages of MIS.**(or)****Explain the merits of MIS.****Ans :**

Following are the merits of MIS

1. Helps in formulation of Planning

With the help of MIS, the management can formulate correct planning because, preparation of planning requires various data and information, which can be systematically supplied by the process of MIS.

2. Provides Coordination

Under this system of MIS, data and information are collected from each subsystem of the organization, through unifying the concept of each Sub-System. So, the MIS can provide the facility of coordination.

3. Systematic Decentralization

MIS also provides systematic decentralization in the organization. Under the process of MIS, different middle and lower level officers and managers are authorized to supply their information. So, by implementing MIS, the authority can be distributed among various officers and managers of middle and lower levels without the loss of control. It also provides a system for monitoring performance. Likewise, the MIS can help in decentralization.

4. Help in Control System

To be an effective control system, it should be based on relevant data and information. On the other hand, relevant data and information can be provided regularly in a systematic manner by the MIS. So, MIS can help in taking proper control.

5. Increase Speed in Operation

In order to increase the speed of operation of a business, data and information should be supplied at the right time at the right place. Because, without data and information no operation can be done in a proper way.

By supplying necessary data and information, MIS can increase the speed of the operation of a business.

6. Reduce Duplication of Efforts

Under the Process of MIS, various data and information are stored in a scientific manner. So, the managers can take the help of these data and information before and at the time of performing their activities. Thereby, the MIS can prevent unnecessary duplication of efforts likely to be done by the managers. Generally, duplication of effort happens owing to the lack of sufficient data provided timely to the managers.

Q9. State the disadvantages of MIS.*Ans :***1. Highly Sensitive Requires Constant Monitoring**

MIS is highly sensitive for fraudulent activities. The information thus obtained can be used and manipulated to harm the particular organization in many ways. Hence, it requires continuous monitoring and filtering.

2. Budgeting of MIS Extremely Difficult

Like all other department activities MIS cannot be budgeted. It is a highly sensitive and important function of an organization however it is not feasible to predict the budget of an MIS in any organization. Hence, it is often unpredictable expense.

3. Quality of Outputs Governed by Quality of Inputs

The information generated through MIS, is solely dependent on the raw data provided for the processing. The authenticity of the raw data will considerably assess the quality of the information generated.

4. Lack of Flexibility to Update Itself

Unlike many other applications, MIS does not have the feature of getting updated automatically. In order to update any information, the raw data has to be obtained and fed in for the processing and updating of the existing data.

5. Effectiveness Decreases Due to Frequent Changes in Top Management

The effectiveness of information provided decreases owing to the frequent changes in middle or top level managements. The requirement of MIS substantially indicates towards the inputs given by these management levels. When the management changes, the requirements change as well, therefore the resultant information produced till now may not be of much use to the new management.

6. Takes into Account Only Qualitative Factors

MIS has one big limitation of taking into account only qualitative factors and completely ignoring the non-qualitative factors like morale of worker, attitude of worker, and motivation.

2.3 DECISION SUPPORT SYSTEM (DSS)**Q10. Define Decision Support System. Explain the characteristics of DSS.***Ans :***Meaning**

Decision Support Systems is an interactive computer-based system that assists the decision makers of an organization to efficiently utilize the data and model for solving unstructured problems. This makes the decision making activities to get enhanced. It helps the managers in examining the long range effects of newer organizations so that, they can easily depict the future problems. This system supports decision making by,

- Automating certain decision procedures
- Providing information regarding different decision processes
- Stimulating innovation in decision making process.

DSS can be considered as a component of MIS. It has the capability of handling all the decisions associated with the information system. Some of the examples of such decisions include launching a product, designing (or) altering a product, implementing a particular criteria etc.

Characteristics

The following are the characteristics of DSS,

1. DSS Provides a Support to the Semi-structured or Unstructured Decisions

When a decision is not completely structured, the computer cannot be fully programmed to make a decision along with the user's satisfaction. Hence, in such situations, DSS uses human judgement and computerised information so as to make semistructured/unstructured decisions.

2. DSS Provides Support to the Decision Making Process

For the success of an organization, the following decisions are to be made,

- (i) The products that must be manufactured
- (ii) The services that must be provided
- (iii) The way of advertising and selling the products
- (iv) The way of increasing the capital
- (v) The persons that must be involved in every task.

Thus, DSS is used to make such type of decisions, which are very important to an organization.

3. DSS are Integrated with some Sort of Database

Every decision in an organization is made based on the information that is provided by a database. The database typically refers to a large repository, where massive volumes of data are stored. Such data is processed and thus interpreted as information to the organizations.

4. DSS are Integrated with Certain Models

A Model refers to a structural representation of system which possibly helps in making decisions. Such a model, is very useful and provides a Significant impact to an organization.

5. DSS Provide Support to the Managers

A Manager refers to a person who receive results from the DSS users. Typically, DSS users can be any of the following,

(i) Knowledge Workers

These are the users that include non-management members like travel agents, urban planners, stock brokers, college admission officers, etc.

(ii) Decision Makers

These are the users who make decisions in the areas like business, non-profit sector, government, etc.

6. DSS Provides Support to the Approaches of Information System

The approaches/mechanisms applied to an information system, can also be applied to the DSS. Thus, DSS is considered as similar to the information system.

7. DSS Provide Support to the People

DSS does not explicitly make the decisions. Instead, it supports the humans in making decisions regarding a problem context.

2.3.1 Types**Q11. Explain the various types of decision support system.**

Ans : **(Imp.)**

The different types of information system in addition to decision support system are as follows,

(i) Transaction Processing Systems (TPS)

Transaction processing system is one of the important functionalities of operation support system whose major objective is to,

- Enhance the speed of transaction processing
- Increase the level of productivity
- Simplify the execution procedure of different process.

Basically, transaction can be defined as the fundamental level of activity, which is performed while executing different business operations. TPS represents an organized collection of people, processes, software, database and devices which are helpful in monitoring and recording the information about the transactions. This information is documented so that it can be used by managers of different functional areas (marketing, finance, human resource) in performing their respective activities. TPS is not only used for executing ordinary business transactions but are also used for executing transactions that are critical while performing day-to-day business activities.

TPS accumulates all the inputs that may be required for different types of system and

provides the basic input to organizations data base. The execution of transaction generates data, which is recorded by TPS. The generated data is intum supplied as input so as to generate other information systems like MIS, DSS, EIS. The advantage of TPS is that it automatically manages the data required for performing different business activities and transactions.

(ii) Office Automation System (OAS)

Office automation system provide support for automating different business activities, for performing general, traditional office work so as to handle and manage the documents, conduct meeting, schedule projects. These systems enables communication to be performed within the office or between the office and its related environment using communicating devices like network, internet. The main purpose of enabling communication is to transmit messages, documents, images, video, audio.

Office automation system creates professional documents with graphics and layout feature using text processing systems like word processors, desktop publishing system. OAS consists of spreadsheet, presentation packages, personal database systems and note-taking system (calendar, notepad appointment book).

(iii) Executive Support System (ESS)

Executive Support System is also known as Executive Information Systems (EIS). Executive information system provides summarized information to strategic-level managers so as to support the senior managers in making strategic decisions. This information system is basically designed to help the managers in accessing the information quickly and in effective manner. In contrast to decision support-system, executive information system helps doesn't use any analytical models for solving specific problems. The major objective of EIS is to help the senior manager in identifying the problems, opportunities as well as the trends that may have major impact on the

performance and productivity level of the organization. The input to EIS is the data generated by other information systems like TPS, MIS. The characteristic features of EIS include,

- Menu-driven user friendly interfaces
- Interactive graphics
- Telecommunication links.

(iv) Expert System (ES)

Expert System is the information system that provides solutions to various problems by capturing knowledge for a specific and limited domain of human expertise. It provides assistance for decision making by generating various questions and adopts certain actions based on the answers.

It also explains the reasons for the actions it does. These systems do have a set of rules formed by capturing knowledge of skilled employees in an organization. The rules are accumulated in the memory of the organization.

(v) Strategic Information System (SIS)

Strategic information system are used by the top level management for making strategic or unstructured decisions. Strategic decisions are the most complex decisions as they are made on personal assumptions rather than facts. Strategic decision making process focuses on achieving long-range organizational goals. In contrast to this tactical decision making process the strategic information system emphasizes on effective allocation of resources to meet organizational objectives.

Top management makes decisions by monitoring the operations of the competing organizations and by having knowledge of the latest government regulation trends.

Strategic decisions will have an impact on the organization for either a year or more.

(vi) Work Group Information System (WGIS)

Work Group Information System is developed so as to facilitate workgroup effectiveness. This is done by enabling the

members of the group to communicate and co-ordinate with each other, while performing the set of organizational activities collaborately. The system generally supports a group decision-making process. It enhances the value of group strategic management, group management and group operations that result in achieving better product output and delivery.

(vii) Personal Information System (PIS)

Personal Information Systems are developed so as to satisfy every individual's requirement. It is basically used by an individual while performing the end-user computing to enhance their products, improve overall quality.

(viii) Information Reporting System (IRS)

Information Reporting Systems are the most common type of management information system. IRS provides the supervisors and middle level managers of organizations with reports that summarize data and provides support for making decisions related to the day-to-day operations. This type of information system focuses on the processing efficiency factor as well as the simplification factor.

Q12. Describe how decision support systems are evolved.

Ans :

Evolution of Decision Support System

The use of computers for commercial and business data processing started in early 1950s. In mid 1950s, several large firms started using computers to perform repetitive calculations like payroll processing. This was known as Automatic Data Processing which replaced the mechanical punched card processing known as Electronic Data Processing (EDP). The use of computers for such processing of data became popular as Data Processing (DP).

Data processing comprises of all computer applications of a firm but, there are few business activities that are repeatedly performed. Such activities are known as Transaction Processing.

In 1951, US Census Bureau, started the use of first large scale system, i.e., Univac I.

Gradually, managers discovered that the transactional data contain some useful information pattern which can be used in decision making. Hence, they started obtaining long reports containing transactional data from their data processing staff. This system was paper-based and required a lot of effort from the managers. It was known as Information Reporting System (IRS).

With the evolution of technology, a new concept known as Management Information System (MIS) came into existence. In this system, it is possible to store the whole organization's data such as orders, customer information, inventory data, suppliers, distributors and employee information, payroll, production schedule, etc. This data can be accessed by managers and other staff in several ways. MIS was good at automating the activities of a firm, but it was not much useful for decision making. This is because, the managers had to manually interpret long and thick reports.

In the 1970s, a new system evolved from MIS which is known as Decision Support Systems (DSS). This system helped managers and decision makers to take critical decisions. It processes large amount of corporate data, along with providing valuable information and advises to the managers.

In the 1980s, DSS further improved and in the 1990s, it started using the concept of data warehouse. The design of such DSS is shown below.

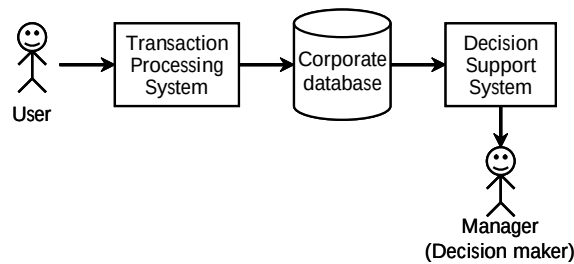


Fig.: Decision Support System using Transactional Data

2.3.2 Architecture of DSS

Q13. Explain the architecture of DSS.

Ans :

(Imp.)

An organization's DSS architecture, corresponds to a part of information system architecture of that organization. The DSS architecture should include several elements similar to that of the organization's overall architecture.

It should consider all the applications required in any environment, that may conform to the needs of the organization in making following decisions.

- (i) Decisions regarding strategies, tactics and operations to be followed.
 - (ii) Decisions that are unstructured, structured and semistructured.
 - (iii) Management and knowledge workers in each level of organization.
 - (iv) An organization's geographic divisions and all the basic functional, product or line of business.
- The factors that a DSS architecture must take into account in its planning are,

1. **Database(s):** The DSS architecture should include, all existing database(s), whether internal or external to the organization and also those, that have been specially created to be used by DSS. The architecture should specify which databases are used at personal, departmental and enterprise levels. This specification ensures to achieve accuracy, concurrency and security.
2. **Model(s):** The DSS architecture should include all models along with their data sources. It should also assign responsibilities to provide a limited access, and to maintain them. At the initial stages, only major categories should be defined, instead of specifying each and every model.
3. **Users:** The DSS architecture should include details about all the users regarding their locations, jobs, educational qualifications etc., along with other factors, that will restrict the users from employing decision support system services.
4. **End-user Level Software Tools:** The DSS architecture should include software tools that help users to access the database as well as the models. The database package itself provides few software tools, that may be used for executing simple database queries. However, other software tools required, may be obtained from other sources or may be developed separately. The software tool required for accessing a data warehouse is, online analytical processing software.
5. **Management Level Software Tools:** The DSS architecture should include software tools that help software administrators in maintaining and managing database and models obtained from the underlying platforms, at regular intervals.

6. **Hardware and Operating System Platforms:** The DSS architecture should include hardware and operating system platforms, that hold databases and models, run programs, and allow users to access the DSS. The required constraints and the arrangements for possible upgrades in hardware and software must also be specified here.
7. **Network and Communication Capabilities:** The DSS architecture should include networking and communication capabilities, required to interconnect all these platforms. They should consider the factors, such as,
 - (i) User requirements, for connecting a user to one or more servers or databases.
 - (ii) Workgroup requirements, for allowing a workgroup to communicate within the group.
 - (iii) Enterprise requirements, for connecting workgroups shared data i.e., customers or external databases.

Q14. Explain the advantages and disadvantages of decision support system.

(OR)

What are the benefits of DSS over MIS

Ans :

Advantages

1. Improving Personal Efficiency

Many DSS do not do anything. A person could not do himself or herself. People prepared budgets for centuries before spreadsheet software came in to use. DSS help them do it faster and with less changes of error.

2. Improving Problem Solving

A DSS can make it possible for a person or a group to solve problem faster or better, than they could without it. There is a relationship between the two of course increased efficiency in a small task if properly applied. Hopefully contributes to solving the problem as a whole solving a problem faster is self-explanatory.

3. Facilitating Communications

After found that DSS facilitating interpersonal communication in several ways. In addition technology developments that have occurred since his/her research have opened up for DSS to provide this benefit. One way in which DSS facilitate communication is when used as a tool for benefit. The system can indicate when a particular action should be taken in the future (offensive) or when a particular action was justified in the past (defensive use).

4. Promoting Learning or Training

Using a DSS can also help people learned more about using computers and about software package that are in the DSS although this is seldom a specific objective of developing the DSS it can be valuable by project.

5. Increasing Organizational Control

Some DSS can also control information about an individual's decision to his or her managers. This information can then be used to access the productivity of the individual questions in terms of how many decisions they make and how good their decisions turned out to be.

Disadvantages**1. Limited Storage Capability**

Due to its small memories and limited storage capacities, DSS has definite computational constraints.

2. Slow

It is slow, compared to the speed of large mainframes.

3. Limited Information Sharing

Most DSS are designed for individual use but they can be designed so that several computers can be linked for limited information sharing.

4. Difficult

It is difficult to know interdependencies of functions provided by system. It is difficult to keep track of consequences of DSS function usage with respect to decision scenario and integrity of database.

5. Require Extensive Knowledge

There are applications that require extensive knowledge of specific problem domain or technical knowledge.

6. Translation Problems

Users have to deal with several databases and models each with different data models and resulting translation problems.

7. Conflicion

Users may have to work on several decision scenarios at same time. As a consequence they have to keep track of what they done for each of them.

Q15. State the Applications of DSS.

Ans :

- (i) Management decision making is one of the main applications of decision support systems, specifically in case of issues of long-term growth.
- (ii) Medical industry is one of the common applications of decision support systems. It is used to make diagnoses depending upon the number of different symptoms and medical histories quickly.
- (iii) Agricultural professionals such as farmers, biologists and other specialists also use applications of decision support systems to gather data in relation with growing, seasons, climates, markets and policies for making plans.
- (iv) Air traffic professionals discovered and are using the applications of decision support systems for managing the planes and monitoring weather with those systems.
- (v) Individuals who participate in meetings also use this system in which it is referred as group decision support system.
- (vi) Facilitation for noting is also an application of this system.

Q16. Compare and contrast DSS and MIS.**(or)****What are the differences between DSS and MIS?****Ans :****(Imp.)**

Sl. No.	Basis	Decision Support System	Management Information System
1.	Problem Type	A DSS can handle unstructured problems that cannot be easily programmed.	An MIS is normally used only with structured problems.
2.	Users	A DSS supports individuals, small groups, and the entire organization. In the short run, users typically have more control over a DSS.	An MIS supports primarily the organization. In the short run, users have less control over an MIS.
3.	Support	A DSS supports all aspects and phases of decision making; it does not replace the decision maker - people still make the decisions.	This is not true of all MIS systems -some make automatic decisions and replace the decision maker
4.	Emphasis	A DSS emphasizes actual decisions and decision-making styles.	An MIS usually emphasizes information only.
5.	Approach	A DSS is a direct support system that provides interactive reports on computer screens.	An MIS is typically an indirect support system that uses regularly produced reports.
6.	System	The computer that provides decision support is usually online (directly connected to the computer system and display screens are examples these devices can provide immediate information and answers to questions.	An MIS, using printed reports that might be delivered to managers once per week, cannot provide immediate results.
7.	Speed	Because a DSS is flexible and can be implemented by users, it usually takes less time to develop and is better able to respond to user requests.	An MIS's response time is usually longer.
8.	Output	DSS reports are usually screen oriented, with the ability to generate reports on a printer.	An MIS, however, typically is oriented toward printed reports and documents.
9.	Development	DSS users are usually more directly involved in its development. User involvement usually means better systems that provide superior support. For all systems, user involvement is the most important factor for the development of a successful system.	An MIS is frequently several years old and often was developed for people who are no longer performing the work supported by the MIS.

2.4 DATA WAREHOUSE AND DATA MINING

Q17. Discuss the concept of data warehouse and its design process.

Ans :

(Imp.)

Meaning

A data warehouse is a subject-oriented, integrated, time-variant and non-volatile collection of data in support of management's decision making process.

Subject-Oriented: A data warehouse can be used to analyze a particular subject area. For example, "sales" can be a particular subject. **Integrated:** A data warehouse integrates data from multiple data sources. For example, source A and source B may have different ways of identifying a product, but in a data warehouse, there will be only a single way of identifying a product. **Time-Variant:** Historical data is kept in a data warehouse. For example, one can retrieve data from 3 months, 6 months, 12 months, or even older data from a data warehouse. This contrasts with a transactions system, where often only the most recent data is kept. For example, a transaction system may hold the most recent address of a customer, where a data warehouse can hold all addresses associated with a customer.

Subject-Oriented

A data warehouse can be used to analyze a particular subject area. For example, "sales" can be a particular subject.

Integrated

A data warehouse integrates data from multiple data sources. For example, source A and source B may have different ways of identifying a product, but in a data warehouse, there will be only a single way of identifying a product.

Time-Variant

Historical data is kept in a data warehouse. For example, one can retrieve data from 3 months, 6 months, 12 months, or even older data from a data warehouse. This contrasts with a transactions system, where often only the most recent data is kept. For example, a transaction system may hold the most recent address of a customer, where a data

warehouse can hold all addresses associated with a customer.

Non-volatile

Once data is in the data warehouse, it will not change. So, historical data in a data warehouse should never be altered.

Data Warehouse Design Process

A data warehouse can be built using a top-down approach, a bottom-up approach, or a combination of both.

- The top-down approach starts with the overall design and planning. It is useful in cases where the technology is mature and well known, and where the business problems that must be solved are clear and well understood.
- The bottom-up approach starts with experiments and prototypes. This is useful in the early stage of business modeling and technology development. It allows an organization to move forward at considerably less expense and to evaluate the benefits of the technology before making significant commitments.
- In the combined approach, an organization can exploit the planned and strategic nature of the top-down approach while retaining the rapid implementation and opportunistic application of the bottom-up approach.

The warehouse design process consists of the following steps:

- Choose a business process to model, for example, orders, invoices, shipments, inventory, account administration, sales, or the general ledger. If the business process is organizational and involves multiple complex object collections, a data warehouse model should be followed. However, if the process is departmental and focuses on the analysis of one kind of business process, a data mart model should be chosen.
- Choose the grain of the business process. The grain is the fundamental, atomic level of data to be represented in the fact table for this process, for example, individual transactions, individual daily snapshots, and so on.

- Choose the dimensions that will apply to each fact table record. Typical dimensions are time, item, customer, supplier, warehouse, transaction type, and status.
- Choose the measures that will populate each fact table record. Typical measures are numeric additive quantities like dollars sold and units sold.

Q18. Explain three tier Architecture of data warehouse.

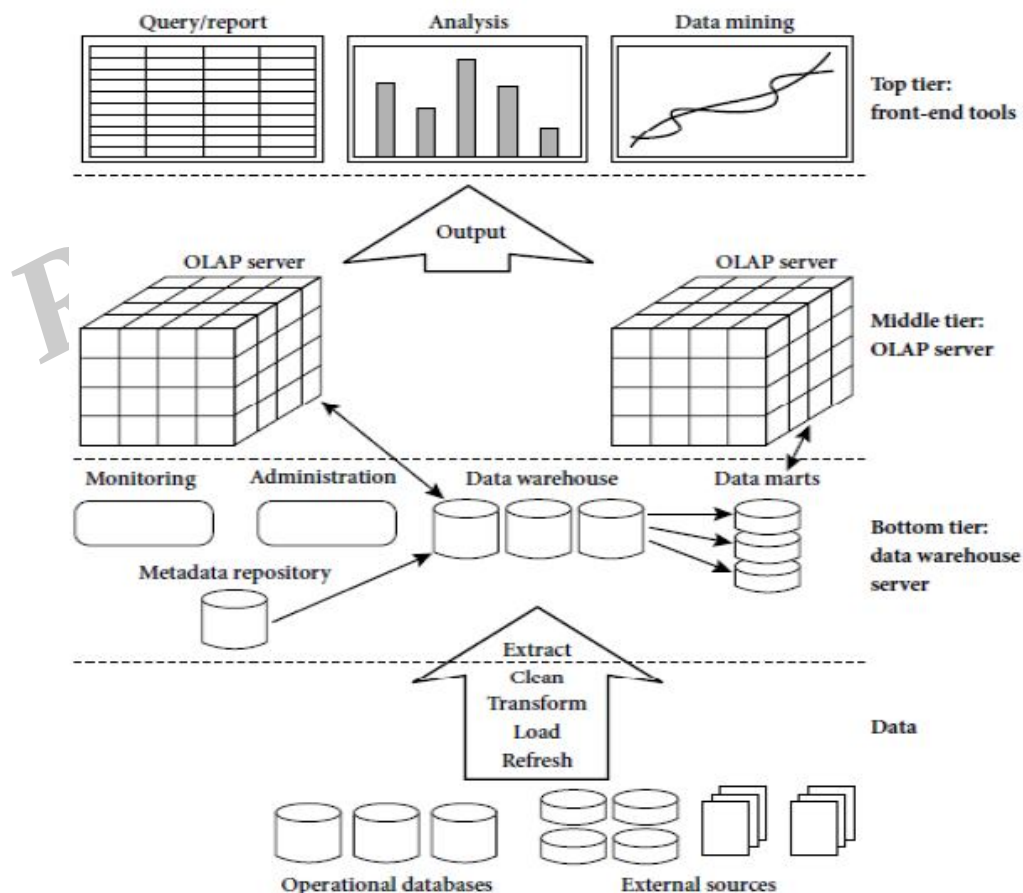
Ans :

Tier-1:

The bottom tier is a warehouse database server that is almost always a relational database system. Back-end tools and utilities are used to feed data into the bottom tier from operational databases or other external sources (such as customer profile information provided by external consultants). These tools and utilities perform data extraction, cleaning, and transformation (e.g., to merge similar data from different sources into a unified format), as well as load and refresh functions to update the data warehouse. The data are extracted using application program interfaces known as gateways. A gateway is supported by the underlying DBMS and allows client programs to generate SQL code to be executed at a server.

Examples of gateways include ODBC (Open Database Connection) and OLEDB (Open Linking and Embedding for Databases) by Microsoft and JDBC (Java Database Connection).

This tier also contains a metadata repository, which stores information about the data warehouse and its contents.



Tier - 2

The middle tier is an OLAP server that is typically implemented using either a relational OLAP (ROLAP) model or a multidimensional OLAP.

- OLAP model is an extended relational DBMS that maps operations on multidimensional data to standard relational operations.
- A multidimensional OLAP (MOLAP) model, that is, a special-purpose server that directly implements multidimensional data and operations.

Tier-3

The top tier is a front-end client layer, which contains query and reporting tools, analysis tools, and/or data mining tools (e.g., trend analysis, prediction, and so on).

Q19. Explain various types of data warehouse models.

Ans :

Data Warehouse Models

There are three data warehouse models.

1. Enterprise warehouse

An enterprise warehouse collects all of the information about subjects spanning the entire organization.

It provides corporate-wide data integration, usually from one or more operational systems or external information providers, and is cross-functional in scope.

It typically contains detailed data as well as summarized data, and can range in size from a few gigabytes to hundreds of gigabytes, terabytes, or beyond.

An enterprise data warehouse may be implemented on traditional mainframes, computer superservers, or parallel architecture platforms. It requires extensive business modeling and may take years to design and build.

2. Data mart

A data mart contains a subset of corporate-wide data that is of value to a specific group of users.

The scope is confined to specific selected subjects. For example, a marketing data mart may confine its subjects to customer, item, and sales. The data contained in data marts tend to be summarized.

Data marts are usually implemented on low-cost departmental servers that are UNIX/LINUX- or Windows-based. The implementation cycle of a data mart is more likely to be measured in weeks rather than months or years. However, it may involve complex integration in the long run if its design and planning were not enterprise-wide.

Depending on the source of data, data marts can be categorized as independent or dependent. Independent data marts are sourced from data captured from one or more operational systems or external information providers, or from data generated locally within a particular department or geographic area. Dependent data marts are sourced directly from enterprise data warehouses.

3. Virtual warehouse

A virtual warehouse is a set of views over operational databases. For efficient query processing, only some of the possible summary views may be materialized. A virtual warehouse is easy to build but requires excess capacity on operational database servers.

Q20. What is data mining? Explain the scope of data mining.

Ans :

(Imp.)

Meaning

Data mining refers to extracting or mining knowledge from large amounts of data. The term is actually a misnomer. Thus, data mining should have been more appropriately named as knowledge mining which emphasizes on mining from large amounts of data.

It is the computational process of discovering patterns in large data sets involving methods at the intersection of artificial intelligence, machine learning, statistics, and database systems. The overall goal of the data mining process is to extract information from a data set and transform it into an understandable structure for further use.

The key properties of data mining are

- Automatic discovery of patterns.
- Prediction of likely outcomes.

- Creation of actionable information.
- Focus on large datasets and databases.

Scope

Data mining derives its name from the similarities between searching for valuable business information in a large database – for example, finding linked products in gigabytes of store scanner data – and mining a mountain for a vein of valuable ore. Both processes require either sifting through an immense amount of material, or intelligently probing it to find exactly where the value resides. Given databases of sufficient size and quality, data mining technology can generate new business opportunities by providing these capabilities:

Automated prediction of trends and behaviors

Data mining automates the process of finding predictive information in large databases. Questions that traditionally required extensive hands-on analysis can now be answered directly from the data - quickly. A typical example of a predictive problem is targeted marketing. Data mining uses data on past promotional mailings to identify the targets most likely to maximize return on investment in future mailings. Other predictive problems include forecasting bankruptcy and other forms of default, and identifying segments of a population likely to respond similarly to given events.

Automated discovery of previously unknown patterns

Data mining tools sweep through databases and identify previously hidden patterns in one step. An example of pattern discovery is the analysis of retail sales data to identify seemingly unrelated products that are often purchased together. Other pattern discovery problems include detecting fraudulent credit card transactions and identifying anomalous data that could represent data entry keying errors.

Q21. State various tasks of data mining.

Ans :

Data mining involves six common classes of tasks:

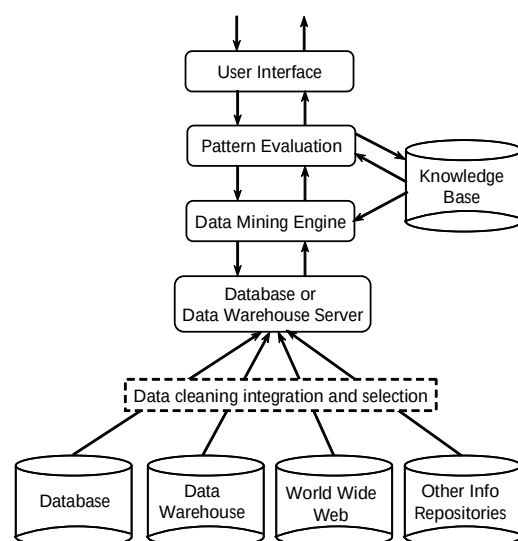
- i) **Anomaly detection (Outlier/change/deviation detection):** The identification of unusual data records, that might be interesting or data errors that require further investigation.

- ii) **Association rule learning (Dependency modelling):** Searches for relationships between variables. For example a supermarket might gather data on customer purchasing habits. Using association rule learning, the supermarket can determine which products are frequently bought together and use this information for marketing purposes. This is sometimes referred to as market basket analysis.
- iii) **Clustering:** Is the task of discovering groups and structures in the data that are in some way or another “similar”, without using known structures in the data.
- iv) **Classification:** Is the task of generalizing known structure to apply to new data. For example, an e-mail program might attempt to classify an e-mail as “legitimate” or as “spam”.
- v) **Regression:** Attempts to find a function which models the data with the least error.
- vi) **Summarization:** providing a more compact representation of the data set, including visualization and report generation.

Q22. Describe the architecture of data mining.

Ans :

A typical data mining system may have the following major components.



1. **Knowledge Base:** This is the domain knowledge that is used to guide the search or evaluate the interestingness of resulting patterns. Such knowledge can include concept hierarchies used to organize attributes or attribute values into different levels of abstraction. Knowledge such as user beliefs, which can be used to assess a pattern's interestingness based on its unexpectedness, may also be included. Other examples of domain knowledge are additional interestingness constraints or thresholds, and metadata (e.g., describing data from multiple heterogeneous sources).
2. **Data Mining Engine:** This is essential to the data mining system and ideally consists of a set of functional modules for tasks such as characterization, association and correlation analysis, classification, prediction, cluster analysis, outlier analysis, and evolution analysis.
3. **Pattern Evaluation Module:** This component typically employs interestingness measures and interacts with the data mining modules so as to focus the search toward interesting patterns. It may use interestingness thresholds to filter out discovered patterns. Alternatively, the pattern evaluation module may be integrated with the mining module, depending on the implementation of the data mining method used. For efficient data mining, it is highly recommended to push the evaluation of pattern interestingness as deep as possible into the mining process so as to confine the search to only the interesting patterns.
4. **User interface:** This module communicates between users and the data mining system, allowing the user to interact with the system by specifying a data mining query or task, providing information to help focus the search, and performing exploratory data mining based on the intermediate data mining results. In addition, this component allows the user to browse database and data warehouse schemas or data structures, evaluate mined patterns, and visualize the patterns in different forms.

Q23. State the process of Data mining.

Ans :

Data Mining is a process of discovering various models, summaries, and derived values from a given collection of data. The general experimental procedure adapted to data-mining problems involves the following steps:

1. State the problem and formulate the hypothesis

Most data-based modeling studies are performed in a particular application domain. Hence, domain-specific knowledge and experience are usually necessary in order to come up with a meaningful problem statement. Unfortunately, many application studies tend to focus on the data-mining technique at the expense of a clear problem statement. In this step, a modeler usually specifies a set of variables for the unknown dependency and, if possible, a general form of this dependency as an initial hypothesis. There may be several hypotheses formulated for a single problem at this stage. The first step requires the combined expertise of an application domain and a data-mining model. In practice, it usually means a close interaction between the data-mining expert and the application expert. In successful data-mining applications, this cooperation does not stop in the initial phase; it continues during the entire data-mining process.

2. Collect the data

This step is concerned with how the data are generated and collected. In general, there are two distinct possibilities. The first is when the data-generation process is under the control of an expert (modeler): this approach is known as a designed experiment. The second possibility is when the expert cannot influence the data-generation process: this is known as the observational approach. An observational setting, namely, random data generation, is assumed in most data-mining applications. Typically, the sampling distribution is completely unknown after data are collected, or it is partially and implicitly given in the data-collection procedure. It is very important, however, to understand how data collection affects its theoretical distribution, since such a priori knowledge can be very useful for modeling and, later, for the

final interpretation of results. Also, it is important to make sure that the data used for estimating a model and the data used later for testing and applying a model come from the same, unknown, sampling distribution. If this is not the case, the estimated model cannot be successfully used in a final application of the results.

3. Preprocessing the data

In the observational setting, data are usually “collected” from the existing databases, data warehouses, and data marts. Data preprocessing usually includes at least two common tasks:

- (i) **Outlier detection (and removal):** Outliers are unusual data values that are not consistent with most observations. Commonly, outliers result from measurement errors, coding and recording errors, and, sometimes, are natural, abnormal values. Such nonrepresentative samples can seriously affect the model produced later. There are two strategies for dealing with outliers:
 - a) Detect and eventually remove outliers as a part of the preprocessing phase, or
 - b) Develop robust modeling methods that are insensitive to outliers.
- (ii) **Scaling, encoding, and selecting features:** Data preprocessing includes several steps such as variable scaling and different types of encoding. For example, one feature with the range [0, 1] and the other with the range [“100, 1000] will not have the same weights in the applied technique; they will also influence the final data-mining results differently. Therefore, it is recommended to scale them and bring both features to the same weight for further analysis. Also, application-specific encoding methods usually achieve dimensionality reduction by providing a smaller number of informative features for subsequent data modeling. These two classes of preprocessing tasks are only illustrative examples of a large spectrum of preprocessing activities in a data-mining process. Data-preprocessing steps should not be considered completely independent from other data-mining phases. In every iteration of the data-mining process, all activities, together, could define new and improved data sets for subsequent iterations. Generally, a good preprocessing method provides an optimal representation for a data-mining technique by incorporating a priori knowledge in the form of application-specific scaling and encoding.

4. Estimate the model

The selection and implementation of the appropriate data-mining technique is the main task in this phase. This process is not straightforward; usually, in practice, the implementation is based on several models, and selecting the best one is an additional task. The basic principles of learning and discovery from data are given in Chapter 4 of this book. Later, Chapter 5 through 13 explain and analyze specific techniques that are applied to perform a successful learning process from data and to develop an appropriate model.

5. Interpret the model and draw conclusions

In most cases, data-mining models should help in decision making. Hence, such models need to be interpretable in order to be useful because humans are not likely to base their decisions on complex “black-box” models. Note that the goals of accuracy of the model and accuracy of its interpretation are somewhat contradictory. Usually, simple models are more interpretable, but they are also less accurate. Modern data-mining methods are expected to yield highly accurate results using highdimensional models. The problem of interpreting these models, also very important, is considered a separate task, with specific techniques to validate the results. A user does not want hundreds of pages of numeric results. He does not understand them; he cannot summarize, interpret, and use them for successful decision making.

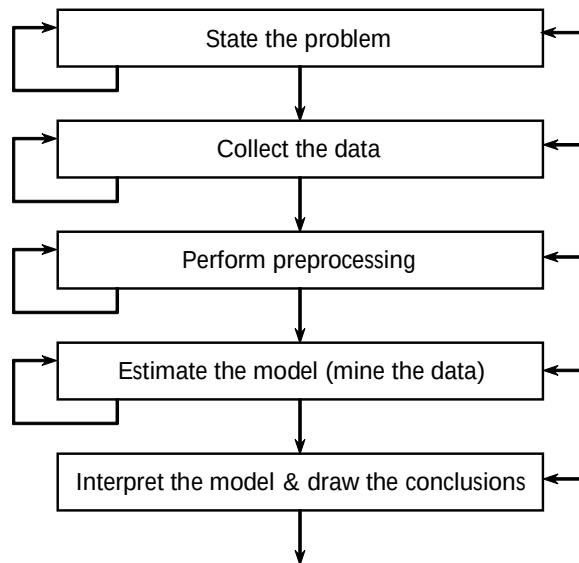


Fig.: The Data mining Process

2.5 ARTIFICIAL INTELLIGENCE

Q24. Discuss about artificial intelligence.

Ans :

(Imp.)

Artificial intelligence (AI) is a field of science and technology based on disciplines such as computer science, biology, psychology, linguistics, mathematics, and engineering.

The use of the term artificial intelligence (AI) to describe computers with the ability to mimic or duplicate the functions of the human brain.

The goal of AI is to develop computer that can think, as well as see, hear, walk, talk, and feel. A major thrust of artificial intelligence is the development of computer functions normally associated with human intelligence, such as reasoning, learning, and problem solving.

Applications of Artificial intelligence Technologies in Business

Figure Illustrates the major domains of AI research and development.

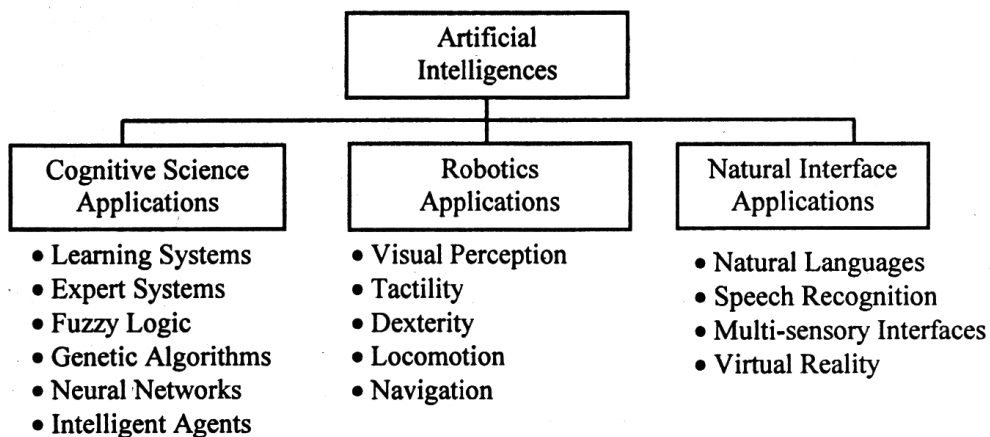


Fig.: Applications of Artificial Intelligence

AI applications can be grouped under three major areas: **cognitive science, robotics, and natural interfaces**, though these classifications do overlap each other, and other classifications can be used. Another important point to be noted is that expert systems are just one of many important AI applications.

1. Cognitive Science Applications

This branch of AI is concerned with incorporating knowledge from varied disciplines, such as biology, neurology, psychology, mathematics, and several linked disciplines. It is typically concerned with studying the functioning of human brain. The human information processing research is conducted to learn how humans think and learn. The various applications in the cognitive science area of AI are:

i) Learning systems

The learning gathered during functioning is used by the adaptive learning systems to incorporate changes in their own behavior.

ii) Expert Systems

This knowledge-based system is basically involved in providing information through a reasoning and analysis ability. The role of a knowledge engineer forms the crux of the system. Their job is to interview experts in a subject area and embody the knowledge so acquired in a computer program for carrying out some task.

iii) Fuzzy Logic

This is an area in which AI is close to the human level. Fuzzy logic is an approach of dealing with imperfect data in a meticulous way. It is concerned with processing uncertain data and using the results/inferences to solve many unstructured issues to a great extent if not completely.

iv) Neural Networks

This involves the art of learning pattern recognition by processing sample problems and their solutions. It looks for patterns in the set of examples, and learns from those

examples by associating the input patterns with the correct answer. It is used mainly for credit assessment and fraud detection.

v) Genetic Algorithms

This is a technique for getting problems to solve a task by randomizing and other mathematics functions. It uses Darwinian law of survival of the fittest to replicate advanced processes that are capable of solving the problems in a better way. They are mainly used for problems which are accompanied by infinite alternative course of actions to resolve them. The use of genetic algorithms software assists in isolating the best fit.

vi) Intelligent Agents

These are special purpose knowledge-based information systems that use expert systems along with other AI technologies to accomplish tasks compatible to the user's expectations. They serve as surrogate software for an end user or a process that fulfills a stated need or activity. The search Web sites on the Internet and intranets exemplify the use of intelligent agent in furthering the e-commerce revolution.

2. Robotics Applications

Based on the disciplines of engineering, AI, and physiology, robotics is concerned with building robot machines with physical capabilities akin to human beings, which are controlled by computers. The functioning of these machines is supplemented by providing computer intelligence. These machine vision inspection systems are used in Computer Aided Manufacturing (CAM), where they are involved with gauging, guiding, identifying, and inspecting products. They provide the users with a competitive edge by performing the tasks efficiently in a lesser time frame as compared to humans. The robots are endowed with certain abilities, as listed below, to assist their role performance:

i) **Visual Perception** : The powers of sight.

ii) **Tactility**: Power of touch or corporeal assessment.

- iii) **Dexterity:** Agility and adroitness in handling and manipulating the tasks with both hands.
- iv) **Locomotion:** Mobility to work in any territory irrespective of the environment
- v) **Navigation:** The power to find directions to reach the final objective in time.

3. Natural Interfaces Applications

A break through in the AI intelligence, the development of natural interfaces is a prerequisite to the optimal use of computers by human beings. It incorporates:

- i) **Natural Languages:** The computer programming languages are essentially concerned with being able to communicate with computers and robots in conversational human languages. This ensures a platform for crystal clear communication between computer or robots and the user, and facilitates understanding of instructions given by the user. It increases the responsiveness of the machine.
- ii) **Speech Recognition:** Essentially motivated by success in development and use of natural languages, voice recognition and response technology has evolved, which permits the user to substitute the conventional use of keyboard and mouse to input data by merely using their speech.
- iii) **Multi-sensory Interfaces:** These devices use diverse human body movements to maneuver computers.
- iv) **Virtual Reality (VR):** Uses a range of multi-sensory input/output devices (human-computer interfaces) that enable the user to experience and interact with computer-simulated objects, entities, and environments as if they actually exist. The most extensive use of VR is in the field of computer-aided design. Other applications are in the field of medical diagnostics and treatment, flight simulation for training pilots and astronauts, game playing, scientific analysis, engineering, and human resource training and recreation.

2.6 INTELLIGENT SYSTEMS

Q25. Define intelligent systems. State the challenges of intelligent system.

Ans :

Intelligent systems are technologically advanced machines that perceive and respond to the world around them. Intelligent systems can take many forms, from automated vacuums such as the Roomba to facial recognition programs to Amazon's personalized shopping suggestions. Our department focuses on two main areas within intelligent systems: how machines perceive their environment and how those machines interact with that environment

One way that such systems can perceive their environment is through vision. The study of how computers can understand and interpret visual information from static images and video sequences emerged in the late 1950s and early 1960s. It has since grown into a powerful technology that is central to the country's industrial, commercial, and government sectors. The key factors that have contributed to this growth are the exponential growth of processor speed and memory capacity as well as algorithmic advance.

The field of intelligent systems also focuses on how these systems interact with human users in changing and dynamic physical and social environments. Early robots possessed little autonomy in making decisions: they assumed a predictable world and performed the same action(s) repeatedly under the same conditions. Today, a robot is considered to be an autonomous system that can sense the environment and can act in a physical world in order to achieve some goals.

Challenges

Research in intelligent systems faces numerous challenges, many of which relate to representing a dynamic physical world computationally.

1. **Uncertainty:** Physical sensors/actuators provide limited, noisy and inaccurate information/action. Therefore, any actions

the system takes may be incorrect both due to noise in the sensors and due to the limitations in executing those actions.

2. **Dynamic world:** The physical world changes continuously, requiring that decisions be made at fast time scales to accommodate for the changes in the environment.
3. **Time-consuming computation:** Searching for the optimal path to a goal requires extensive search through a very large state space, which is computationally expensive. The drawback of spending too much time on computation is that the world may change in the meantime, thus rendering the computed plan obsolete.
4. **Mapping:** A lot of information is lost in the transformation from the 3D world to the 2D world. Computer vision must deal with challenges including changes in perspective, lighting and scale; background clutter or motion; and grouping items with intra/inter-class variation.

Q26. State the applications of intelligent Systems.

Ans :

Intelligent systems are poised to fill a growing number of roles in today's society, including :

- Factory automation
- Field and service robotics
- Assistive robotics
- Military applications
- Medical care
- Education
- Entertainment
- Visual inspection
- Character recognition
- Human identification using various biometric modalities (e.g. face, fingerprint, iris, hand)
- Visual surveillance
- Intelligent transportation

Q27. Describe various Types of Artificial Intelligence System.

Ans :

(Imp.)

Since the earliest days of computers, researchers have tried to create systems that mimic human intelligence. While a silicon Einstein may still be a distant possibility, artificial intelligence, or AI, has brought us phones that recognize human speech, cars that drive themselves and expert systems that compete on television game shows. Over the years, AI research has moved through several evolutions and, as each technology has matured, they have become part of our everyday experience.

1. Machine Learning

Early researchers struggled with limited processing power and computer storage, but still laid the foundation of AI with programming languages like LISP and concepts like decision trees and machine learning. Programs written in LISP could easily analyze games like chess, map all possible moves for several turns, then choose the best alternative. These programs could also modify their decision logic and learn from previous mistakes, getting "smarter" over time. With more powerful computers and cheaper mass storage, this branch of AI spawned the computer gaming industry, as well as a variety of personalized search engines and online shopping sites that not only remember our preferences, but anticipate our needs.

2. Expert Systems

While the first wave of AI researchers relied on computing cycles to simulate human reasoning, the next approach relied on facts and data to mimic human experience. Expert systems gathered facts and rules into a knowledge base then used computer-based inference engines to deduce new facts or answer questions. Knowledge engineers interviewed experts in medicine, automotive repair, industrial design or other professions, then reduced these findings into machine readable facts and rules. These knowledge bases were then used by others to help diagnose problems or answer questions. As the technology matured, researchers found ways to automate knowledge base

development, feeding in reams of technical literature, or letting the software crawl the Web to find relevant information on its own.

3. Neural Networks

Another group of researchers tried to reproduce the workings of the human brain by creating artificial networks of neurons and synapses. With training, these neural networks could recognize patterns from what looked like random data. Images or sounds are fed into the input side of the network, with the correct answers fed into the output side. Over time, the networks reorganize their internal structure so that when a similar input gets fed in, the network returns the correct answer. Neural networks work well when responding to human speech or when translating scanned images into text. Software that relies on this technology can read books to blind people or translate speech from one language to another.

4. Big Data

Large scale data analysis, often called "big data," harnesses the power of many computers to discover facts and relations in data that the human mind cannot comprehend. Trillions of credit card charges or billions of social network relations can be scanned and correlated using a variety of statistical methods to discover useful information. Credit card companies can find buying patterns that indicate that a card has been stolen, or that a cardholder is in financial difficulty. Retail merchants may find buying patterns that indicate that a customer is pregnant, even before she knows this herself. Big data allows computers to understand the world in ways that we humans never could on our own.

2.7 CLOUD COMPUTING

Q28. Define cloud computing. State the components of cloud computing.

Ans :

The term 'cloud computing' refers to computing services available to anyone online. Cloud computing is a style of computing in which

dynamically scalable and often virtualized resources are provided as a service over the Internet.

Components

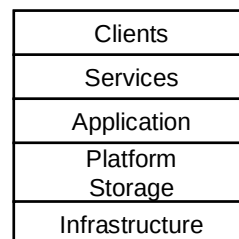


Fig. : Components of Cloud Computing

1. Clients

A cloud client consists of computer hardware and/or computer software which relies on cloud computing for application delivery, or which is specifically designed for delivery of cloud services and which, in either case, is essentially useless without it.

2. Services

A cloud service includes "products, services and solutions that are delivered and consumed in real-time over the Internet. For example, Web Services which may be accessed by other cloud computing components and software.

3. Applications

A cloud application leverages the Cloud in software architecture, often eliminating the need to install and run the application on the customer's own computer, thus alleviating the burden of software maintenance, ongoing operation, and support.

4. Platform

A cloud platform, such as Platform as a service, the delivery of a computing platform, and/or solution stack as a service, facilitates deployment of applications without the cost and complexity of buying and managing the underlying hardware and software.

5. Storage

Cloud storage involves the delivery of data storage as a service, including database-like services, often billed on a utility computing basis.

6. Infrastructure

Cloud infrastructure, such as Infrastructure as a service, is the delivery of computer infrastructure, typically a platform virtualization environment, as a service.

Q29. Describe the services provided by cloud computing

Ans :

1. Software as a Service (SaaS)

The software applications like CRM, Office Suite, Email, etc., are offered as a service through the internet, instead of a shrink wrapped software on a physical medium (or in a downloadable form), which is the norm in the traditional desktop world. The applications are hosted on a highly scalable infrastructure and it is offered over the internet. Users can access it using an ordinary web browser, without any need to install software in their local computer. Companies like Google, Zoho, Salesforce, Microsoft, Wordpress offer their applications as a service to the end users.

2. Platform as a Service (PaaS)

Some vendors are offering application development platform as a service. Developers can code the applications and upload it into the platform (offered as a service) and run the application on the cloud infrastructure. It helps developers to scale their apps without worrying about building the infrastructure. The platform scales automatically based on the resource needs of the app, without any efforts from the developer. Services like Google App Engine, Bungee Connect and Force.com are examples for PaaS.

SaaS	Microsoft "Software Services", Google Apps
PaaS	Google AppEngine, Force.com
IaaS	AmazonEC2, Sun Grid, IBM Blue Cloud
DSaaS	Amazon S3, Cleversafe dsNet

Fig.: Services of cloud computing

3. Infrastructure/Hardware as a Service (HaaS)

Vendors offer computing infrastructure as a service to end users. The term Hardware as a Service is a bit of a misnomer. It is actually computing power offered through a virtualized environment rather than a physical hardware. This service is offered either as raw computing power or storage or both. Some examples of services offered in this category include Amazon's EC2 and S3, Mozy, GoGrid, etc.

4. Cloud Computing Vs. Grid Computing

Grid computing is the application of several computers to a single problem at the same time - usually to a scientific or technical problem that requires a great number of computer processing cycles or access to large amounts of data. Grid computing depends on software to divide and divide up pieces of a program among several computers, sometimes up to many thousands. This technology has been applied to computationally intensive scientific, mathematical, and academic problems through volunteer computing, and it is used in commercial enterprises for such diverse applications as drug discovery, economic forecasting, seismic analysis, and back-office data processing in support of e-commerce and Web services.

Cloud computing is Internet ("cloud") based development and use of computer technology ("computing"). It is a style of computing in which dynamically scalable and often virtualized resources are provided as a service over the Internet.

Users need not have knowledge of, expertise in, or control over the technology infrastructure "in the cloud" that supports them.

Q30. What are the advantages and disadvantages of cloud computing ?

Ans :

Advantages

1. Cost Savings

Perhaps, the most significant cloud computing benefit is in terms of IT cost savings. Businesses, no matter what their type or size, exist to earn money while keeping capital and operational expenses to a minimum. With cloud computing, you can save substantial capital costs with zero in-house server storage and application requirements. The lack of on-premises infrastructure also removes their associated operational costs in the form of power, air conditioning and administration costs. You pay for what is used and disengage whenever you like - there is no invested IT capital to worry about. It's a common misconception that only large businesses can afford to use the cloud, when in fact, cloud services are extremely affordable for smaller businesses.

2. Reliability

With a managed service platform, cloud computing is much more reliable and consistent than in-house IT infrastructure. Most providers offer a Service Level Agreement which guarantees 24/7/365 and 99.99% availability. Your organization can benefit from a massive pool of redundant IT resources, as well as quick failover mechanism - if a server fails, hosted applications and services can easily be transited to any of the available servers.

3. Manageability

Cloud computing provides enhanced and simplified IT management and maintenance capabilities through central administration of resources, vendor managed infrastructure and SLA backed agreements. IT infrastructure updates and maintenance are eliminated, as all resources are maintained by the service provider. You enjoy a simple web-based user interface for accessing software, applications and services - without the need for installation - and an SLA ensures the timely and guaranteed delivery, management and maintenance of your IT services.

4. Strategic Edge

Ever-increasing computing resources give you a competitive edge over competitors, as the time you require for IT procurement is virtually nil. Your company can deploy mission critical applications that deliver significant business benefits, without any upfront costs and minimal provisioning time. Cloud computing allows you to forget about technology and focus on your key business activities and objectives. It can also help you to reduce the time needed to market newer applications and services.

Disadvantages

1. Downtime

As cloud service providers take care of a number of clients each day, they can become overwhelmed and may even come up against technical outages. This can lead to your business processes being temporarily suspended. Additionally, if your internet connection is offline, you will not be able to access any of your applications, server or data from the cloud.

2. Security

Although cloud service providers implement the best security standards and industry certifications, storing data and important files on external service providers always opens

up risks. Using cloud-powered technologies means you need to provide your service provider with access to important business data. Meanwhile, being a public service opens up cloud service providers to security challenges on a routine basis. The ease in procuring and accessing cloud services can also give nefarious users the ability to scan, identify and exploit loopholes and vulnerabilities within a system. For instance, in a multi-tenant cloud architecture where multiple users are hosted on the same server, a hacker might try to break into the data of other users hosted and stored on the same server. However, such exploits and loopholes are not likely to surface, and the likelihood of a compromise is not great.

3. Vendor Lock-In

Although cloud service providers promise that the cloud will be flexible to use and integrate, switching cloud services is something that hasn't yet completely evolved. Organizations may find it difficult to migrate their services from one vendor to another. Hosting and integrating current cloud applications on another platform may throw up interoperability and support issues. For instance, applications developed on Microsoft Development Framework (.Net) might not work properly on the Linux platform.

4. Limited Control

Since the cloud infrastructure is entirely owned, managed and monitored by the service provider, it transfers minimal control over to the customer. The customer can only control and manage the applications, data and services operated on top of that, not the backend infrastructure itself. Key administrative tasks such as server shell access, updating and firmware management may not be passed to the customer or end user.

2.8 MOBILE APPS AND COMPUTING

Q31. Define mobile applications. State the advantages and disadvantages of mobile applications.

Ans :

A mobile app is a software application designed to run on mobile devices such as smartphones and tablet computers. Most such devices are sold with several apps bundled as pre-installed software, such as a web browser, email client, calendar, mapping program, and an app for buying music or other media or more apps.

According to webopedia.com, mobile applications help users by connecting them to Internet services more commonly accessed on desktop or notebook computers. While opportunities abound, we have identified three advantages of using mobileapps for your business: speed, volume of information, and advertising.

Advantages of Mobile Applications

The benefits of using mobile applications include :

- Convenience through the ability to access and share information anytime from anywhere.
- Replacement of traditional built-for-purpose service devices.
- Speed and reliability.
- Greater access to large amounts of information such as videos and catalogues as compared to a traditional online access.
- Enhanced user experience.
- Improved productivity.

Disadvantages of Using Mobile Applications

1. Limitation

Since mobile devices has limited amount of storage and size of the products screen compared to computer, there are limitation of using apps. For examples, small display screen and overflow of data storage.

2. Accelerate Information Overload

Bulletin board advertising has been long rampant while not many people pay attention to those ads when passing by on their way. But mobile applications can make our mobile devices full of spam.

3. Privacy and Security

When downloading applications, users possibly have to allow the publishers to track and analyze their actions. This would give birth to the loss or abuse of personal information. On the other hand, one may get virus downloaded in mobile devices without being aware of it.

4. Costs of developing and marketing

The cost spending on developing apps is high for better quality of application. Since millions of mobile apps existing in the market, there is both huge time and financial cost to stand out from the fierce competition. Moreover, If spending on developing application is higher than the profits they earn, there will be deficiency.

Q32. Explain the categories of mobile applications.

Ans :

(i) Native Applications

Native applications are developed by writing the source code and by creating additional resources like OS-specific declaration files, images and audio segments. This source code is compiled and an executable binary form is generated. The native mobile applications can be installed on mobile device and can be launched by the user. It communicates with the mobile operating system through proprietary api calls. These calls are divided into low level API's and high level API's. By using the low level API's it can communicate directly with touch screen or keyboard, renders graphics, processes the audio, receives the audio or video and play's the sounds through speaker or headphones. It connects

to networks by using the high level API's it can manage calender, contact, photo album, make phone calls, receive or send messages and even browse the web.

Examples: Facebook, WhatsApp etc.

(ii) Web Applications

The web applications are not applications in real. They are websites in fact. They are coded in HTML5 and are run by the browser. They can be just accessed as web pages. Most of the latest browsers support new HTML5 capabilities, CSS3 and advanced javascript.

HTML5 enables this technology to convert into a powerful development standard for browser dependent applications from "page definition language". Certain examples of it include geolocation services, offline availability, access to media types and advanced UI components. With such features advanced applications can be created easily.

It has multiplatform support and low cost. The mobile web applications have become a promising trend and they are built using a number of Javascript toolkits like sencha touch, dojox.mobile and j Query mobile. They produce user interfaces that can be compared with native applications. These both can be executed in browsers by using Javascript, CSS, HTML5 etc.

Examples: Google Docs, Gmail etc.

(iii) Hybrid Applications

Hybrid mobile applications are the combination of native apps and mobile web apps. They are developed by using JavaScript, HTML, CSS.

The native part of the application makes use of OS API's for creating embedded HTML by rendering the engine which acts as bridge between browser and device API's. The web portion of the app can be web page on server or a set of HTML, Javascript, CSS and media files packed and stored locally.

Examples: Amazon, Netflix etc.

Q33. Outline the advantage of Mobile Computing.

Ans :

Advantages of Mobile Computing**1. Location flexibility**

This means users can work from anywhere as long as there is a connection established. A user can work without being in fixed position.

2. Saves time

One can access all the important documents and files over a secured portal and work as if they were on their computer. Mobile computing was encouraged by many organisations to reduce expenditure on communication.

3. Enhanced productivity

Users can work efficiently and effectively from whichever location they find comfortable. This in turn enhances productivity level.

4. Ease of Research

In the field of research users can search for facts and feed them back into the system. The field officers and researchers collect and feed data from wherever they are without making unnecessary trips to and from the office to the field.

5. Entertainment

Video and audio recordings can be streamed on using mobile computing. It is easy to access movies, educational and informative material. With the improvement and availability of high speed data connections at considerable cost, one is able to get all the entertainment they want as they browse the internet for streamed data.

6. Streamlining of Business Process

Business processes are now easily available through secured connections, looking into security issues adequate measures have been put in place to ensure authentication and authorisation of the user accessing the services.

Some business functions can be run over source links and sharing of information between business partners can also take place.

Meetings, seminars and other informative services can be conducted using video and voice conferencing.

Travel time and expenditure is also considerably reduced.

2.9 BIG DATA, ROBOTICS**Q34. What is Big data? State the characteristics of big data.**

Ans :

(Imp.)

Meaning

Big data refers to large collections of data that are so complex and expansive that they cannot be interpreted by humans or by traditional data management systems. When properly analyzed using modern tools, these huge volumes of data give businesses the information they need to make informed decisions.

New software developments have recently made it possible to use and track big data sets. Much of this user information would seem meaningless and unconnected to the human eye. However, big data analytic tools can track the relationships between hundreds of types and sources of data to produce useful business intelligence.

All big data sets have three defining properties, known as the **3 V's**:

➤ **Volume:** Big data sets must include millions of unstructured, low-density data points. Companies that use big data can keep anything from dozens of terabytes to hundreds of petabytes of user data. The advent of cloud computing means companies now have access to zettabytes of data! All data is saved regardless of apparent importance. Big data specialists argue that sometimes the answers to business questions can lie in unexpected data.

➤ **Velocity:** Velocity refers to the fast generation and application of big data. Big data is received, analyzed, and interpreted in quick

succession to provide the most up-to-date findings. Many big data platforms even record and interpret data in real-time.

- **Variety:** Big data sets contain different types of data within the same unstructured database. Traditional data management systems use structured relational databases that contain specific data types with set relationships to other data types. Big data analytics programs use many different types of unstructured data to find all correlations between all types of data. Big data approaches often lead to a more complete picture of how each factor is related.

Q35. What are the technologies available to manage big data.

Ans :

1. **Apache Cassandra:** It is one of the No-SQL databases which is highly scalable and has high availability. In this, we can replicate data across multiple data centers. Replication across multiple data centers is supported. In Cassandra, fault tolerance is one of the big factors in which failed nodes can be easily replaced without any downtime.
2. **Apache Hadoop:** Hadoop is one of the most widely used big data technology that is used to handle large-scale data, large file systems by using Hadoop file system which is called HDFS, and parallel processing like feature using MapReduce framework of Hadoop. Hadoop is a scalable system that helps to have a scalable solution that handles large capacities and large capabilities. For example: If you see real use cases like NextBio is using Hadoop MapReduce and HBase to process multi-terabyte data sets off the human genome.
3. **Apache Hive:** It is used for data summarization and ad hoc querying which means for querying and analyzing easy Big Data. It is built on top of Hadoop for providing data summarization, ad-hoc queries, and the analysis of large datasets using SQL-like language called HiveQL. It is not a relational database and not a language for real-time queries. It has many features like -designed for OLAP, SQL type language called HiveQL, fast, scalable, and extensible.
4. **Apache Flume:** It is a distributed and reliable system that is used to collect, aggregate, and move large amounts of log data from many data sources toward a centralized data store.
5. **Apache Spark:** The main objective of spark for speeding up the Hadoop computational computing software process, and It is introduced by Apache Software Foundation. Apache Spark can work independently because it has its own cluster management, and It is not an updated or modified version of Hadoop and if you will deep dive then you can say it is just one way to implement Spark with Hadoop. The Main idea to implement Spark with Hadoop in two ways is for storage and processing. So, in two ways Spark uses Hadoop for storage purposes just because Spark has its own cluster management computation. In Spark, it includes interactive queries and stream processing, and in-memory cluster computing is one of the key features.
6. **Apache Kafka:** It is a distributed publish-subscribe messaging system and more specifically you can say it has a robust queue that allows you to handle a high volume of data, and you can pass the messages from one point to another as you can say from one sender to receiver. You can do message computation offline and online mode, it is suitable for both. To prevent data loss Kafka messages are replicated within the cluster. For real-time streaming data analysis, it integrates Apache Storm and Spark and is built on top of the ZooKeeper synchronization service.
7. **MongoDB:** It is based on cross-platform and works on a concept like collection and document. It has document-oriented storage that means data will be stored in the form of JSON form. It can be an index on any attribute. It has features like high availability, replication, rich queries, support by MongoDB, Auto-Sharding, and Fast in-place updates.

8. **ElasticSearch:** It is a real-time distributed system, and open-source full-text search and analytics engine. It has features like scalability factor is high and scalable structured and unstructured data up to petabytes, It can be used as a replacement of MongoDB, RavenDB which is based on document-based storage. To improve the search performance, it uses denormalization. If you see the real use case then it is an enterprise search engine and big organizations using it, for example- Wikipedia, GitHub.

Q36. Explain the concept of Robotics.

Ans :

The science that deals with the design and construction of robot used in different applications in an automated manufacturing and other industries is called robotics.

Robotics is one of the artificial intelligence applications. The benefits of using robots are:

- (i) Robots are capable of managing specialized tasks like cutting, welding, drilling and painting.
- (ii) Robots have the ability to consistently move in one particular direction.
- (iii) Robots can handle various complex tasks which are beyond the capabilities of the humans.

Robots also play an important role in production and manufacturing tasks. For instance, robots are used by Japanese factories for the assembling of automobiles, cameras and various electronic devices. Robots are also implemented by American manufacturers like General Dynamics Corporation in their factories for drilling holes in the F-16 aircraft and inserting the rivets in it. Robotics has made such an impact that, some of the manufacturers feel that it was influential in improving the productivity of manufacturing in 1990's.

2.10 VIRTUAL REALITY, INTERNET OF THINGS (IOT)

Q37. Explain briefly about virtual reality.

Ans :

Virtual reality is an artificial environment or scene that are created by using hardware devices and software of a computer. This artificial scene or environment is presented in such a manner that it look and appears 3-D and we feel like a 3-D world.

To experience a virtual reality scene or environment, a user requires a head- mounted display (HMD) and special types of gloves which receives input from the computer. A HMD keeps a track on how eyes move and responds by sending a new input video. Also a user require the data gloves which sensor the movement of hand and interface those movement by a computer. The most important element required for virtual reality is the software to give a real experience which feels like a real world.

Note that a virtual environment represents a 3-D world that it look either real or abstract. It includes real system like buildings, landscapes, spacecraft, trees, human anatomy, sculptures, crime scene, solar system and many more. these virtual environment are animated and can be represents like a real world.

Virtual Reality can be applied in many areas:

1. It can be used in medical studies to enable students to know the human body structure.
2. It can be used in scientific research laboratories so that scientist can easily research on a specific topic.
3. It can be used in entertainment like in games and movies to make the gaming experience more real and to allow individual to experience adventures under extreme conditions.
4. It can be used in driving schools as it give a real look of roads and traffic.
5. It can be used in military training for the soldiers to get familiar with different areas in the battlefield.

These are the thing about virtual reality. Now i am going to talk about its advantages and disadvantages.

Advantages

1. Virtual reality creates a realistic world
2. It enables user to explore places.
3. Through Virtual Reality user can experiment with an artificial environment.
4. Virtual Reality make the education more easily and comfort.

Disadvantages

1. The equipments used in virtual reality are very expensive.
 2. It consists of complex technology.
 3. In virtual reality environment we cant move by our own like in the real world.
-

Q38. Write in brief about the Internet of Things (IoT). Discuss about the features of IoT.

Ans :

The concept IoT can be defined as the method that allows internetworked devices and applications communicate with each other. Examples of it are GPS based tracking, monitoring and controlling of devices, connected cars, wearable and personal devices communication, M2M communication and Industry 4.0.

The Internet is a wide global network of servers, tablets, mobiles and computers. It follows a set of standard protocols developed for connected systems. It allows to communicate, send, receive, connect with remote servers, analytics platforms and cloud.

Features

The key features of IoT include,

1. Interconnectivity
2. Things-related services
3. Heterogeneity
4. Dynamic alterations
5. Enormous scale.

1. Interconnectivity

The IoT makes use of global information and communication infrastructure to interconnect things.

2. Things-related Services

The IoT facilitates things-related services under the limits of things. These services include privacy protection and providing semantic consistency among physical things and its related virtual things. This alters the technologies and information prevailing in physical world.

3. Heterogeneity

The IoT devices are the composition from dissimilar parts. They operate on different hardware platforms and networks with which using different networks, they perform communication with other devices as well as other service platforms.

4. Dynamic Alterations

The IoT devices changes there state dynamically from sleeping state to waking up, from connected to disconnected. Aside this, it also includes the context of devices such as location and speed. Also, there is a dynamic change in total number of devices.

5. Enormous Scale

The IoT devices that requires control and communicates with each other must be kept in least order of magnitude. In essence, they must be kept in :rder larger than the connected devices. Clearly, the ratio of communication initiated by devices to the communication initiated by humans will invariably shifts towards the device-initiated communication. Another important thing is the management of data renerated and understanding for application.

2.11 5G**Q39. Define 5G systems.**

Ans :

Fifth Generation (5G) systems are the next evolutionary mobile network systems that will come after 4G systems. The standard is, at present, in its developmental stages and is expected to be launched around the year 2020. In the history of mobile communication systems, it has been found that in every 10 years, a new generation of mobile network is launched. The first generation (1G) system, namely AMPS was first introduced in late seventies (1978) in USA. The second generation (2G) system, i.e. GSM first appeared in late eighties (1988) followed by CDMA, another 2G system. The third generation system (3G) was first introduced in the year 2000 in the form of UMTS and CDMA 2000, and is widely deployed around the world for fast internet download and multimedia application).

5G will also utilize the benefits of Artificial Intelligence (AI), which will gather relevant information from internet based on certain user defined criteria and employ the information in a variety of business applications. For example, while passing across a bill board displaying a certain product, the availability and retail outlet details of the particular product in near vicinity will be extracted and displayed in the mobile device. In yet another application of AI, during video call, the picture along with the smell of the place of the caller can be perceived. Support of IPv6 will be provided whereby each mobile device will be allotted a unique IP address so that they can independently connect to wireless internet, thus giving rise to a Wireless World Wide Web (WWW).

Q40. List out various advantages and disadvantages of 5G.

Ans :

Advantages

1. Better coverage area, less traffic, and high data speed at the edge of the cell.
2. Provide good efficiency in terms of energy and spectrum.
3. It has multiple data transfer capacities.
4. 5G technologies consume low battery in comparison to 1G, 2G, 3G, and 4G.
5. As per security terms, 5G is more secure than the rest.
6. 5G supports the Virtual Private Network (VPN).

7. It has very low latency (time taken by data from origin to destination).
8. 5G regulate the bandwidth requirement according to the application as some application requires low BW whereas some require High BW.
9. 5G can connect more devices simultaneously than other technologies.

Disadvantages

1. 5G requires high investment in infrastructure development, and up-gradation and degradation are also costly.
2. As 5G provides a high data speed, so it requires more storage capacity in smartphones and also requires huge battery power.
3. There is no specific standard known for 5G till now as 4G has its VoLTE.
4. Wi-Fi is cheaper and easily feasible, so Wi-Fi is already a better alternative over 5G, which requires high costs and maintenance than Wi-Fi.
5. As 5G network technologies are under the working mode, so still have lots of drawbacks and will take time to be operational globally.

Rahul Publications

Short Question and Answers

1. Define Management Information System.

Ans :

Meaning

A management information system (MIS) is a computer-based system that provides the information necessary to manage an organization effectively. An MIS should be designed to enhance communication among employees, provide an objective system for recording information and support the organization's strategic goals and direction.

Definitions

- (i) "A Management Information System is an integrated user-machine system, for providing information, to support the operations, management, analysis and decision-making functions in an organization
- (ii) **According to Kenn Evans**, MIS is an organized method of providing past, present and projection information relating to internal operations and external intelligence.
- (iii) **According to Gordon B. Davis**, MIS is an integrated man/machine system for providing information to support the operations management and decision making functions of an organization.
- (iv) **According to Robert G. Mardick**, MIS is the System intended to provide information for decision making, planning, organizing and controlling the operations of the subsystems of the firm and to provide a Synergistic organization in the process.

2. Explain the Need for MIS.

Ans :

Following are the reasons for the adoption of the MIS :

- To store and manage data efficiently from all the functional areas of the business.

- To process the collected data and derive information out of them.
- To provide information quickly as and when required.
- To collect and store the data for the purpose of internal research.
- To provide the information regarding the financial health of the business organization.
- To provide information regarding production and inventory.
- To provide information for planning, organizing and controlling purposes.
- To speed up the execution of the results with the reliable data available.
- To smooth up the flow of data thorough various levels of the organization.

3. What are the Objectives of MIS ?

Ans :

Following are the basic objectives of an MIS:

- i) **Capturing Data:** Capturing contextual data, or operational information that will contribute in decision making from various internal and external sources of organization.
- ii) **Processing Data:** The captured data is processed into information needed for planning, organizing, coordinating, directing and controlling functionality at strategic, tactical and operational level. Processing data means:
 - Making calculations with the data
 - Sorting data
 - Classifying data and
 - Summarizing data
- iii) **Information Storage:** Information or processed data need to be stored for future use.

- iv) **Information Retrieval:** The system should be able to retrieve this information from the storage as and when required by various users.
- v) **Information Propagation:** Information or the finished product of the MIS should be circulated to its users periodically using the organizational network.

4. Explain the components of MIS.

Ans :

A management information system is made up of five major components namely people, business processes, data, hardware, and software. All of these components must work together to achieve business objects.

- i) **People:** These are the users who use the information system to record the day to day business transactions. The users are usually qualified professionals such as accountants, human resource managers, etc. The ICT department usually has the support staffs who ensure that the system is running properly.
- ii) **Business Procedures:** These are agreed upon best practices that guide the users and all other components on how to work efficiently. Business procedures are developed by the people i.e. users, consultants, etc.
- iii) **Data:** It refers to the recorded day to day business transactions. For a bank, data is collected from activities such as deposits, withdrawals, etc.
- iv) **Hardware:** Hardware is made up of the computers, printers, networking devices, etc. The hardware provides the computing power for processing data. It also provides networking and printing capabilities. The hardware speeds up the processing of data into information.

5. State the advantages of MIS.

Ans :

Following are the merits of MIS

- i) **Helps in formulation of Planning:** With the help of MIS, the management can

formulate correct planning because, preparation of planning requires various data and information, which can be systematically supplied by the process of MIS.

- ii) **Provides Coordination:** Under this system of MIS, data and information are collected from each subsystem of the organization, through unifying the concept of each Sub-System. So, the MIS can provide the facility of coordination.

- iii) **Systematic Decentralization:** MIS also provides systematic decentralization in the organization. Under the process of MIS, different middle and lower level officers and managers are authorized to supply their information. So, by implementing MIS, the authority can be distributed among various officers and managers of middle and lower levels without the loss of control. It also provides a system for monitoring performance. Likewise, the MIS can help in decentralization.

- iv) **Help in Control System:** To be an effective control system, it should be based on relevant data and information. On the other hand, relevant data and information can be provided regularly in a systematic manner by the MIS. So, MIS can help in taking proper control.

- v) **Increase Speed in Operation:** In order to increase the speed of operation of a business, data and information should be supplied at the right time at the right place. Because, without data and information no operation can be done in a proper way.

By supplying necessary data and information, MIS can increase the speed of the operation of a business.

6. Define Decision Support System.

Ans :

Decision Support Systems is an interactive computer-based system that assists the decision makers of an organization to efficiently utilize the data and model for solving unstructured problems. This makes the decision making activities to get enhanced. It helps the managers in examining the

long range effects of newer organizations so that, they can easily depict the future problems. This system supports decision making by,

- Automating certain decision procedures
- Providing information regarding different decision processes
- Stimulating innovation in decision making process.

DSS can be considered as a component of MIS. It has the capability of handling all the decisions associated with the information system. Some of the examples of such decisions include launching a product, designing (or) altering a product, implementing a particular criteria etc.

7. What are the benefits of DSS.

Ans :

- i) **Improving Personal Efficiency:** Many DSS do not do anything. A person could not do himself or herself. People prepared budgets for centuries before spreadsheet software came in to use. DSS help them do it faster and with less changes of error.
- ii) **Improving Problem Solving:** A DSS can make it possible for a person or a group to solve problem faster or better, than they could without it. There is a relationship between the two of course increased efficiency in a small task if properly applied. Hopefully contributes to solving the problem as a whole solving a problem faster is self-explanatory.
- iii) **Facilitating Communications:** After found that DSS facilitating interpersonal communication in several ways. In addition technology developments that have occurred since his/her research have opened up for DSS to provide this benefit. One way in which DSS facilitate communication is when used as a tool for benefit. The system can indicate when a particular action should be taken in the future (offensive) or when a particular action was justified in the past (defensive use).
- iv) **Promoting Learning or Training:** Using a DSS can also help people learned more about using computers and about software package that are in the DSS although this is seldom a specific objective of developing the DSS it can be valuable by project.

8. State the Applications of DSS.

Ans :

- (i) Management decision making is one of the main applications of decision support systems, specifically in case of issues of long-term growth.
- (ii) Medical industry is one of the common applications of decision support systems. It is used to make diagnoses depending upon the number of different symptoms and medical histories quickly.
- (iii) Agricultural professionals such as farmers, biologists and other specialists also use applications of decision support systems to gather data in relation with growing, seasons, climates, markets and policies for making plans.
- (iv) Air traffic professionals discovered and are using the applications of decision support systems for managing the planes and monitoring weather with those systems.
- (v) Individuals who participate in meetings also use this system in which it is referred as group decision support system.

9. What is data mining?

Ans :

Meaning

Data mining refers to extracting or mining knowledge from large amounts of data. The term is actually a misnomer. Thus, data mining should have been more appropriately named as knowledge mining which emphasis on mining from large amounts of data.

It is the computational process of discovering patterns in large data sets involving methods at the intersection of artificial intelligence, machine learning, statistics, and database systems. The overall goal of the data mining process is to extract information from a data set and transform it into an understandable structure for further use.

The key properties of data mining are

- Automatic discovery of patterns.
- Prediction of likely outcomes.
- Creation of actionable information.
- Focus on large datasets and databases.

10. Artificial intelligence.

Ans :

Artificial intelligence (AI) is a field of science and technology based on disciplines such as computer science, biology, psychology, linguistics, mathematics, and engineering.

The use of the term artificial intelligence (AI) to describe computers with the ability to mimic or duplicate the functions of the human brain.

The goal of AI is to develop computer that can think, as well as see, hear, walk, talk, and feel. A major thrust of artificial intelligence is the development of computer functions normally associated with human intelligence, such as reasoning, learning, and problem solving.

11. Intelligent systems

Ans :

Intelligent systems are technologically advanced machines that perceive and respond to the world around them. Intelligent systems can take many forms, from automated vacuums such as the Roomba to facial recognition programs to Amazon's personalized shopping suggestions. Our department focuses on two main areas within intelligent systems: how machines perceive their environment and how those machines interact with that environment

One way that such systems can perceive their environment is through vision. The study of how computers can understand and interpret visual information from static images and video sequences emerged in the late 1950s and early 1960s. It has since grown into a powerful technology that is central to the country's industrial, commercial, and government sectors. The key factors that have contributed to this growth are the exponential growth of processor speed and memory capacity as well as algorithmic advance.

12. Define mobile applications.

Ans :

A mobile app is a software application designed to run on mobile devices such as smartphones and tablet computers. Most such devices are sold with several apps bundled as pre-installed software, such as a web browser, email

client, calendar, mapping program, and an app for buying music or other media or more apps.

According to webopedia.com, mobile applications help users by connecting them to Internet services more commonly accessed on desktop or notebook computers. While opportunities abound, we have identified three advantages of using mobileapps for your business: speed, volume of information, and advertising.

13. Internet of Things.

Ans :

The concept IoT can be defined as the method that allows internetworked devices and applications communicate with each other. Examples of it are GPS based tracking, monitoring and controlling of devices, connected cars, wearable and personal devices communication, M2M communication and Industry 4.0.

The Internet is a wide global network of servers, tablets, mobiles and computers. It follows a set of standard protocols developed for connected systems. It allows to communicate, send, receive, connect with remote servers, analytics platforms and cloud.

14. 5G systems.

Ans :

Fifth Generation (5G) systems are the next evolutionary mobile network systems that will come after 4G systems. The standard is, at present, in its developmental stages and is expected to be launched around the year 2020. In the history of mobile communication systems, it has been found that in every 10 years, a new generation of mobile network is launched. The first generation (1G) system, namely AMPS was first introduced in late seventies (1978) in USA. The second generation (2G) system, i.e. GSM first appeared in late eighties (1988) followed by CDMA, another 2G system. The third generation system (3G) was first introduced in the year 2000 in the form of UMTS and CDMA 2000, and is widely deployed around the world for fast internet download and multimedia application).

Choose the Correct Answers

1. A _____ is a computer application used to support determinations, decisions, and courses of action in an organization or a business. [a]
(a) Decision Support System (DSS) (b) Transaction Process System
(c) Executive Support System (d) None of the mentioned above
2. A Decision Support System (DSS) is an application for information systems that helps in _____. [c]
(a) System Design (b) System Analysis
(c) Decision making (d) All of the mentioned above
3. DSS is most widely used in the _____, analysis in an organization. [a]
(a) Planning (b) Support
(c) System maintenance (d) All of the mentioned above
4. A decision support system differs from an ordinary _____. [c]
(a) Operating System (b) Transaction Process System
(c) Operational Application (d) None of the mentioned above
5. A _____ can integrate all multiple variables and produces an outcome. [b]
(a) ESS (b) DSS
(c) TPS (d) All of these
6. Which of the following applied on warehouse? [b]
(a) write only (b) read only
(c) both a & b (d) none of these
7. Data can be store , retriive and updated in _____. [b]
(a) SMTOP (b) OLTP
(c) FTP (d) OLAP
8. Which of the following is a good alternative to the star schema? [d]
(a) snow flake schema (b) star schema
(c) star snow flake schema (d) fact constellation
9. Patterns that can be discovered from a given database are which type... [a]
(a) More than one type (b) Multiple type always
(c) One type only (d) No specific type
10. Background knowledge is... [c]
(a) It is a form of automatic learning.
(b) A neural network that makes use of a hidden layer
(c) The additional acquaintance used by a learning algorithm to facilitate the learning process
(d) None of these

Fill in the blanks

1. A _____ system (MIS) is a computer-based system that provides the information necessary to manage an organization effectively.
2. The structure of an information system can also be described in terms of the _____ functions which use information.
3. OAS stands for _____.
4. _____ System is the information system that provides solutions to various problems by capturing knowledge for a specific and limited domain of human expertise.
5. _____ Systems are the most common type of management information system.
6. A _____ is a subject-oriented, integrated, time-variant and non-volatile collection of data in support of management's decision making process.
7. An _____ warehouse collects all of the information about subjects spanning the entire organization.
8. _____ are technologically advanced machines that perceive and respond to the world around them.
9. The term _____ refers to computing services available to anyone online.
10. A _____ is a software application designed to run on mobile devices such as smartphones and tablet computers.

ANSWERS

1. Management information
2. Organizational
3. Office Automation System
4. Expert
5. Information Reporting
6. Data warehouse
7. Enterprise
8. Intelligent systems
9. Cloud computing
10. Mobile app

UNIT III

COMMUNICATIONS AND NETWORKS:

Definition, Introduction to Networks, Overview of Networks, Types of Networks, Network Topologies, Components of Networks, Computer Network Models, Applications of Communications: Definition, Internet - Overview of Internet, Architecture and Functioning of Internet, WWW, FTP, Telnet, Gopher, Browsers and Search Engines, Teleconference, Web Conferencing platforms.

3.1 DEFINITION, INTRODUCTION TO NETWORKS, OVERVIEW OF NETWORKS

Q1. What is a network.

(OR)

Define network.

Ans :

Meaning

A network is a group of interconnected computers to share resources, exchange files or allow communication.

A computer network is a group of computer systems and other computing hardware devices that are linked together through communication channels to facilitate communication and resource-sharing among a wide range of users.

Definition

(i) According to Tenenbaum, "Network as an interconnected collection of autonomous computers."

Computer networking is the process of inter connecting two or more computers so that the users can communicate with each other, share resources and overcome other limitations of stand-alone systems. The network can be established with a variety of combinations of computers such as a net of only microcomputers, microcomputers and one or more minicomputers and a set of microcomputers connected to a mainframe computer. The computers in typical network are autonomous in the sense that they have processing capability independent of the network.

Two computers are said to be interconnected if they are capable of exchanging information. Central to this definition is the fact that the computers are autonomous. This means that no computer on the network can start, stop, or control another.

Q2. State the advantages and disadvantages of computer networks.

Ans :

Advantages

The main benefits of using computer networks are:

1. Sharing Resources

Computer networks not only provide the ability to share information but also the resources. Resources can be hardware resources like- printer, scanner, and hard disk or software resources like- application programs.

For example, Using a computer network, an expensive laser printer can be shared among various employees in a department of a company instead of giving each employee a separate laser printer. Similarly, software resources like accounting software can be shared among users.

2. Cost Reduction

Resource sharing results in cost reduction as cost of resources is shared. For example: Multiple individual licensed copies of a popular software programs can be costly. Network versions of software are available at relatively low cost. Moreover, shared programs on a network allows for easier upgrading of the

programs on one single file server instead of upgrading on individual computers.

3. Connectivity and Communication

Networks connect computers and users of those computers. Once they are connected it is possible for the user to communicate with each other. User can communicate efficiently and easily via mails, video conferencing, instant messaging etc.

4. Centralized Software Management

Software loaded on one computer can be used by all other computers connected to that computer, thus eliminating the need to spend time and energy installing the same software on different computers. For example: If in a network, 20 users want to work with oracle then instead of installing oracle on each computer we can install it on single central computer (server) and make it shareable by others.

5. Higher Reliability and Backup

In computer network, having alternative source of supply to provide higher reliability is one of the aims. For example: All the files could be replicated on more than one machine so that if one of the machine is unavailable due to some reasons the other can be used. Networking also provides the facility of backup. In case if one computer fails other can resume its functions.

6. Improved Performance

Another advantage of the using network is that networks performance can be increased for some application by distributing the computational tasks on various computers.

Disadvantages

Some of the disadvantages of using computer networks are:

1. Data Security Concerns

A poorly secured network puts critical data at risk. For example: When files are shared among users then there is always a threat that unauthorized users can alter or use the sensitive data. The responsibility of network

administrator to take care such threats by issuing proper permissions to various users and proper implementing the network which improves that security of important data.

2. Network Implementation Cost

To setup a network requires investment in hardware and software. For small network of few PCs this cost is smaller but for large network this cost can run in thousands or more.

3. Network Management and Administration Costs

Network managers and administrators are required to manage and administer large networks. Hiring of these professionals increase the management and administration cost.

4. Threat from Viruses

The effect of viruses on a network is more as compared with stand-alone systems because viruses can easily spread one computer to another over.

3.2 TYPES OF NETWORKS

Q3. Define Local Area Network (LAN). State the characteristics of Local Area Network.

Ans :

A Local Area Network (LAN) is a private network that connects computers and devices within a limited area like a residence, an office, a building or a campus. On a small scale, LANs are used to connect personal computers to printers. However, LANs can also extend to a few kilometers when used by companies, where a large number of computers share a variety of resources like hardware (e.g. printers, scanners, audiovisual devices etc), software (e.g. application programs) and data.

Features

- Network size is limited to a small geographical area, presently to a few kilometers.
- Data transfer rate is generally high. They range from 100 Mbps to 1000 Mbps.

- In general, a LAN uses only one type of transmission medium, commonly category 5 coaxial cables.
- A LAN is distinguished from other networks by their topologies. The common topologies are bus, ring, mesh, and star.
- The number of computers connected to a LAN is usually restricted. In other words, LANs are limitedly scalable.
- IEEE 802.3 or Ethernet is the most common LAN. They use a wired medium in conjuncture with a switch or a hub. Originally, coaxial cables were used for communications. But now twisted pair cables and fiber optic cables are also used. Ethernet's speed has increased from 2.9 Mbps to 400 Gbps.

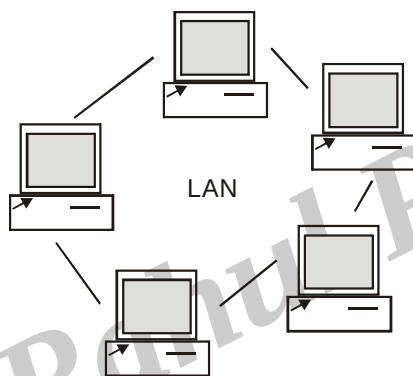


Fig. : Local Area Network

Q4. Explain the advantages and disadvantages of Local Area Network (LAN).

Ans :

Advantages

1. File and Program Sharing

It permits sharing of software, files and etc. For example, suppose your friend or junior in office wanted you to check a document, he or she doesn't need to carry that document from ground floor to 4th floor. When computers are networked together one can open the file from your computer, make changes, and then save the file on that computer without interrupting others.

2. Sharing of Printers

Hardware resource like a laser printer is very expensive. An organization cannot afford to attach a printer to each of its computers. Since there is a need of printers, several employees would need to share one. It is tedious for an employee to carry a printer and attach it to his/ her machine after his/her colleague has finisher using it. With a LAN, employees can sit on their computers, give print commands, and the printer that may be attached to a machine in some other corner of the office would do the printing.

3. Communication

Another use of a LAN is that it can help make the computer do the job of an office intercom. We can use the computer to flash messages on the screen of one computer, or a selected group of computers or all the computers in the office. This would save employees the time they would use in going to some desk in another department, on some other floor to deliver a message or a notice. This also reduces the need for face-to-face meetings and the need to circulate a notice among the employees.

Disadvantages

1. Reliability

With a single LAN, a service interruption, even of short duration, could result in a major disruption for users.

2. Capacity

A single LAN could be saturated as the number of devices attached to the network grows over time.

3. Cost

A single LAN technology is not optimized for the diverse requirements of interconnection and communication. The presence of large numbers of low-cost microcomputers dictates that network support for these devices be provided at low cost. LANs that support very-low-cost attachment will not be suitable for meeting the overall requirement.

Q5. Define Wide Area Network (WAN). State the characteristics of Wide Area Network.

Ans :

A wide area network (WAN) is a computer network that covers a large geographical area comprising a region, a country, a continent or even the whole world. WAN includes the technologies to transmit data, image, audio and video information over long distances and among different LANs and MANs.

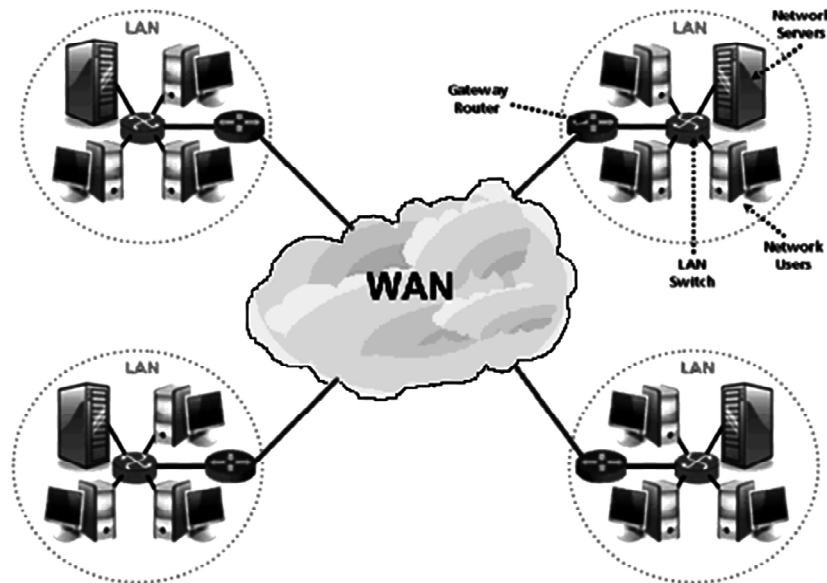


Fig.: Wide Area Network

Features

- WANs have a large capacity, connecting a large number of computers over a large area, and are inherently scalable.
- They facilitate the sharing of regional resources.
- They provide uplinks for connecting LANs and MANs to the Internet.
- Communication links are provided by public carriers like telephone networks, network providers, cable systems, satellites etc.
- Typically, they have low data transfer rate and high propagation delay, i.e. they have low communication speed.
- They generally have a higher bit error rate

Examples

- The Internet
- 4G Mobile Broadband Systems
- A network of bank cash dispensers.

Q6. State the advantages and disadvantages of WAN.*Ans :***Advantages**

Following are the benefits (or) advantages of WAN :

- WAN covers larger geographical area. Hence business offices situated at longer distances can easily communicate.
- Like LAN, it allows sharing of resources and application softwares among distributed workstations or users.
- The software files are shared among all the users. Hence all will have access to latest files. This avoids use of previous versions by them.
- Organizations can form their global integrated network through WAN. Moreover it supports global markets and global businesses.
- The emergence of IoT (Internet of Things) and advanced wireless technologies such as LAN or LAN-Advanced have made it easy for the growth of WAN based devices. Messages can be sent very quickly across the globe with the help of applications such as whatsapp, facebook messenger etc.

Disadvantages

Following are the disadvantages of WAN:

- Initial investment costs are higher.
- It is difficult to maintain the network. It requires skilled technicians and network administrators.
- There are more errors and issues due to wide coverage and use of different technologies. Often it requires more time to resolve issues due to involvement of multiple wired and wireless technologies.
- It has lower security compare to LAN and MAN due to wider coverage and use of more technologies.
- Security is big concern and requires use of firewall and security software's/protocols at multiple points across the entire system. This will avoid chances of hacking by intruders.

Q7. Bring the differences between LAN and WAN with examples.*Ans :*

S.No	Parameter	LAN	WAN
1.	Abbreviation	Local Area Network	Wide Area Network
2.	Philosophy	LAN (Local Area Network) is a network covering a small geographic area and connecting various end devices like computers and printers. LAN may be limited to a home, home, office, schools or building.	WAN (Wide Area Network) is a network that covers a broad area and used to connect end devices like computers and printers which are distributed across long distance.

3.	Speed	LAN Speed is high, upto 1/10 Gbps	WAN speed is much lower, generally 100 mbps. In few cases upto hundreds of Mbps
4.	Components	The LAN is build using the layer 1/2 devices like hubs, switches, bridges and layer 3 devices like Core/Layer 3switch. These devices connect to computers, serversand Printers etc.	The WAN is build using the layers 3 devices Routers and Multi-layer Switches.
5.	Ownership & management	LAN is owned, operated, managed and monitored by a customer	WAN is owned, operated, managed and monitored by multiple Service providers hence exist under distributed ownership.
6.	Security	More secured	Less secured
7.	Technologies	Ethernet and Token Rings are 2 primary technologiesused in LAN environment.	MPLS, ATM, Frame relay and ISDN are examples of WAN technologies.
8.	Cost (CAPEX and OPEX)	Less expensive to setup and operate	More expensive
9.	Coverage	Coverage across a small geographical area like limitedto office area or customer building.	WAN is has extremely large geographical area. It is not limited to one country
10.	Physical layer connectivity (Fiber)	Generally Copper and Fiber medium is used in LANSetup. Multimode Fiber is preferred environment	Generally Fiber medium is used in WAN terminations. Single mode Fiber is preferred Fiber type in LAN environment.
11.	Congestion Example	Less congested Network inside an office space	More congested Internet is the best example of WAN Network

Q8. What is Metropolitan Area Network (MAN). State the characteristics of MAN.

Ans :

A metropolitan area network (MAN) is a network with a size greater than LAN but smaller than a WAN. It normally comprises networked interconnections within a city that also offers a connection to the Internet.

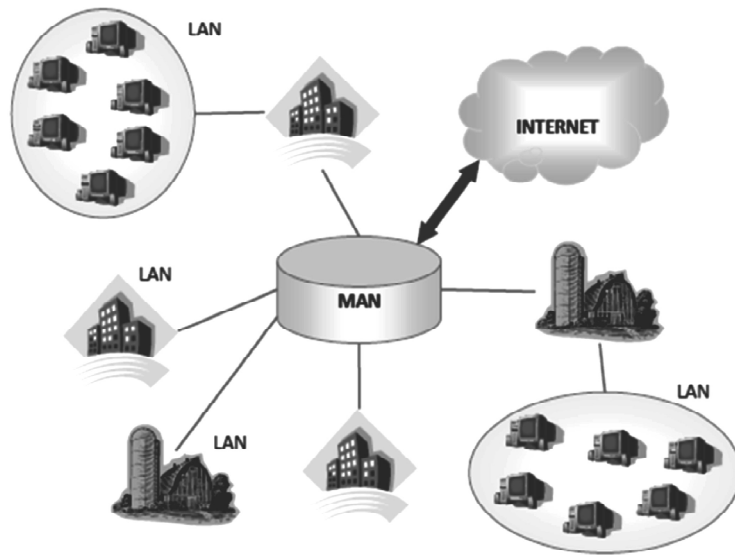


Fig. : Metropolitan Area Network

Features

- Network size generally ranges from 5 to 50 km. It may be as small as a group of buildings in a campus to as large as covering the whole city.
- Data rates are moderate to high.
- In general, a MAN is either owned by a user group or by a network provider who sells service to users, rather than a single organization as in LAN.
- It facilitates sharing of regional resources.
- They provide uplinks for connecting LANs to WANs and Internet.

Examples

- Cable TV network
- Telephone networks providing high-speed DSL lines
- IEEE 802.16 or WiMAX, that provides high-speed broadband access with Internet connectivity to customer premises

Q9. State the advantages and disadvantages of metropolitan area network(MAN).

Ans :

Advantages

- (i) It utilizes drawbacks of both LAN and WAN to provide larger and controllable computer network.
- (ii) MAN requires fewer resources compare to WAN. This saves the implementation cost.
- (iii) It helps people interface fast LANs together. This is due to easy implementation of links.
- (iv) It provides higher security compare to WAN.
- (v) It helps in cost effective sharing of common resources such as printers etc.
- (vi) Like LAN and WAN, it also offers centralized management of data and files.

Disadvantages

I

- (i) It is difficult to manage the network once it becomes large.
- (ii) It is difficult to make the system secure from hackers and industrial espionage.
- (iii) Network installation requires skilled technicians and network administrators. This increases overall installation and management costs.
- (iv) It requires more cables for connection from one place to the other compare to LAN.

Q10. What are the differences between local area network, metropolitan area network and wide area network.

Ans :

SNo.	Factor	LAN	MAN	WAN
1.	Scale	Operates in small area such as room, building or a same campus.	Operates in large area area or city.	Operates in larger such as country, continent or entire world.
2.	Ownership	Privately owned started providing the service private	Private or public some large companies have	Usually public owned, but under PPP public partnership.
3.	Speed	High	Medium	Low
4.	Error Rate	Low	Moderate	High
5.	Setup Cost	Low	Moderate	High
6.	Maintenance cost	Low	Moderate	High
7.	Transmission Media	Coaxial cable or UTP	Telephone lines	PSTN or Satellite
8.	Applications	Used in offices to connect users system, printer, scanners etc.	Telephone network or CableTV network in a city.	Used to provide services of internet.

3.3 NETWORK TOPOLOGIES

Q11. Define topology. Explain the different types of network topologies.

(OR)

List the advantages and disadvantages of each of the LAN Topologies Bus, Star, and Ring.

Ans :

(Imp.)

Topology of a network refers to the way in which the network's nodes (computers or other devices that need to communicate) are linked together. It determines the various data paths available between any pair of nodes in the network. Although number of possible network topologies is seemingly limitless, four major ones are star network, ring network, completely connected network, and multi-access bus network. Choice of a topology for a computer network depends on a combination of factors such as:

- Desired performance of the system.
- Desired reliability of the system.
- Size (number of nodes and their geographical distribution) of the system.
- Expandability of the system.
- Cost of components and services required to implement the network.
- Availability of communication lines.
- Delays involved in routing information from one node to another.

Types

1. Bus Topology

Bus topology is a network type in which every computer and network device is connected to single cable. When it has exactly two endpoints, then it is called Linear Bus topology.

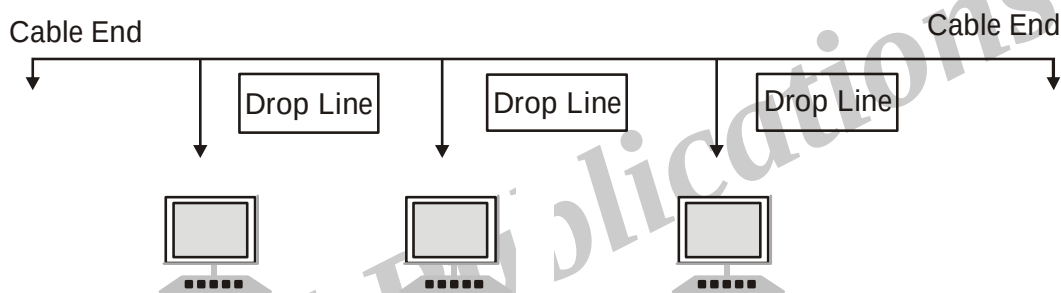


Fig. : Bus Topology

Characteristics

- It consists of single shared communication link or cable shared by all nodes in the network.
- This is multipoint configuration.
- Proper signal balancing is essential to reduce transmitter overloading.
- Signal balancing becomes increasingly difficult with increase in the number of stations.
- Repeaters can be used to boost the signal and increase the distance.

Advantages

- It is cost effective.
- Cable required is least compared to other network topology.
- Used in small networks.
- It is easy to understand.
- Easy to expand joining two cables together.

Disadvantages

- Cables fails then whole network fails.
- If network traffic is heavy or nodes are more the performance of the network decreases.

- Cable has a limited length.
- It is slower than the ring topology.

2. Ring Topology

It is called ring topology because it forms a ring as each computer is connected to another computer, with the last one connected to the first. Exactly two neighbors for each device.

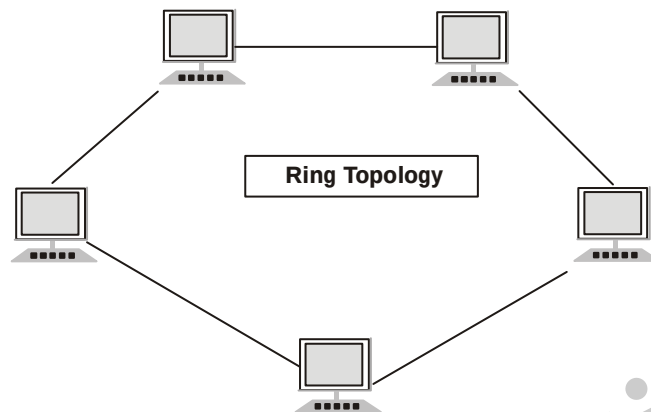


Fig. : Ring Topology

Features

- A number of repeaters are used for Ring topology with large number of nodes, because if someone wants to send some data to the last node in the ring topology with 100 nodes, then the data will have to pass through 99 nodes to reach the 100th node. Hence to prevent data loss repeaters are used in the network.
- The transmission is unidirectional, but it can be made bidirectional by having 2 connections between each Network Node, it is called Dual Ring Topology.
- In Dual Ring Topology, two ring networks are formed, and data flow is in opposite direction in them. Also, if one ring fails, the second ring can act as a backup, to keep the network up.
- Data is transferred in a sequential manner that is bit by bit. Data transmitted, has to pass through each node of the network, till the destination node.

Advantages

- Transmitting network is not affected by high traffic or by adding more nodes, as only the nodes having tokens can transmit data.
- Cheap to install and expand

Disadvantages

- Troubleshooting is difficult in ring topology.
- Adding or deleting the computers disturbs the network activity.
- Failure of one computer disturbs the whole network.

3. Star Topology

In this type of topology all the computers are connected to a single hub through a cable. This hub is the central node and all others nodes are connected to the central node.

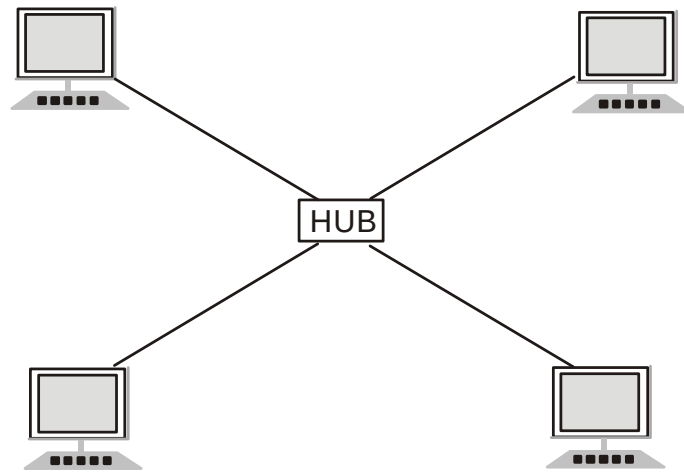


Fig. : Star Topology

Characteristics

- This topology has a central connection point called the HUB.
- Each node in the network has a dedicated point to point link to the hub.
- The hub can be active or passive.
- Active hub generates the electrical signal and send it to all the computers connected to it, where as passive hub act as connection point and does not generate signal.
- There is no direct link between nodes.
- Hub performs the routing function.

Advantages

- Fast performance with few nodes and low network traffic.
- Hub can be upgraded easily.
- Easy to troubleshoot.
- Easy to setup and modify.
- Only that node is affected which has failed, rest of the nodes can work smoothly.

Disadvantages

- Cost of installation is high.
- Expensive to use.
- If the hub fails then the whole network is stopped because all the nodes depend on the hub.
- Performance is based on the hub that is it depends on its capacity

4. Mesh Topology

- In mesh topology, each node is connected to more than one node of the system. In this way, there exist multiple paths between two nodes of the network. In case of failure of one path, the other one can be used.

- The mesh topology is mainly used in networks spread in wide geographical area spanning several kilometers. This kind of topology is extremely costly to implement and maintain.

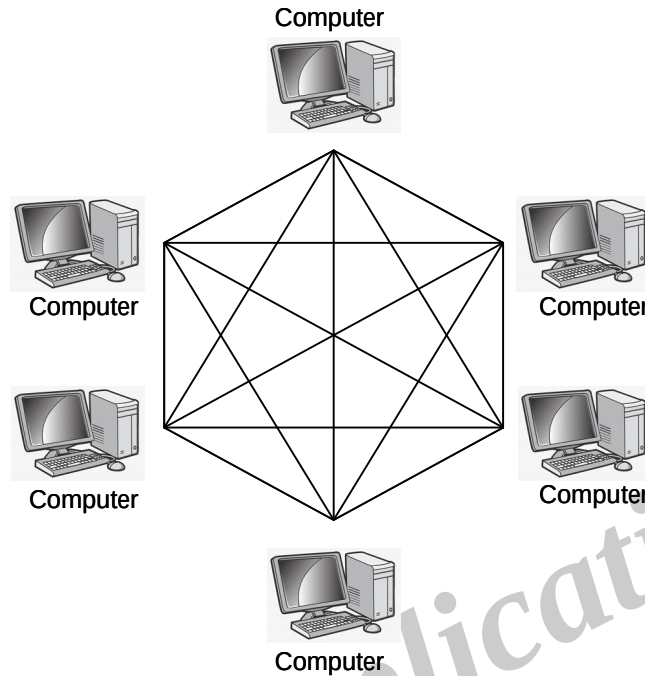


Fig. : Mesh topology

Characteristics

- Each node has a dedicated point-to-point link to every other node in the network.
- The multiple paths exist between two nodes.

Advantages

- Dedicated links eliminate traffic congestion problem.
- It provides data security and privacy due to dedicated links.
- It is robust because the failure of any one computer does not bring down the entire network.
- It ensures faster transmission without delay.
- Point to point links make fault diagnose easy.

Disadvantages

- Mesh topology is bit complex and costly.
- Installation and reconfiguration is difficult.
- Cabling cost is more.
- It requires high maintenance.
- Troubleshooting is difficult in large network.

5. Tree Topology

It has a root node and all other nodes are connected to it forming a hierarchy. It is also called hierarchical topology. It should at least have three levels to the hierarchy.

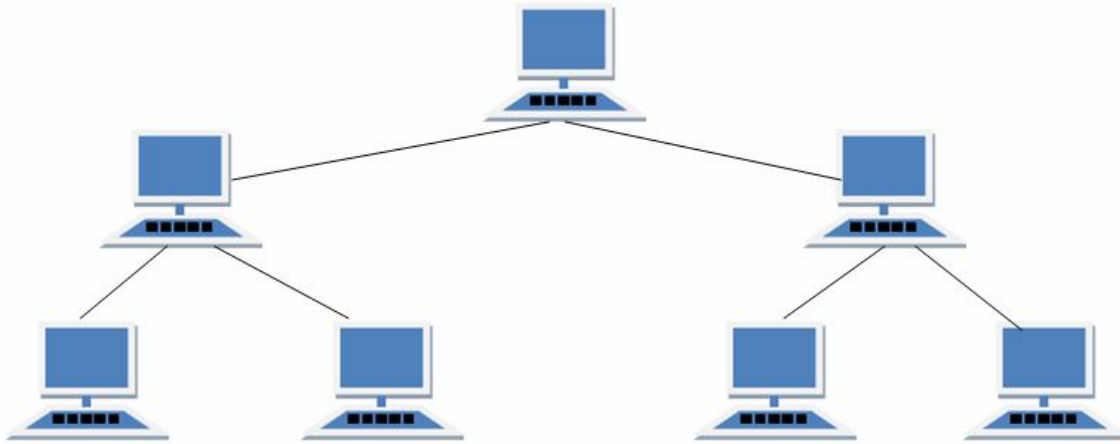


Fig. : Tree Topology

Characteristics

- It is a variation of star topology.
- Nodes are connected to central hub that controls the traffic of the network.
- It has hierarchical flow of data i.e., data travels level by level.

Advantages

- There are no closed loops; hence failure of one branch does not affect the whole system.
- It allows the network to isolate and prioritize communications from different computers.
- The branches may be extended without any delay or stopping the transmission of information from other branches.

Disadvantages

- In contrast to bus topology, tree topology is bit complex and costly.
- Only one workstation can transmit information at a time.
- If the central hub fails, the system breaks down.
- The cabling cost is more.

6. Hybrid Topology

It is two different types of topologies which is a mixture of two or more topologies. For example if in an office in one department ring topology is used and in another star topology is used, connecting these topologies will result in Hybrid Topology (ring topology and star topology).

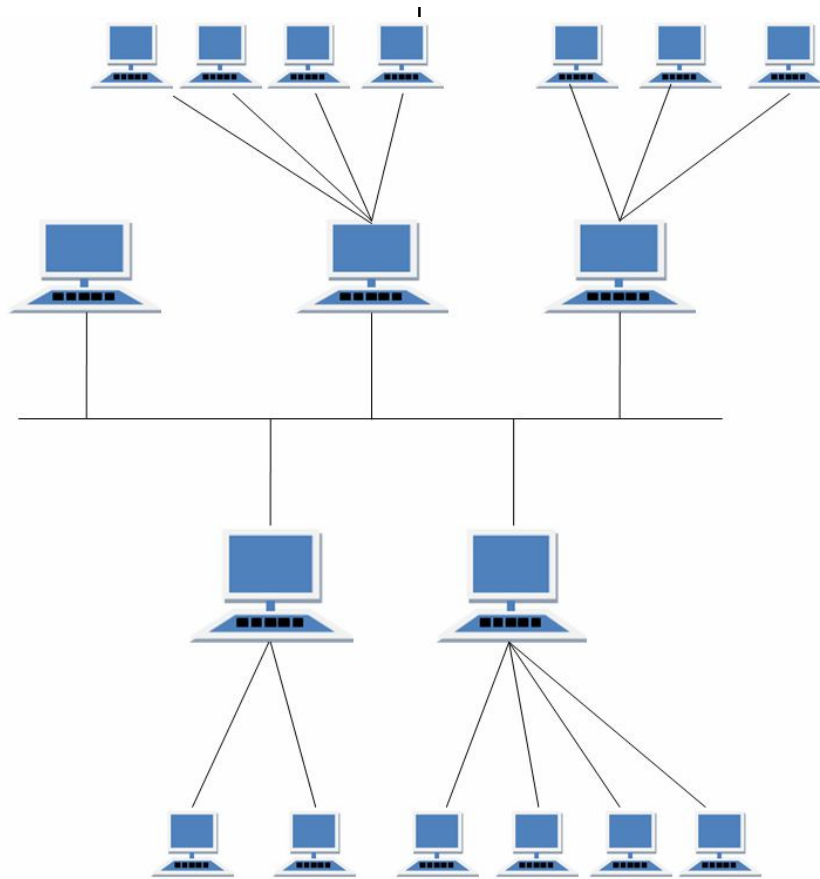


Fig. Hybrid Topology

Characteristics

- The combination of topologies is done according to the requirements of the organization.
- Connecting two similar topologies cannot be termed as Hybrid topology.

Advantages

- Unlike other networks, fault detection and troubleshooting is easy in this type of topology.
- It is easy to increase the size of network by adding new components, without disturbing existing architecture.

Disadvantages

- One of the biggest drawbacks of hybrid topology is its design. It is not easy to design this type of architecture.
- The hubs used to connect two distinct networks, are very expensive. These hubs are different from usual hubs as they need to be intelligent enough to work with different architecture and should be function even if a part of network is down.
- As hybrid architectures are usually larger in scale, they require a lot of cables, cooling systems, network devices etc.

3.4 COMPONENTS OF NETWORKS

Q12. Explain the various components of Network.

(OR)

Explain Basic Network devices

Ans :

(Imp.)

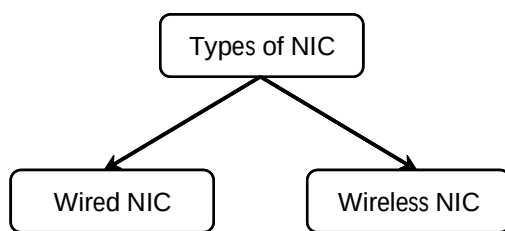
Computer network components are the major parts which are needed to install the software. Some important network components are NIC, switch, cable, hub, router, and modem. Depending on the type of network that we need to install, some network components can also be removed. For example, the wireless network does not require a cable.

Following are the major components required to install a network:

1. NIC

- NIC stands for network interface card.
- NIC is a hardware component used to connect a computer with another computer onto a network
- It can support a transfer rate of 10,100 to 1000 Mb/s.
- The MAC address or physical address is encoded on the network card chip which is assigned by the IEEE to identify a network card uniquely. The MAC address is stored in the PROM (Programmable read-only memory):

There are two types of NIC:



- i) Wired NIC
- ii) Wireless NIC

(i) Wired NIC

The Wired NIC is present inside the motherboard. Cables and connectors are used with wired NIC to transfer data.

- (ii) **Wireless NIC:** The wireless NIC contains the antenna to obtain the connection over the wireless network. For example, **Hub**

A Hub is a hardware device that divides the network connection among multiple devices. When computer requests for some information from a network, it first sends the request to the Hub through cable. Hub will broadcast this request to the entire network. All the devices will check whether the request belongs to them or not. If not, the request will be dropped.

The process used by the Hub consumes more bandwidth and limits the amount of communication. Nowadays, the use of hub is obsolete, and it is replaced by more advanced computer network components such as Switches, Routers.

2. Switch

A switch is a hardware device that connects multiple devices on a computer network. A Switch contains more advanced features than Hub. The Switch contains the updated table that decides where the data is transmitted or not. Switch delivers the message to the correct destination based on the physical address present in the incoming message. A Switch does not broadcast the message to the entire network like the Hub. It determines the device to whom the message is to be transmitted. Therefore, we can say that switch provides a direct connection between the source and destination. It increases the speed of the network.

3. Router

- A router is a hardware device which is used to connect a LAN with an internet connection. It is used to receive, analyze and forward the incoming packets to another network.
- A router works in a Layer 3 (Network layer) of the OSI Reference model.
- A router forwards the packet based on the information available in the routing table.
- It determines the best path from the available paths for the transmission of the packet.

Advantages of Router➤ **Security**

The information which is transmitted to the network will traverse the entire cable, but the only specified device which has been addressed can read the data.

➤ **Reliability**

If the server has stopped functioning, the network goes down, but no other networks are affected that are served by the router.

➤ **Performance**

Router enhances the overall performance of the network. Suppose there are 24 workstations in a network generates a same amount of traffic. This increases the traffic load on the network. Router splits the single network into two networks of 12 workstations each, reduces the traffic load by half.

4. Modem

➤ A modem is a hardware device that allows the computer to connect to the internet over the existing telephone line.

➤ A modem is not integrated with the motherboard rather than it is installed on the PCI slot found on the motherboard.

➤ It stands for Modulator/Demodulator. It converts the digital data into an analog signal over the telephone lines.

Based on the differences in speed and transmission rate, a modem can be classified in the following categories:

- Standard PC modem or Dial-up modem
- Cellular Modem
- Cable modem

5. Cables and Connectors

Cable is a transmission media used for transmitting a signal.

There are three types of cables used in transmission:

- Twisted pair cable
- Coaxial cable
- Fibre-optic cable

Q13. What is data communication ? Explain the characteristics of data communication.

Ans :

Meaning

Data communication technologies deal with means and methods of data transfer from one location to another. Marriage between computing and data communication technologies is one of the most exciting developments that has revolutionized information age. This development gave birth to computer networks.

Characteristics**1. Delivery**

The system must deliver data to the correct destination. Data must be received by the intended device or user and only by that device or user.

2. Accuracy

The system must deliver the data accurately. Data that have been altered in transmission and left uncorrected are unusable.

3. Timeliness

The system must deliver data in a timely manner. Data delivered late are useless. In the case of video and audio, timely delivery means delivering data as they are produced, in the same order that they are produced, and without significant delay. This kind of delivery is called real-time transmission.

4. Jitter

Jitter refers to the variation in the packet arrival time. It is the uneven delay in the delivery of audio or video packets. For example, let us assume that video packets are sent every 3D ms. If some of the packets arrive with 3D-ms delay and others with 4D-ms delay, an uneven quality in the video is the result.

Q14. What is Data Transmission Media ? Explain different types of Data Transmission Medias.

Ans :

The sender-medium-receiver concept has been with us for a long time. For example, shouting to another person involves voice transmission on the medium air that carries voice as sound waves. Use of telephone lines, as a transmission medium, considerably enhances possible communication distance. Like telephone lines, there are several types of physical channels (communication media) used for data transmission from one point to another.

Q15. What is a wire pair ? In what situations they are suitable for use in data transmission.

Ans :

A twisted-pair wire consists of two bunches of thin copper wires, each bunch enclosed separately in a plastic insulation, then twisted around each other to reduce interference by adjacent wires. It is also called unshielded twisted-pair (UTP) cable because other than the plastic insulation around the two individual bunches of copper wires, nothing else shields it from outside interference.

UTP cables are used commonly in local telephone communication and short distance (up to about 1 km) digital data transmission. They are used normally to connect terminals to main computer, if they are placed at a short distance apart. For distance up to 100 meters, data transmission speed of up to 9600 bps can be achieved. However, for longer distances, local telephone lines are used having speed typically of the order of 1200 bps.

UTP cables are inexpensive, and easy to install and use. However, their use is limited because they easily pick up noise signals (resulting in high error rates) when line length extends beyond 100 meters.



Fig. A twisted-pair wire (UTP cable)

Q16. What is a coaxial cable ? State its practical uses.

Ans :

Coaxial cables are groups of specially wrapped and insulated wire lines capable of transmitting data at high rates. They consist of a central copper wire surrounded by a PVC insulation over which there is a sleeve of copper mesh. The copper mesh sleeve is shielded again by an outer shield of thick PVC material. Signal transmitted by inner copper wire, and is electrically shielded by the outer copper mesh sleeve.

Coaxial cables offer much higher bandwidths than UTP cables, and can transmit digital signals at rates up to 10 mega bps. They are used extensively in long distance telephone lines and as cables for cable TV.

They are used also by telephone companies to transmit data. Telephone companies often package several coaxial cables into a very large cable, which can handle over 40,000 telephone calls simultaneously. Furthermore, coaxial cables have much higher noise immunity, and can offer cleaner and crisper data transmission without distortion or loss of signal.

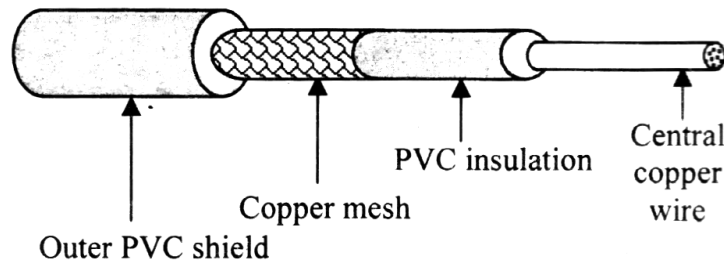


Fig : A coaxial cable

Q17. Explain how microwave systems are used for communication between two distant stations.

Ans :

Microwave systems use very high frequency radio signals to transmit data through space (wireless communication). However at microwave frequencies, electromagnetic waves cannot bend or pass obstacles like tall buildings or hills. Hence, transmitter and receiver of a microwave system, mounted on very high towers, should be in line-of-sight. This may not be possible for very long distance transmission. Moreover, signals become weaker after traveling a certain distance and require power amplification.

To overcome problems of line-of-sight and power amplification of weak signals, microwave systems use repeaters at intervals of about 25 to 30 kms in between transmitting and receiving stations. First repeater is placed in line-of-sight of transmitting stations and last repeater is placed in line-of-sight of receiving station. Two consecutive repeaters are also placed in line-of-sight of each other. Data signals are received, amplified, and retransmitted by each of these stations.

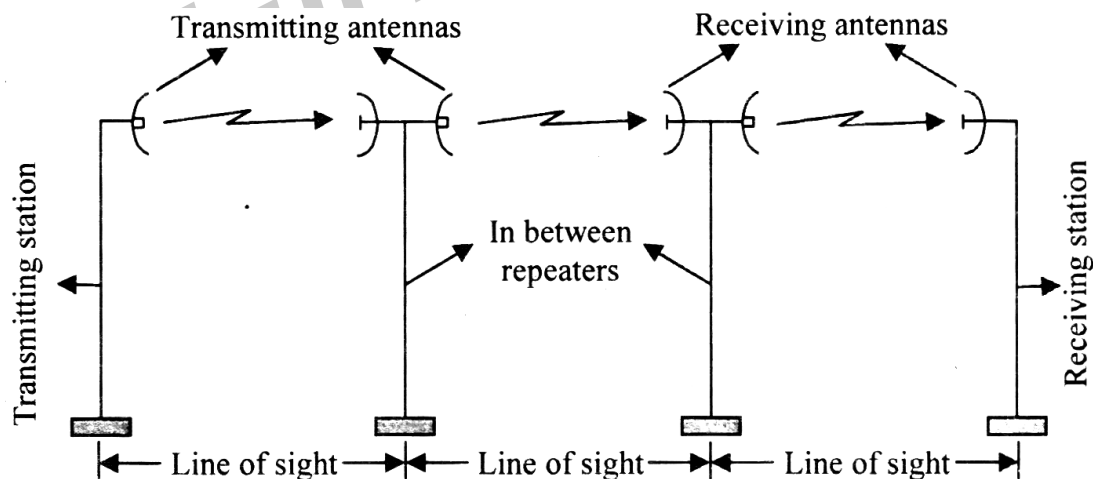


Fig : A microwave communication system

Microwave systems have speed of about 16 Giga bps (1 Giga = 10^9). They can support about 250,000 voice channels simultaneously. As they support, wireless communication, they do not require cables to be laid and the associated cost of land digging. However their initial installation cost being very high, they are used mostly to link big cities with heavy telephone/data traffic between them.

Q18. How communication satellites are used ? What advantages and disadvantages are there in using a communication satellite ?

Ans :

Main problem with microwave communication is that curvature of earth, mountains, and other structures often block the line-of-sight. Hence, several repeater stations are required normally for long distance transmission increasing data transmission cost between two points. This problem is overcome by using satellites.

Communication satellites are microwave relay stations placed in outer space. They are launched by either rockets or space shuttles, and are positioned precisely 36,000 kms above the equator with an orbit speed that matches earth's rotation speed exactly. Since a satellite is positioned in geosynchronous orbit, it is stationary relative to earth, and always stays over same point on the ground. This allows a ground station to aim its antenna at a fixed point in the sky. Each satellite can receive and retransmit signals to slightly less than half the earth's surface. Therefore, at least three satellites are needed in geosynchronous orbit to provide data transmission service worldwide. Hundreds of satellites are now in orbit to handle international and domestic data, voice, and video communications needs. The INSAT series of Indian satellites are positioned in outer space in a manner to be accessible from any place in India.

In satellite communication, microwave signal at 6 GHz or 14 GHz (GHz is read as gigahertz, and 1 GHz = 10^9 Hz) is transmitted from a transmitter on earth to a satellite positioned in space. By the time this signal reaches the satellite, it becomes weak due to 36,000 kms travel. A transponder, mounted on the satellite, amplifies the weak signal and transmits it back to earth at a frequency of 4 GHz or 11 GHz. This signal is received at a receiving station on earth. Note that retransmission frequency is different from transmission frequency to avoid interference of powerful retransmission signal with weak incoming signal.

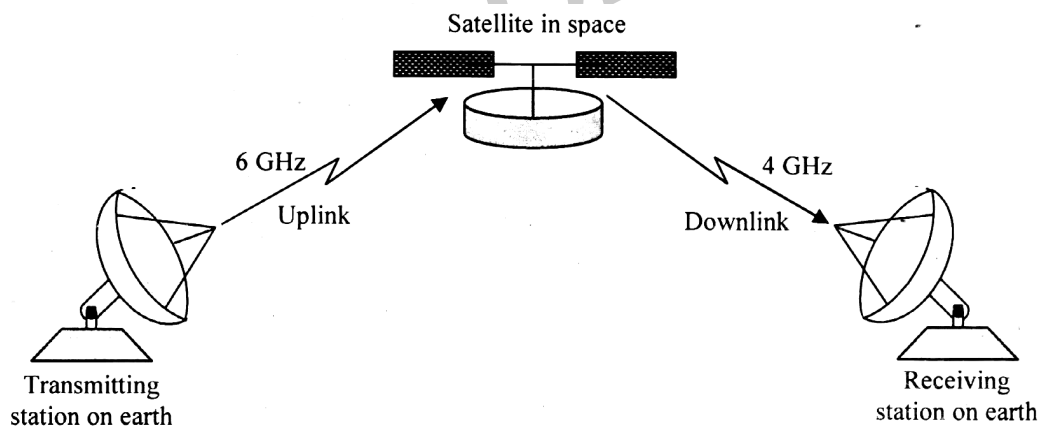


Fig : A satellite communication system

Advantages:

1. A satellite is essentially a microwave relay station visible from any point in a very large area. Hence, it enables data transmission between any two randomly chosen points in that area.
2. Data transmission costs are independent of distance between two points as long as these two points are within the satellite's area coverage.
3. A satellite having many transponders has enormous data communication capability.
4. Error detection is trivial in satellite communication system because a transmitting station can receive back its own transmission and check whether the satellite has transmitted data correctly. If not, it can retransmit the data.

- As they support wireless communication, they do not require cables to be laid and the associated cost of land digging.

A satellite communication system, however, suffers from following disadvantages:

Disadvantages

- Initial cost of placing a satellite into its orbit is very high.
- Microwave signal has to travel a long distance from transmitting earth station to satellite and then back to receiving earth station. This causes data propagation delay of about 270 m sec between sender and receiver.
- In a satellite communication system, data sent to a satellite for transmission is broadcast automatically to all receiving stations within the satellite's area coverage. Hence, special security measures are needed to prevent unauthorized access of information.
- Atmospheric disturbances, like thunder and lightening, affect K_u-band transmission of a satellite communication system. Hence, C-band transmission is recommended during bad weather.

Q19. Define optical fiber. How it is for data communication ? What are its advantages.

Ans :

Meaning

Optical fibers are hair-thin threads of glass or plastic used as data transmission medium like copper wires or coaxial cables. However, unlike copper wires or coaxial cables, they transmit light signals instead of electrical signals. As light travels much faster than electricity, optical fibers can transmit data at much higher speed than copper wires or coaxial cables with no significant loss of intensity over long distances.

Optical fibers are made of glass, plastic, or silica. Plastic fibers are least efficient, but are cheaper and more rugged. Glass or silica fibers are much smaller, and their lower attenuation makes them more suitable for high capacity channels.

Physically, a fiber-optic cable consists of three concentric layers - inner core, a cladding around it, and outer protective coating. Inner core has a diameter of 8 to 200 micrometers and consists of a bunch of optical fibers. The cladding around it is made of plastic or glass, and has a refractive index less than that of the core. The characteristics of light propagation depend primarily on fiber size, its construction, refractive index profile, and nature of light source. The outer protective coating is made of plastic.

Figure below shows the main components of an optical fiber communication system. The sender side electrical to light wave converter converts electrical signals into light signals. It uses either a light-emitting diode (LED) or a laser diode to convert electric signals into light signals. These light waves are then transmitted over the optical fiber to receiver's end. The receiver side light to electrical wave converter detects the light waves and converts them back to electrical signals. It uses photoelectric diodes for this purpose. An amplifier then amplifies and sends the electrical signals to the receiver.

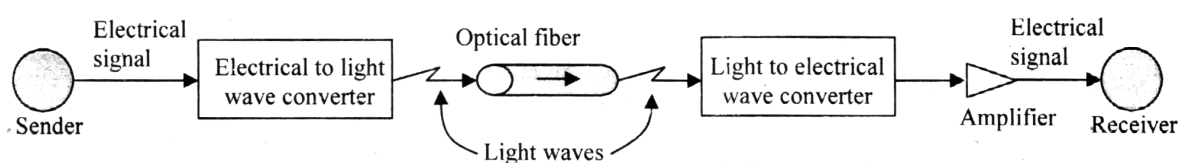


Fig : Optical fiber communication system

Advantages**1. Large bandwidth**

Optical fibers can transmit large volumes of data at very high speed and long distances. They can have 10 to 100 times greater bandwidth than the best coaxial cables depending on the number of fibers bunched in inner core. A fiber-optic cable consisting of a bunch of 10 optical fibers can support more than 200,000 voice channels.

2. Low loss

Light signals can travel at much higher speed than electrical signals with no significant loss of intensity over long distances. Hence, when any communication medium that uses electrical signals for transmitting data (such as copper wires or coaxial cables) is used for data transmission, electrical signals have to be intercepted and amplified by repeaters at short intervals along the way. Light signals flowing through a fiber-optic cable must also be amplified, but at much longer intervals than that of electrical signals. Its implication is that signal repeaters are not required at short intervals, reducing cost of an optical fiber communication system.

3. Immunity to electromagnetic interference

Optical fibers are made of glass/plastic. Hence, optical fiber transmissions are not affected by magnetic or electrical interference that causes errors in other media, especially in twisted-pair wire. Consequently, optical fiber communication systems have potential for reducing costs associated with complex error checking and correction mechanisms, which are required with other media that are affected by electromagnetic interference.

4. Small size and lightweight

Fiber optic cables are much smaller and lighter than copper wires or coaxial cables. For example, a fiber optic cable with a core and cladding of 0.125 mm diameter and 3.5 mm outer protective coating has the same data transmission capacity as 900 twisted copper wire pairs with an 8 cm outer diameter and weighing 100 times more. Size and weight are important factors when considering conduits running under overcrowded city streets. In some large cities, there simply is no room for additional bulky copper wires. In this case, use of smaller and lighter fiber optic cables is very effective.

5. Security

Optical fiber offers increased security against unauthorized tampering of information, since it is extremely difficult and expensive to tap optical signals.

6. Safety and electrical insulation

Optical fibers, being insulators, provide electrical isolation between source and destination. Hence, they present no electrical spark hazards and can be used safely in those places where it is unsafe to use electrical conductors.

7. Analog and digital signals transmission

Optical fibers enable transmission of both analog and digital signals. In analog transmission, light intensity is varied continuously, whereas in digital transmission, light source is turned on and off.

Disadvantages

1. Optical fibers, being fragile, cannot turn at sharp corners. They can turn at corners having radius of at least a few inches. This creates problem when fiber optic cables are physically laid.

2. Aligning and joining two fiber optic cables is not so simple and easy as for twisted copper wire pairs or coaxial cables. It requires special equipment to do so.

Advantages of optical fibers have made them a preferable data transmission medium for many applications involving telephones, televisions, and computers. Hence, they are widely used today.

3.5 COMPUTER NETWORK MODELS

3.5.1 OSI Model

Q20. Describe briefly the function of each layer of the OSI Model.

Ans :

(Imp.)

Prerequisite Basics of Computer Networking OSI stands for Open Systems Interconnection. It has been developed by ISO – 'International Organization of Standardization', in the year 1974. It is a 7 layer architecture with each layer having specific functionality to perform. All these 7 layers work collaboratively to transmit the data from one person to another across the globe.

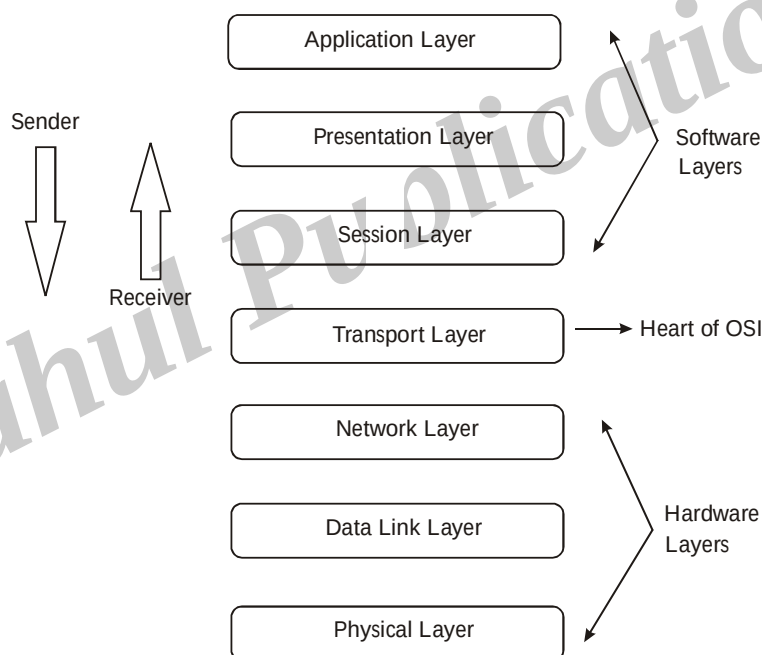
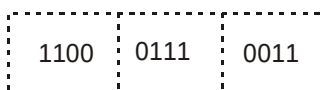


Fig. :OSI Reference Model

1. Physical Layer (Layer 1)

The lowest layer of the OSI reference model is the physical layer. It is responsible for the actual physical connection between the devices. The physical layer contains information in the form of bits. It is responsible for the actual physical connection between the devices. When receiving data, this layer will get the signal received and convert it into 0s and 1s and send them to the Data Link layer, which will put the frame back together.



The functions of the physical layer are :**i) Bit synchronization**

The physical layer provides the synchronization of the bits by providing a clock. This clock controls both sender and receiver thus providing synchronization at bit level.

ii) Bit rate control

The Physical layer also defines the transmission rate i.e. the number of bits sent per second.

iii) Physical topologies

Physical layer specifies the way in which the different, devices/nodes are arranged in a network i.e. bus, star or mesh topology.

iv) Transmission mode

Physical layer also defines the way in which the data flows between the two connected devices. The various transmission modes possible are: Simplex, half-duplex and full-duplex.

- Hub, Repeater, Modem, Cables are Physical Layer devices.
- Network Layer, Data Link Layer and Physical Layer are also known as Lower Layers or Hardware Layers.

2. Data Link Layer (DLL) (Layer 2)

The data link layer is responsible for the node to node delivery of the message. The main function of this layer is to make sure data transfer is error free from one node to another, over the physical layer. When a packet arrives in a network, it is the responsibility of DLL to transmit it to the Host using its MAC address.

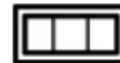
Data Link Layer is divided into two sub layers :

1. Logical Link Control (LLC)
2. Media Access Control (MAC)

The packet received from Network layer is further divided into frames depending on the frame size of NIC(Network Interface Card).

DLL also encapsulates Sender and Receiver's MAC address in the header.

The Receiver's MAC address is obtained by placing an ARP(Address Resolution Protocol) request onto the wire asking "Who has that IP address?" and the destination host will reply with its MAC address.

**The functions of the data Link layer are****i) Framing**

Framing is a function of the data link layer. It provides a way for a sender to transmit a set of bits that are meaningful to the receiver. This can be accomplished by attaching special bit patterns to the beginning and end of the frame.

ii) Physical addressing

After creating frames, Data link layer adds physical addresses (MAC address) of sender and/or receiver in the header of each frame.

iii) Error control

Data link layer provides the mechanism of error control in which it detects and retransmits damaged or lost frames.

iv) Flow Control

The data rate must be constant on both sides else the data may get corrupted thus , flow control coordinates that amount of data that can be sent before receiving acknowledgement.

v) Access control

When a single communication channel is shared by multiple devices, MAC sub-layer of data link layer helps to determine which device has control over the channel at a given time.

- Packet in Data Link layer is referred as Frame.
- Data Link layer is handled by the NIC (Network Interface Card) and device drivers of host machines.
- Switch & Bridge are Data Link Layer devices.

3. Network Layer (Layer 3)

Network layer works for the transmission of data from one host to the other located in different networks. It also takes care of packet routing i.e. selection of the shortest path to transmit the packet, from the number of routes available. The sender & receiver's IP address are placed in the header by network layer.

The functions of the Network layer are :

i) Routing

The network layer protocols determine which route is suitable from source to destination. This function of network layer is known as routing.

ii) Logical Addressing

In order to identify each device on internet work uniquely, network layer defines an addressing scheme. The sender & receiver's IP address are placed in the header by network layer. Such an address distinguishes each device uniquely and universally.

- Segment in Network layer is referred as Packet.



- Network layer is implemented by networking devices such as routers.

4. Transport Layer (Layer 4)

Transport layer provides services to application layer and takes services from network layer. The data in the transport layer is referred to as Segments. It is responsible for the End to End delivery of the complete

message. Transport layer also provides the acknowledgment of the successful data transmission and re-transmits the data if an error is found.

i) At sender's side

Transport layer receives the formatted data from the upper layers, performs Segmentation and also implements Flow & Error control to ensure proper data transmission. It also adds Source and Destination port number in its header and forwards the segmented data to the Network Layer.

Note

The sender need to know the port number associated with the receiver's application.

Generally, this destination port number is configured, either by default or manually. For example, when a web application makes a request to a web server, it typically uses port number 80, because this is the default port assigned to web applications. Many applications have default port assigned.

ii) At receiver's side

Transport Layer reads the port number from its header and forwards the Data which it has received to the respective application. It also performs sequencing and reassembling of the segmented data.

The functions of the transport layer are

i) Segmentation and Reassembly

This layer accepts the message from the (session) layer, breaks the message into smaller units. Each of the segment produced has a header associated with it. The transport layer at the destination station reassembles the message.

ii) Service Point Addressing

In order to deliver the message to correct process, transport layer header includes a type of address called service point address or port address. Thus by

specifying this address, transport layer makes sure that the message is delivered to the correct process.

The services provided by transport layer :

i) Connection Oriented Service

It is a three-phase process which include

- Connection Establishment
- Data Transfer
- Termination / disconnection

In this type of transmission, the receiving device sends an acknowledgment, back to the source after a packet or group of packet is received. This type of transmission is reliable and secure.

ii) Connection less service

It is a one phase process and includes Data Transfer. In this type of transmission, the receiver does not acknowledge receipt of a packet. This approach allows for much faster communication between devices. Connection oriented Service is more reliable than connection less Service.

- Data in the Transport Layer is called as Segments.
- Transport layer is operated by the Operating System. It is a part of the OS and communicates with the Application Layer by making system calls.

Transport Layer is called as Heart of OSI model.

5. Session Layer (Layer 5)

This layer is responsible for establishment of connection, maintenance of sessions, authentication and also ensures security.

The functions of the session layer are :

i) Session establishment, maintenance and termination

The layer allows the two processes to establish, use and terminate a connection.

ii) Synchronization

This layer allows a process to add checkpoints which are considered as synchronization points into the data. These synchronization point help to identify the error so that the data is re-synchronized properly, and ends of the messages are not cut prematurely and data loss is avoided.

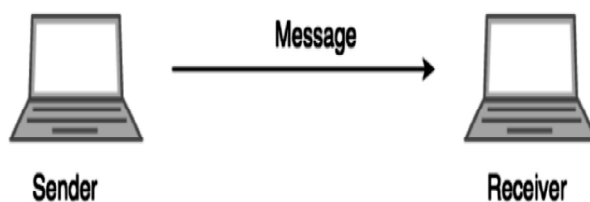
iii) Dialog Controller

The session layer allows two systems to start communication with each other in half-duplex or full-duplex.

- All the below 3 layers (including Session Layer) are integrated as a single layer in TCP/IP model as "Application Layer".
- Implementation of these 3 layers is done by the network application itself. These are also known as Upper Layers or Software Layers.

Scenario:

Let's consider a scenario where a user wants to send a message through some Messenger application running in his browser. The "Messenger" here acts as the application layer which provides the user with an interface to create the data. This message or so-called Data is compressed, encrypted (if any secure data) and converted into bits (0's and 1's) so that it can be transmitted.



6. Presentation Layer (Layer 6)

Presentation layer is also called the Translation layer. The data from the application layer is extracted here and manipulated as per the required format to transmit over the network.

The functions of the presentation layer are :

i) **Translation** : For example, ASCII to EBCDIC.

ii) **Encryption/ Decryption**

Data encryption translates the data into another form or code. The encrypted data is known as the cipher text and the decrypted data is known as plain text. A key value is used for encrypting as well as decrypting data.

iii) **Compression**

Reduces the number of bits that need to be transmitted on the network.

7. Application Layer (Layer 7)

At the very top of the OSI Reference Model stack of layers, we find Application layer which is implemented by the network applications. These applications produce the data, which has to be transferred over the network. This layer also serves as a window for the application services to access the network and for displaying the received information to the user.

Ex: Application – Browsers, Skype Messenger etc.

➤ Application Layer is also called as Desktop Layer.



The functions of the Application layer are :

1. Network Virtual Terminal
2. FTAM-File transfer access and management
3. Mail Services
4. Directory Services

OSI model acts as a reference model and is not implemented in Internet because of its late invention. Current model being used is the TCP/IP model.

3.5.2 TCP / IP Model

Q21. Explain briefly about TCPI / IP Model.

Ans :

(Imp.)

Prerequisite – Layers of OSI Model

The OSI Model we just looked at is just a reference/logical model. It was designed to describe the functions of the communication system by dividing the communication procedure into smaller and simpler

components. But when we talk about the TCP/IP model, it was designed and developed by Department of Defense (DoD) in 1960s and is based on standard protocols. It stands for Transmission Control Protocol/Internet Protocol. The TCP/IP model is a concise version of the OSI model. It contains four layers, unlike seven layers in the OSI model. The layers are:

1. Process/Application Layer
2. Host-to-Host/Transport Layer
3. Internet Layer
4. Network Access/Link Layer

1. Network Access Layer

This layer corresponds to the combination of Data Link Layer and Physical Layer of the OSI model. It looks out for hardware addressing and the protocols present in this layer allows for the physical transmission of data.

We just talked about ARP being a protocol of Internet layer, but there is a conflict about declaring it as a protocol of Internet Layer or Network access layer. It is described as residing in layer 3, being encapsulated by layer 2 protocols.

2. Internet Layer

This layer parallels the functions of OSI's Network layer. It defines the protocols which are responsible for logical transmission of data over the entire network. The main protocols residing at this layer are

i) IP

stands for Internet Protocol and it is responsible for delivering packets from the source host to the destination host by looking at the IP addresses in the packet headers. IP has 2 versions:

IPv4 and IPv6. IPv4 is the one that most of the websites are using currently. But IPv6 is growing as the number of IPv4 addresses are limited in number when compared to the number of users.

ii) ICMP

stands for Internet Control Message Protocol. It is encapsulated within IP datagrams and is responsible for providing hosts with information about network problems.

iii) ARP

stands for Address Resolution Protocol. Its job is to find the hardware address of a host from a known IP address. ARP has several types: Reverse ARP, Proxy ARP, Gratuitous ARP and Inverse ARP.

3. Host-to-Host Layer

This layer is analogous to the transport layer of the OSI model. It is responsible for end-to-end communication and error-free delivery of data. It shields the upper-layer applications from the complexities of data. The two main protocols present in this layer are :

i) Transmission Control Protocol (TCP)

It is known to provide reliable and error-free communication between end systems. It performs sequencing and segmentation of data. It also has acknowledgment feature and controls the flow of the data through flow control mechanism. It is a very effective protocol but has a lot of overhead due to such features. Increased overhead leads to increased cost.

ii) User Datagram Protocol (UDP)

On the other hand does not provide any such features. It is the go-to protocol if your application does not require reliable transport as it is very cost-effective. Unlike TCP, which is connection-oriented protocol, UDP is connectionless.

4. Process Layer

This layer performs the functions of top three layers of the OSI model: Application, Presentation and Session Layer. It is responsible for node-to-node communication and controls user-interface specifications. Some of the protocols present in this layer are: HTTP, HTTPS, FTP, TFTP, Telnet, SSH, SMTP, SNMP, NTP, DNS, DHCP, NFS, X Window, LPD. Have a look at Protocols in Application Layer for some information about these protocols. Protocols other than those present in the linked article are :

i) HTTP and HTTPS

HTTP stands for Hypertext transfer protocol. It is used by the World Wide Web to manage communications between web browsers and servers. HTTPS stands for HTTP-Secure. It is a combination of HTTP with SSL(Secure Socket Layer). It is efficient in cases where the browser need to fill out forms, sign in, authenticate and carry out bank transactions.

ii) SSH

SSH stands for Secure Shell. It is a terminal emulations software similar to Telnet. The reason SSH is more preferred is because of its ability to maintain the encrypted connection. It sets up a secure session over a TCP/IP connection.

iii) NTP

NTP stands for Network Time Protocol. It is used to synchronize the clocks on our computer to one standard time source. It is very useful in situations like

bank transactions. Assume the following situation without the presence of NTP. Suppose you carry out a transaction, where your computer reads the time at 2:30 PM while the server records it at 2:28 PM. The server can crash very badly if it's out of sync.

3.6 APPLICATIONS OF COMMUNICATIONS**Q22. State the various Applications of Communications.****Ans :****(Imp.)**

The different applications of communications are as follows :

1. Electronic Mail

E-mail is defined as the transmission of messages on the Internet. It is one of the most commonly used features over communications networks that may contain text, files, images, or other attachments. Generally, it is information that is stored on a computer sent through a network to a specified individual or group of individuals.

Email messages are conveyed through email servers; it uses multiple protocols within the TCP/IP suite. For example, SMTP is a protocol, stands for simple mail transfer protocol and used to send messages whereas other protocols IMAP or POP are used to retrieve messages from a mail server. If you want to login to your mail account, you just need to enter a valid email address, password, and the mail servers used to send and receive messages.

Although most of the webmail servers automatically configure your mail account, therefore, you only required to enter your email address and password. However, you may need to manually configure each account if you use an email client like Microsoft Outlook or Apple Mail. In addition, to enter the email address and password, you may also need to enter incoming and outgoing mail servers and the correct port numbers for each one.

2. Fax

The internet fax service allows to send long distance faxes at local telephone rates. As it follows store-and-forward mechanisms, the delivery of fax is always guaranteed.

3. Video Conferencing

Video conferencing allows more two users to communicate through audio as well as video when it is not possible for them to be presented physically. They can speak and even see the video picture of people at the other locations/sites. It is mostly used for presenting visuals such as video tape, slides, charts, graphs, demos etc. Users of video conference need a camera, loudspeaker, monitor, microphone and a CODEC (Compressor | de compressor). The cameras will convert the analog signals to digital information through analog-to-digital converter. This digital information is stored and transmitted over the network to other sites.

The receiver should again transform the digital data to analog data through digital to analog converter (DAC). This technology increases the productivity, encourages the teaching that involves participation etc. It has a number of advantages other than these. Applications of video conferencing include schools, colleges, institutions, organizations, business meetings etc.

4. Electronic Fund Transfer (EFT)

An electronic fund transfer moves money from one account to another. The accounts can be at the same financial institution or two different financial institutions. The transaction is done electronically over a computerised network. Although EFT refers to any transfer of funds initiated through an electronic terminal, including credit card, ATM, and point-of-sale (POS) transactions, one of the most widely-used EFT programmes is Direct Deposit, in which payroll is deposited straight into an employee's bank account. It is used for both credit transfers, such as payroll payments, and for debit transfers, such as

mortgage payments. EFT can be segmented into three broad categories:

(a) Banking and Financial Payments

- (i) Large-scale or wholesale payments (e.g., bank-to-bank transfer)
- (ii) Small-scale or retail payments (e.g., automated teller machines)
- (iii) Home banking (e.g., bill payment)

(b) Retailing Payments

- (i) Credit Cards (e.g., VISA or Master Card)
- (ii) Private label credit/debit cards (e.g., J.C. Penney Card)
- (iii) Charge Cards (e.g., American Express).

(c) On-line electronic commerce payments

- (i) Token-based payment systems
 - (a) Electronic cash (e.g., Digi Cash)
 - (b) Electronic checks (e.g., Net Cheque)
 - (c) Smart cards or debit cards (e.g., Mondex Electronic Currency Card)
- (ii) Credit card-based payments systems
 - (a) Encrypted Credit Cards (e.g., World Wide Web form-based encryption)
 - (b) Third-party authorization numbers (e.g., First Virtual)

5. Electronic Data Interchange (EDI)

Electronic Data Interchange (EDI) is the computer-to-computer exchange of business documents between companies in standard data format using networks, such as VANs or the Internet. It replaces the paper-based exchange of business documents. A standard format is used in EDI so that the computer will be able to read and understand the documents. It is widely used by big companies for e-commerce purposes. Business enjoy major benefits of EDI such as reduced cost, increased processing speed, information security, reduced errors and improved relationships with business partners.

As more and more companies get connected to the Internet, EDI is becoming increasingly important as an easy mechanism for companies to buy, sell, and trade information. EDI offers automated and efficient business therefore many businesses, government agencies and other organizations use EDI every day in the regular course of business.

EDI documents can flow directly out of a sender's computer system directly into a receiver's computer system without any human intervention and processing can begin immediately.

3.7 DEFINITION, INTERNET - OVERVIEW OF INTERNET, ARCHITECTURE AND FUNCTIONING OF INTERNET

Q23. Define Internet. How did it evolve.

Ans :

Computer network is a group of computers linked together, so that they can share information and resources. Internet is a global "network of networks". It can also be described as information highway. It is the world's largest network of computers. The networks are related to academics, research, government and include users of all types of profiles i.e., corporate, individuals, professionals, children, schools, institutes etc. It may be remembered that computer is not located at a single site, not controlled by any central authority. The networking in the internet are not directly connected but interconnected. The ability to graphically access internet resources throughout the web is the primary reason for the phenomenal growth of the internet.

The internet can be known as a kind of global meeting place where people from all parts of the world can come together. It is a service available on the computer, through which everything under the sun is now at the fingertips of anyone who has access to the internet.

To get 'online', meaning to connect to the Internet, you need to have:

➤ **A Computer**

A computer is also called a "Data Processor" because it can store, process, and retrieve data whenever desired. Computer equipment is a sizeable investment and thus you should select a computer carefully. Before buying a computer, understand your needs and then choose one accordingly.

➤ **Internet Service Provider**

This is the software that you will require to get online. You can now choose from a dial-up service or 24-hour broadband services. This is the service that will help you to connect to the Internet and start your surfing experiences.

In the early days, most people just used the internet to search for information. Today's internet is a constantly evolving tool that not only contains an amazing variety of information, but also provides new ways of accessing, interacting and connecting with people and content).

History

The Internet has its root in the ARPANET system of the Advanced Research Project Agency of the U.S. Department of Defense. ARPANET was the first WAN and had only four sites in 1969. The Internet evolved from basic ideas of ARPANET for interconnecting computers, and was used by research organizations and universities initially to share and exchange information. In 1989, the U.S. Government lifted restrictions on use of the Internet, and allowed it to be used for commercial purposes as well. Since then, the Internet has grown rapidly to become the world's largest network. It now interconnects more than 30,000 networks, allowing more than 10 million computers, and more than 50 million computer users in more than 150 countries around the world to communicate with each other. The Internet continues to grow at a rapid pace.

Q24. State the characteristics of internet.

Ans :

i) Internet is a network of networks

There are several layers and modes of communications among the layers. Hence, some standards have been raised to allow a proper level of communication across networks. However, these standards do not restrict the access of information to a particular location. The information flows freely across the networks in a standardized manner.

ii) Flexibility

Another remarkable feature of the Internet is Flexibility on the transfer of the data. Internet is basically a network that carries information in digital form in the majority of the cases instead of voice information in analog form.

iii) Ubiquitous

Internet connections are not fixed from point to point for the duration of the Data sent over the internet is in the form of packets. It transmits a small part of the data, verifies it is correct and then sends more information toward the destination. Internet does not require all of the information to be delivered through the same path at the same time. Available everywhere at any time. Reduces transaction cost. Shopping can be done easily.

iv) Client-server architecture

The internet follows a client-server architecture. A server is a computer loaded with a software package that provides requested information to clients. A client is a software program that contacts a server and requests information.

v) Readily accessible customers

When it comes to affiliate marketing, this is one of the most admired business models. Affiliate marketing entails selling a product or service developed by one person or entity by third parties. The other parties engaged in the sale of these goods or services earn a

share of profit in this. The business owner provides marketing collateral such as banners, affiliate links, sales letters, etc.

vi) Internet marketing tools

Internet marketing tools are necessary for any online business. These tools include enormous features that will not only take your marketing techniques to a diverse level but also make the supervision of sites and simple procedure which will ultimately lead to high search Engine rankings. These dissimilar tools that can be of use include SEO (Search Engine Optimization), email marketing, SEM (Search Engine Marketing) and another medium as banner advertisements, etc.

Q25. Explain the advantages of internet.

Ans :

The advantages of Internet are given below:

1. E-mail

Email is an essential communication tools in todays world. With e-mail one can send and receive instant electronic messages, which works like writing letters. Messages are delivered instantly to people anywhere in the world, unlike traditional mail that takes a lot of time. Email is free, fast and very cheap when compared to telephone, fax and postal services.

2. 24 hours a day

7 days a week: Internet is available, 24x7 days for usage.

3. 'Information

There is a huge amount of information available on the internet for just about every subject, ranging from government law and services, trade fairs and conferences, market information, new ideas and technical support. One can find any type of data on almost any kind of subject by using search engines like google, yahoo, msn, etc.

4. On-line Chat

Chat facility can be used to meet new people, make new friends, as well as to stay in touch with friends. Commonly used chat messengers are MSN, gmail and yahoo websites.

5. Services

Many services are provided on the internet like net banking, job searching, purchasing tickets, hotel reservations, guidance services on array of topics engulfing the every aspect of life.

6. Communities

Communities of all types have sprung up on the internet. Its a great way to meet up with people of similar interest and discuss common issues.

7. Shopping

There are many on-line stores and sites that can be used to look for products as well as buy them using credit card. Through internet all shopping could be done sitting conveniently @ your home.

8. Entertainment

Internet provides facility to access wide range of Audio/Video songs, plays films. Many of which can be downloaded. One such popular website is YouTube.

9. Software Downloads

You can freely download innumerable, softwares like utilities, games, music, videos, movies, etc from the Internet.

Q26. Explain the disadvantages of Internet.

Ans :

The disadvantage of internet are given below.

1. Theft of Personal Information

With the use of Internet there are chances that personal information such as name, address, credit card, bank details and other information can be accessed by unauthorized persons. If you use a credit card or internet

banking for on-line shopping, then your details can also be 'stolen'.

2. Most parents do not realize the dangers involved when their children log onto the Internet

When children talk to others on-line, they do not realize they could actually be talking to a harmful person. Moreover, pornography is also a very serious issue concerning the Internet, especially when it comes to young children.

3. Virus threat

Virus is a program created to disrupts the normal functioning of computer systems. Computers attached to internet are more prone to virus attacks and they can end up into crashing your whole hard disk.

4. Spamming

It is often viewed as the act of sending unsolicited email. This multiple or vast emailing is often compared to mass junk mailings.

5. Phishing

Phishing attack refers to sending a convincing mail to targetted user with an embedded url in the same. When the user clicks the url it directs the user to the phishing website. And when the person enters there personal details, the same is utilized by phisher to transfer money.

Q27. Explain briefly about internet Addressing and architecture.

Ans :

(Imp.)

The IP address is a familiar term for most computer users. An IP address is the unique numerical address of a device in a computer network that uses Internet Protocol for communication. The IP address allow you to pinpoint a particular device from the billions of devices on the Internet. To send you a letter, someone needs your mailing address. In the same sense, one computer needs the IP address of another computer to communicate with it.

An IP address consists of four numbers; each can contain one to three digits. These numbers are separated with a single dot (.). These four numbers can range from 0 to 255.

An example is: 204.81.205.32

The format of an IP address is a 32-bit numeric address written as four numbers separated by periods. Each number can be zero to 255. For example, 1.160.10.240 could be an IP address.

IP address classes

Class	Address Range
Class A	0.0.0.0 to 127.255.255.255
Class B	128.1.0.1 to 191.255.255.254
Class C	192.0.1.1 to 223.255.254.254
Class D	224.0.0.0 to 239.255.255.255
Class E	240.0.0.0 to 254.255.255.254

Types of IP addresses

The IP addresses can be classified into two. They are listed below.

1. Static IP addresses
2. Dynamic IP addresses

Let us see each type in detail.

1. Static IP Addresses

As the name indicates, the static IP addresses usually never change but they may be changed as a result of network administration. They serve as a permanent Internet address and provide a simple and reliable way for the communication. From the static IP address of a system, we can get many details such as the continent, country, region and city in which a computer is located, The Internet Service Provider (ISP) that serves that particular computer and non-technical information such as precise latitude and longitude of the country, and the locale of the computer. There are many websites providing IP address lookups. You can find out your IP addresses at <http://whatismyip.org>.

2. Dynamic IP Addresses

Dynamic IP address are the second category. These are temporary IP addresses. These IP addresses are assigned to a computer when they get connected to the Internet each time. They are actually borrowed from a pool of IP addresses, shared over various computers. Since limited number of static IP addresses are available, ISPs usually reserve the portion of their assigned addresses for sharing among their subscribers in this way.

Static IP addresses are considered as less secure than dynamic IP addresses because they are easier to track.

3.7.1 WWW**Q28. Define World Wide Web.**

Ans :

The World Wide Web - commonly referred to as WWW, W3, or the Web - is an inter connected system of public WebPages accessible through the Internet. The Web is not the same as the Internet: the Web is one of many applications built on top of the Internet.

The system we know today as “the Web” consists of several components:

- The **HTTP** protocol governs data transfer between a server and a client.
- To access a Web component, a client supplies a unique universal identifier, called a **URL** (uniform resource location) or **URI** (uniform resource identifier) (formally called Universal Document Identifier (UDI)).
- **HTML** (hypertext markup language) is the most common format for publishing web documents.
- Soon after inventing the Web, Tim Berners-Lee founded the **W3C** (World Wide Web Consortium) to standardize and develop the Web further. This consortium consists of core Web interest groups, such as web browser developers, government entities, researchers, and universities.

Q29. State the uses of www.

(OR)

Discuss the uses of www.

Ans :

1. Establish a Presence

Over seven Million people have access to the World Wide Web with more and more added every day. Modern companies can easily and inexpensively expand with a new store.

2. Networking

Develop lines of communication that promote contact with potential clients and organizations.

3. Provide Business Information

Like any printed form of advertising, the web site can post business services, hours, location, phone and e-mail for the public to view, but unlike the traditional advertising mediums, web site can have instant communication with information about your company that changes regularly. Information on how and why people should use company, frequently asked questions, and more can all be just a few mouse clicks away.

4. Service to Customers

Customers can have access to business information and services that may not be available any other way. Clients can be from anywhere in the world and shop in your store like never before and from the comfort of their homes.

5. Conduct Business

A web site does not have to make money to be considered a successful endeavor, but it does not hurt to generate some type of income. The web site can provide customers with the tools needed to locate the exact product that they are looking for and the forms needed to purchase any item (or) service online. This can occur automatically without draining human resources 24 hours a day

6. Provide Files to Download

All pamphlets, brochures, advertisements, and even a demonstration video of product or service can be downloaded from web site.

7. Remote Employee/Office Access

Employees on the road or in satellite offices may need up-to-the-minute information to properly accomplish their tasks. Sensitive information can be protected with a password for employee access only. For the cost of a local phone call an employee can log into the “office” from anywhere in the world at any time.

Q30. Explain the features of www.

Ans :

- The amount of information available on the internet has become so large that it is difficult to search for specific information. The World Wide Web (WWW) makes retrieval easy and quick.
- The WWW is a search tool that helps you find and retrieve information from a website using links to other sites and documents. The WWW was built on the technology called Hypertext. This technology increases accessibility to linked documents on the internet and helps user to navigate between documents very easily.
- Hypertext is identified by underlined text and a different color usually. Hypertext can make links within the same document or to other documents.
- Each time you access a new document by choosing a link, there is a connection made with the web server that the document is on. Once the appropriate document is retrieved the connection is broken. There is no point in maintaining the link while you are viewing it. This is one reason why the WWW is so efficient.
- The WWW is intended to help people share information resources, and services with the widest possible community of users. Thus a user can access the WWW on Apple, UNIX, Macintosh, DOS, Windows, and other operating systems.
- Just like the Internet, the WWW has a protocol, which is known as HyperText Transfer Protocol (HTTP).

Q31. Explain the Architecture of www.

Ans :

(Imp.)

The WWW is a distributed client/server service, in which a client using a browser can access a service using a server. However, the service provided is distributed over many locations called sites, as shown in figure.

Each site holds one or more documents, referred to as web pages. Each web page can contain a link to other pages in the same site or at other sites. The pages can be retrieved and viewed by using browsers.

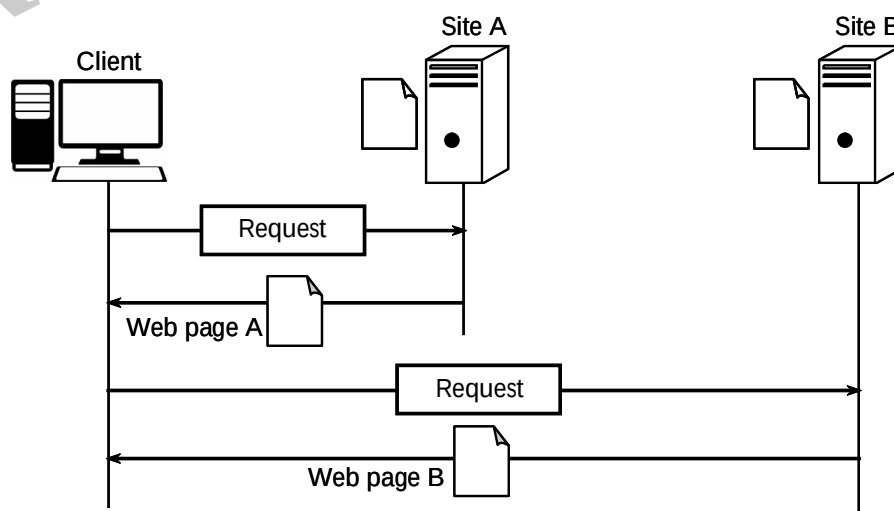


Fig.: Architecture of WWW

The client needs to see some information that it knows belongs to site A. It sends a request through its browser, a program that is designed to fetch web documents. The request, among other information, includes the address of the site and the web page, called the URL (**Uniform Resource Locator**).

The server at site A finds the document and sends it to the client. When the user views the document, the user finds some references to other documents, including a web page at site B. The reference has the URL for the new site. The user is also interested in seeing this document. The client sends another request to the new site, and the new page is retrieved.

3.7.2 FTP

Q32. What is file transfer protocol(FTP)? List the steps involved in downloading/uploading a file by using FTP service.

Ans :

Meaning

File Transfer Protocol service (known as FTP in short) enables an Internet user to move a file from one computer to another on the Internet. A file may contain any type of digital information - text document, image, artwork, movie, sound, software, etc. Moving a file from a remote computer to ones own computer is known as downloading the file, and moving a file from ones own computer to a remote computer is known as uploading the file.

By using FTP service, a file transfer takes place in following manner:

1. A user executes the ftp command on his/her local computer, specifying address of the remote computer as a parameter.
2. An FTP process running on user's computer (called FTP client process) establishes a connection with an FTP process running on remote computer (called FTP server process).
3. The system then asks the user to enter his/her login name and password on the remote computer to ensure that the user is authorized to access the remote computer.
4. After successful login, desired file(s) are downloaded or uploaded by using get (for downloading) and put (for uploading) commands. User can also list directories, or move between directories of the remote computer, before deciding which file(s) to transfer.

Notice that a user needs access rights for a remote computer to transfer files to/from it. With this restriction, it is almost impossible to provide access rights to the vast number of users on the Internet to a computer that contains sharable information. The concept of anonymous FTP site is used to overcome this problem. An anonymous FTP site is a computer allowing a user to log in with a username of anonymous and a password that is user's e-mail address. The user can then download files that have been stored on it for sharing. Such sites are called publicly accessible sites because any user on the Internet can access them.

Of course, FTP service is also used for more secure file transfer operations. In such cases, a user needs a valid username and password to access a particular computer. This is common; for example, for organizations that wish to let only certain people access their computer.

3.7.3 Telnet

Q33. List some common uses of telnet service offered by the Internet.

Ans :

Telnet service enables an Internet user to log in to another computer on the Internet from his/her local computer. That is, a user can execute the telnet command on his/her local computer to start a login session on a remote computer. This action is also called "remote login."

To start a remote login session, a user types the command telnet and address of the remote computer on his/her local computer terminal. The system then asks the user to enter a login name (user ID) and a password. That is, the remote computer authenticates the user to ensure that he/she is authorized to access it. If the user specifies a correct login name and password, he/she is logged on to the remote computer. Once login session is established with the remote computer, telnet enters input mode, and anything typed on the terminal of the local computer by the user is sent to the remote computer for processing.

Some common uses of telnet service are:

1. Using computing power of remote computer. The local computer may be an ordinary personal computer and the remote computer may be a powerful super computer.
2. Using a software on remote computer. A software that a user wants to use may not be available on his/her computer.
3. Accessing remote computer's database or archive. An information archive of interest to a user, such as public database or library resources may be available on the remote computer.
4. For logging in to one's own computer from another computer. For example, if a user is attending a conference in another city and has access to a computer on the Internet, he/she can telnet to his/her own computer and read his/her electronic mails or access some information stored there.

3.7.4 Gopher

Q34. Define Gopher.

Ans :

Gopher is an application-layer protocol that provides the ability to extract and view Web documents stored on remote Web servers. Gopher was conceived in 1991 as one of the Internet's first data/file access protocols to run on top of a TCP/IP network. It was developed at University of Minnesota and is named after the school's mascot.

Gopher was designed to access a Web server or database via the Internet. It requires that files be stored in a menu-style hierarchy on a Gopher server that is accessible through a Gopher-enabled client browser and/or directly. It initially supported only text-based file/document access but later came to support some image formats such as GIF and JPEG.

Gopher was succeeded by the HTTP protocol and now has very few implementations. Gopher-based databases, servers or websites can be accessed through two search engines: Veronica and Jughead.

3.7.5 Browsers and Search Engines

Q35. Explain briefly about web browser.

Ans :

To be used as a web client, a computer needs to be loaded with a special software tool known as WWW browser (or browser in short). Browsers normally provide following navigation facilities to help users save time while Internet surfing (process of navigating the Internet to search for useful information):

1. Unlike FTP and Telnet, browsers do not require a user to log in to a server computer remotely, and then to log out again when the user has finished accessing information stored on server computer.
2. Browsers enable a user to visit a server computer's site directly and access information stored on it by specifying its URL (Uniform Resource Locator) address. URL is an addressing scheme used by WWW browsers to locate sites on the Internet.
3. Browsers enable a user to create and maintain a personal hotlist of favorite URL addresses of server computers that the user is likely to visit in future frequently. A user's hotlist is stored on his/her local web client computer. Browsers provide hotlist commands to enable a user to add, delete, update URL addresses in hotlist, and to select an URL address of a server computer from hotlist, when the user wants to visit the server computer.
4. Many browsers have a "history" feature. These browsers maintain a history of server computers visited in a surfing session. That

is, they save (cache) in local computer's memory, the URL addresses of server computers visited by a user during a surfing session, so that if the user wants to go back to an already visited server later on (in the same surfing session), the link is still available in local computer's memory.

5. Browsers enable a user to download (copy from a server computer to local computer's hard disk) information in various formats (i.e., as a text file, as an HTML file, or as a Post Script file). The downloaded information can be later (not necessarily in the same surfing session) used by the user. For example, downloaded information saved as a Post Script file can be later printed on a Post Script compatible printer, where even graphics will be reproduced properly.

Q36. What are the different types of web browsers.

Ans :

1. Internet Explorer

Internet Explorer (IE) is a product from software giant Microsoft. This is the most commonly used browser in the universe. This was introduced in 1995 along with Windows 95 launch and it has passed Netscape popularity in 1998.

2. Mozilla Firefox

Firefox is a new browser derived from Mozilla. It was released in 2004 and has grown to be the second most popular browser on the Internet.

3. Safari

Safari is a web browser developed by Apple Inc. and included in Mac OS X. It was first released as a public beta in January 2003. Safari has very good support for latest technologies like XHTML, CSS2 etc.

4. Lynx

Lynx is a fully-featured World Wide Web browser for users on Unix, VMS, and other platforms running cursor-addressable, character-cell terminals or emulators.

Q37. Explain briefly about search engine.

Ans :

Search Engine refers to a huge database of internet resources such as web pages, newsgroups, programs, images etc. It helps to locate information on World Wide Web.

User can search for any information by passing query in form of keywords or phrase. It then searches for relevant information in its database and return to the user.

Components

Generally there are three basic components of a search engine as listed below:

1. Web Crawler
2. Database
3. Search Interfaces

1. Web crawler

It is also known as spider or bots. It is a software component that traverses the web to gather information.

2. Database

All the information on the web is stored in database. It consists of huge web resources.

3. Search Interfaces

This component is an interface between user and the database. It helps the user to search through the database.



Working

Web crawler, database and the search interface are the major component of a search engine that actually makes search engine to work. Search engines make use of Boolean expression AND, OR, NOT to restrict and widen the results of a search. Following are the steps that are performed by the search engine:

- The search engine looks for the keyword in the index for predefined database instead of going directly to the web to search for the keyword.
- It then uses software to search for the information in the database. This software component is known as web crawler.
- Once web crawler finds the pages, the search engine then shows the relevant web pages as a result. These retrieved web pages generally include title of page, size of text portion, first several sentences etc.

Examples

Following are the several search engines available today:

Search Engine	Description
Google	It was originally called Backrub. It is the most popular search engine globally.
Bing	It was launched in 2009 by Microsoft. It is the latest web-based search engine that also delivers Yahoo's results.
Ask	It was launched in 1996 and was originally known as AskJeeves. It includes support for match, dictionary, and conversation question.
AltaVista	It was launched by Digital Equipment Corporation in 1995. Since 2003, it is powered by Yahoo technology.
AOL.Search	It is powered by Google.
LYCOS	It is top 5 internet portal and 13th largest online property according to Media Matrix.
Alexa	It is subsidiary of Amazon and used for providing website traffic information.

3.8 TELECONFERENCE

Q38. Explain in detail about Teleconference.

Ans :

Meaning

Teleconferencing means meeting through a telecommunications medium. It is a generic term for linking people between two or more locations by electronics. There are at least six types of teleconferencing: audio, audiographic, computer, video, business television (BTV), and distance education. The methods used differ in the technology, but common factors contribute to the shared definition of teleconferencing:

- Use a telecommunications channel
- Link people at multiple locations
- Interactive to provide two-way communications
- Dynamic to require users' active participation

Types

(i) Audio Teleconference

Voice-only; sometimes called conference calling. Interactively links people in remote locations via telephone lines. Audio bridges tie all lines together. Meetings can be conducted via audio conference. Preplanning is necessary which includes naming a chair, setting an agenda, and providing printed materials to participants ahead of time so that they can be reviewed.

Distance learning can be conducted by audio conference. In fact, it is one of the most underutilized, yet cost effective methods available to education. Instructors should receive training on how to best utilize audio conferences to augment other forms of distance learning.

(ii) Audiographics Teleconference

Uses narrowband telecommunications channels to transmit visual information such as graphics, alpha-numerics, documents, and video pictures as an adjunct to voice communication. Other terms are desk-top computer conferencing and enhanced audio. Devices include electronic tablets/boards, freeze-frame video terminals, integrated graphics systems (as part of personal computers), Fax,

remote-access microfiche and slide projectors, optical graphic scanners, and voice/data terminals.

Audiographics can be used for meetings and distance learning.

(iii) Computer Teleconference

Uses telephone lines to connect two or more computers and modems. Anything that can be done on a computer can be sent over the lines. It can be synchronous or asynchronous. An example of an asynchronous mode is electronic mail. Using electronic mail (E-Mail), memos, reports, updates, newsletters can be sent to anyone on the local area network (LAN) or wide area network (WAN). Items generated on computer which are normally printed and then sent by facsimile can be sent by E-Mail.

Computer conferencing is an emerging area for distance education. Some institutions offer credit programs completely by computer. Students receive texts and workbooks via mail. Through common files assigned to a class which each student can assess, teachers upload syllabi, lectures, grades and remarks. Students download these files, compose their assignment and remarks off-line, then upload them to the common files.

Students and instructors are usually required to log on for a prescribed number of days during the week. Interaction is a large component of the students' grades.

Through computers, faculty, students and administrators have easy access to one another as well as access to database resources provided through libraries. The academic resources of libraries and special resources can be accessed such as OCLC, ERIC, and Internet.

Administrators can access student files, retrieve institutional information from central repositories such as district or system offices,

government agencies, or communicate with one another. Other resources can be created such as updates on state or federal legislation.

(iv) Video Teleconference

Combines audio and video to provide voice communications and video images. Can be one-way video/two-way audio, or two-way video/two-way audio. It can display anything that can be captured by a TV camera. The advantage is the capability to display moving images. In two-way audio/video systems, a common application is to show people which creates a social presence that resembles face-to-face meetings and classes and enables participants to see the facial expressions and physical demeanor of participants at remote sites. Graphics are used to enhance understanding. There are three basic systems: freeze frame, compressed, and full-motion video.

Video conferencing is an effective way to use one teacher who teaches to a number of sites. It is very cost effective for classes which may have a small number of students enrolled at each site. In many cases, video conferencing enables the institution or a group of institutions to provide courses which would be canceled due to low enrollment or which could not be supported otherwise because of the cost of providing an instructor in an unusual subject area. Rural areas benefit particularly from classes provided through video conferencing when they work with a larger metropolitan institution that has full-time faculty.

Through teleconferencing, institutions are able to serve all students equitably.

3.9 WEB CONFERENCING PLATFORMS

Q39. Define Web Conferencing.

Ans :

Web conferencing is a very general term for various kinds of technologies that allow two or more people from different locations to hold a live conference over the Internet. The history of Web

conferencing since the 1990s is part of the history of technological advancement in general, with many aspects of these technologies relying on other bigger advances, such as the Internet and improved processing power for hardware.

Web conferencing generally takes place over the Internet using TCP/IP connections. Early Web conferencing tools relied on the Internet to send text messages, then audio and, eventually, high-resolution video. Today's technologies include tools for different types of webinar, webcasting and videoconferencing uses. These may be based on point-to-point or multicast systems. Many are based on VoIP technologies.

Although a number of Web conferencing tools have proliferated over the years, some companies like Skype, which offers free long-distance video calls via the Internet and which was acquired by Microsoft in May 2011, have been around much longer. Many other popular brands have been developed for enterprise Web conference. Many of these offer specific features such as call monitoring, multiparty collaboration and more.

Q40. Explain various Web Conferencing platforms

Ans : (Imp.)

1. Zoom

Zoom is a heavy hitter in the video conferencing world because of the many options included in every plan. The platform also boasts flawless video, crystal clear audio and instant sharing capabilities that make it our favorite option for video conferencing. Many people who use Zoom often switch from other conference call software because of frustrations they face using other available platforms.

Zoom is the ideal web meeting software for users who want to simply and effectively connect with customers and clients remotely. It also has Chrome and Linux OS support

for increased flexibility and secure socket layer (SSL) encryption to guarantee secure communications.

All Zoom plans include :

- Screen sharing from desktops, tablets or mobile devices
- Whiteboarding
- HD video and voice
- Unlimited number of meetings per month
- Secure Socket Layer (SSL) encryption
- Chat and messaging (private and group)
- Scheduling with Chrome extensions
- Meeting record option
- Ability to join a meeting by telephone
- Instant or scheduled meetings
- Online support
- Breakout rooms
- Breakout capabilities let you divide your meetings into as many as 50 separate sessions

2. Microsoft Teams

Microsoft Teams is designed for seamless efficiency and collaboration. It integrates with Office applications like Word and SharePoint, and its design and infrastructure make it exceptionally interactive. The company has also made it possible to integrate Skype for Business into Microsoft Teams.

This program was designed as a response to the growing number of collaboration tools, like Slack, that have dominated the market in the last few years. Microsoft Teams is a catch-all chat tool for the workplace, but its video conferencing option is just as compelling and powerful. Users can launch video conferences directly from their chats.

All Microsoft Teams plans include :

- Web version of Word, Excel and PowerPoint

- File storage and sharing
- Up to 300 users
- 24/7 phone and web support

One of the newest features included in Microsoft Teams allows users to invite guests that are not part of their enterprise's Azure Active Directory. In addition, the mobile version of Microsoft Teams supports voicemail on Android and iOS.

3. GoToMeeting

Even though GoToMeeting no longer dominates the video conferencing space, it remains a highly polished remote meeting software with a long list of features that would satisfy the needs of most business environments.

This user-friendly software has a few important advantages over its competitors, including its polling and "raise a hand" features. Furthermore, GoToMeeting allows unlimited video meetings and secures these meetings with end-to-end encryption.

All GoToMeeting plans include :

- 24/7 customer care
- HD video
- Unlimited meetings
- Screen sharing from desktops, tablets or mobile devices
- Messaging
- Web audio – no phone required
- Security

With a 14-day free trial, you can see the ease and convenience of the features first-hand.

Participants

GoToMeeting allows 10 to 250 participants, depending on the type of plan you get. However, the free version allows a maximum of three participants vs. up to 100 on other platforms.

Skype for Business

Packaged with Microsoft Office 365, Skype for Business is likely already familiar to many

users. The business version takes the free, standard platform's capabilities to the next level.

All Skype for Business plans include :

- Unlimited meetings
- Screen sharing
- Instant messaging anytime
- Tight security
- Conferencing with up to 250 participants

Skype can also easily integrate with Microsoft Office programs like Word, Excel, PowerPoint, OneNote and Outlook.

By adding an enterprise package, meeting leaders can host up to 250 participants over a secure connection. Upgrading to Online Plan 2 adds HD video and audio calling, a 50GB mailbox and up to 1 TB file storage and mobile technical support.

Microsoft recently announced that it will be retiring Skype for Business requiring users to find a new solution.

4. ezTalks Meetings

Perhaps the biggest selling points of ezTalks Meetings are its continuous technological advancements and its developers' unwavering commitment to introducing cutting-edge features and state-of-the-art video meeting protocols.

This solution is compatible with Android and iOS devices and has a relatively straightforward user interface, even for first-time users. ezTalks Meetings is a solid web application for video conferencing in healthcare, community and education. However, with less distribution and adoption as Zoom, you may find less partners familiar with the tool.

All ezTalks Meetings plans include :

- Unlimited number of meetings
- Instant or scheduled meetings
- Join by telephone call-in

- HD video and audio
- Private and group chat
- Interactive whiteboards
- Screen sharing with co-annotation

In the free version, it's possible to accommodate as many as 100 people in a single meeting for up to 40 minutes, and host an unlimited number of HD video conferencing recordings on this platform.

5. Star Leaf

Star Leaf is outfitted with its own API, which makes it possible to customize its conferencing. The company provides an extensive range of upgrades and integrations including Slack and Skype for Business, and it comes with a complimentary app for Android, iOS and Windows users.

StarLeaf's unique architecture allows you to deliver business-wide connectivity, avoiding the limitations associated with virtual meeting room solutions. The platform is an incredible alternative for those who don't want to spend on costly on premise video infrastructure.

All StarLeaf plans include :

- Global audio dial-in telephone numbers
- Full interoperability with Skype for Business
- Unlimited guest invitations
- Calendar integrations with Outlook and Google

6. Cisco Webex

Cisco Webex is an excellent video collaboration software for online training, webinars and remote support. In particular, it's excellent for businesses that have legitimate security concerns. This teleconference software features Transport Layer Security (TLS), third-party accreditations, encryption, firewall compatibility, single sign-on and secure scheduling options.

Cisco Webex includes seamless integration with Outlook and the ability to use it across

different platforms including Mac, Windows and iPads. What's more, Cisco Webex is part of an ecosystem of interoperable solutions for working remotely. It allows you to add specialized functionalities for training, remote technical support or webinars.

All Cisco Webex plans include :

- Screen sharing
- HD video
- Unlimited meetings
- Cloud recording and storage (limits vary by plan)
- Business-hours phone support for lower level plans and 24/7 support for pricier plans

Participants

The free video conferencing version of Cisco Webex is limited, only allowing two participants in meetings. For paid plans, Webex allows between 50 and 1,000 participants.

Short Question & Answers

1. What is a network?

Ans :

Meaning

A network is a group of interconnected computers to share resources, exchange files or allow communication.

A computer network is a group of computer systems and other computing hardware devices that are linked together through communication channels to facilitate communication and resource-sharing among a wide range of users.

Definition

- (i) **According to Tenenbaum**, "Network as an interconnected collection of autonomous computers."

Computer networking is the process of inter connecting two or more computers so that the users can communicate with each other, share resources and overcome other limitations of stand-alone systems. The network can be established with a variety of combinations of computers such as a net of only microcomputers, microcomputers and one or more minicomputers and a set of microcomputers connected to a mainframe computer. The computers in typical network are autonomous in the sense that they have processing capability independent of the network.

2. Explain the advantages and disadvantages of Local Area Network (LAN).

Ans :

Advantages

1. File and Program Sharing

It permits sharing of software, files and etc. For example, suppose your friend or junior in office wanted you to check a document, he or she doesn't need to carry that document from ground floor to 4th floor.

When computers are networked together one can open the file from your computer, make changes, and then save the file on that computer without interrupting others.

2. Sharing of Printers

Hardware resource like a laser printer is very expensive. An organization cannot afford to attach a printer to each of its computers. Since there is a need of printers, several employees would need to share one. It is tedious for an employee to carry a printer and attach it to his/ her machine after his/her colleague has finisher using it. With a LAN, employees can sit on their computers, give print commands, and the printer that may be attached to a machine in some other corner of the office would do the printing.

3. Communication

Another use of a LAN is that it can help make the computer do the job of an office intercom. We can use the computer to flash messages on the screen of one computer, or a selected group of computers or all the computers in the office. This would save employees the time they would use in going to some desk in another department, on some other floor to deliver a message or a notice. This also reduces the need for face-to-face meetings and the need to circulate a notice among the employees.

Disadvantages

1. Reliability

With a single LAN, a service interruption, even of short duration, could result in a major disruption for users.

2. Capacity

A single LAN could be saturated as the number of devices attached to the network grows over time.

3. Cost

A single LAN technology is not optimized for the diverse requirements of interconnection and communication. The presence of large numbers of low-cost microcomputers dictates that network support for these devices be provided at low cost. LANs that support very-low-cost attachment will not be suitable for meeting the overall requirement.

3. State the advantages and disadvantages of metropolitan area network(MAN).

Ans :

Advantages

- (i) It utilizes drawbacks of both LAN and WAN to provide larger and controllable computer network.
- (ii) MAN requires fewer resources compare to WAN. This saves the implementation cost.
- (iii) It helps people interface fast LANs together. This is due to easy implementation of links.
- (iv) It provides higher security compare to WAN.
- (v) It helps in cost effective sharing of common resources such as printers etc.
- (vi) Like LAN and WAN, it also offers centralized management of data and files.

Disadvantages

- (i) It is difficult to manage the network once it becomes large.
- (ii) It is difficult to make the system secure from hackers and industrial espionage.
- (iii) Network installation requires skilled technicians and network administrators. This increases overall installation and management costs.
- (iv) It requires more cables for connection from one place to the other compare to LAN.

4. Define topology.

Ans :

Topology of a network refers to the way in which the network's nodes (computers or other devices that need to communicate) are linked together. It determines the various data paths

available between any pair of nodes in the network. Although number of possible network topologies is seemingly limitless, four major ones are star network, ring network, completely connected network, and multi-access bus network. Choice of a topology for a computer network depends on a combination of factors such as:

- Desired performance of the system.
- Desired reliability of the system.
- Size (number of nodes and their geographical distribution) of the system.
- Expandability of the system.
- Cost of components and services required to implement the network.
- Availability of communication lines.
- Delays involved in routing information from one node to another.

5. What is data communication ?

Ans :

Meaning

Data communication technologies deal with means and methods of data transfer from one location to another. Marriage between computing and data communication technologies is one of the most exciting developments that has revolutionized information age. This development gave birth to computer networks.

Characteristics**1. Delivery**

The system must deliver data to the correct destination. Data must be received by the intended device or user and only by that device or user.

2. Accuracy

The system must deliver the data accurately. Data that have been altered in transmission and left uncorrected are unusable.

3. Timeliness

The system must deliver data in a timely manner. Data delivered late are useless. In the case of video and audio, timely delivery means delivering data as they are produced, in the same order that they are produced, and without significant delay. This kind of delivery is called real-time transmission.

6. Define Internet

Ans :

Computer network is a group of computers linked together, so that they can share information and resources. Internet is a global “network of networks”. It can also be described as information highway. It is the world’s largest network of computers. The networks are related to academics, research, government and include users of all types of profiles i.e., corporate, individuals, professionals, children, schools, institutes etc. It may be remembered that computer is not located at a single site, not controlled by any central authority. The networking in the internet are not directly connected but interconnected. The ability to graphically access internet resources throughout the web is the primary reason for the phenomenal growth of the internet.

The internet can be known as a kind of global meeting place where people from all parts of the world can come together. It is a service available on the computer, through which everything under the sun is now at the fingertips of anyone who has access to the internet.

To get ‘online’, meaning to connect to the Internet, you need to have:

➤ **A Computer**

A computer is also called a “Data Processor” because it can store, process, and retrieve data whenever desired. Computer equipment is a sizeable investment and thus you should select a computer carefully. Before buying a computer, understand your needs and then choose one accordingly.

➤ **Internet Service Provider**

This is the software that you will require to get online. You can now choose from a dial-up service or 24-hour broadband services. This is the service that will help you to connect to the Internet and start your surfing experiences.

In the early days, most people just used the internet to search for information. Today's internet is a constantly evolving tool that not only contains an amazing variety of information, but also provides new ways of accessing, interacting and connecting with people and content).

7. State the characteristics of internet.

Ans :

i) Internet is a network of networks

There are several layers and modes of communications among the layers. Hence, some standards have been raised to allow a proper level of communication across networks. However, these standards do not restrict the access of information to a particular location. The information flows freely across the networks in a standardized manner.

ii) Flexibility

Another remarkable feature of the Internet is Flexibility on the transfer of the data. Internet is basically a network that carries information in digital form in the majority of the cases instead of voice information in analog form.

iii) Ubiquitous

Internet connections are not fixed from point to point for the duration of the Data sent over the internet is in the form of packets. It transmits a small part of the data, verifies it is correct and then sends more information toward the destination. Internet does not require all of the information to be delivered through the same path at the same time. Available everywhere at any time. Reduces transaction cost. Shopping can be done easily.

iv) Client-server architecture

The internet follows a client-server architecture. A server is a computer loaded with a software package that provides requested information to clients. A client is a software program that contacts a server and requests information.

8. World Wide Web.

Ans :

The World Wide Web - commonly referred to as WWW, W3, or the Web - is an inter connected system of public WebPages accessible through the Internet. The Web is not the same as the Internet: the Web is one of many applications built on top of the Internet.

The system we know today as "the Web" consists of several components:

- The **HTTP** protocol governs data transfer between a server and a client.
- To access a Web component, a client supplies a unique universal identifier, called a **URL** (uniform resource location) or **URI** (uniform resource identifier) (formally called Universal Document Identifier (UDI)).
- **HTML** (hypertext markup language) is the most common format for publishing web documents.

9. Define Gopher.

Ans :

Gopher is an application-layer protocol that provides the ability to extract and view Web documents stored on remote Web servers. Gopher was conceived in 1991 as one of the Internet's first data/file access protocols to run on top of a TCP/IP network. It was developed at University of Minnesota and is named after the school's mascot.

Gopher was designed to access a Web server or database via the Internet. It requires that files be stored in a menu-style hierarchy on a Gopher server that is accessible through a Gopher-enabled client browser and/or directly. It initially supported only text-based file/document access but later came to support some image formats such as GIF and JPEG.

10. Teleconference.

Ans :

Meaning

Teleconferencing means meeting through a telecommunications medium. It is a generic term for linking people between two or more locations by electronics. There are at least six types of teleconferencing: audio, audiographic, computer, video, business television (BTV), and distance education. The methods used differ in the technology, but common factors contribute to the shared definition of teleconferencing:

- Use a telecommunications channel
- Link people at multiple locations
- Interactive to provide two-way communications
- Dynamic to require users' active participation

11. Define Web Conferencing.

Ans :

Web conferencing is a very general term for various kinds of technologies that allow two or more people from different locations to hold a live conference over the Internet. The history of Web conferencing since the 1990s is part of the history of technological advancement in general, with many aspects of these technologies relying on other bigger advances, such as the Internet and improved processing power for hardware.

Web conferencing generally takes place over the Internet using TCP/IP connections. Early Web conferencing tools relied on the Internet to send text messages, then audio and, eventually, high-resolution video. Today's technologies include tools for different types of webinar, webcasting and videoconferencing uses. These may be based on point-to-point or multicast systems. Many are based on VoIP technologies.

Choose the Correct Answer

1. GUI stands for _____. [d]
(a) Graph Use Interface (b) Graphical Universal Interface
(c) Graphical Unique Interface (d) Graphical User Interface
2. Any data or instruction entered into the memory of a computer is considered as [b]
(a) Output (b) Input
(c) Storage (d) Information
3. Which of the following items is not used in LAN? [b]
(a) Computer (b) Modem
(c) Printer (d) Cable
4. Connecting different computers in an organized manner, within an office building can be termed as _____ [d]
(a) ANN (b) MAN
(c) WAN (d) LAN
5. LAN stands for: [b]
(a) Local Area Node (b) Local Area Network
(c) Local Access Node (d) Light Access Node
6. A type of Network: [d]
(a) LAN (b) MAN
(c) WAN (d) All of these
7. To connect two networks of similar systems you'll use [a]
(a) Bridge (b) Gateway
(c) Switch (d) Router
8. Which of the following might not be present in a compu network? [c]
(a) NIC (b) Switch
(c) Modem (d) NOS
9. Which of the following is not described as a typical netw classification? [d]
(a) Local area network (b) Wide area network
(c) Metropolitan area network (d) County area network
10. What is the use of Bridge in Network? [a]
(a) to connect LANs (b) to separate LANs
(c) to control Network Speed (d) All of these
11. Which of the following is not a transmission medium? [c]
(a) Telephone lines (b) Coaxial cables
(c) Modem (d) Microwave systems

Fill in the blanks

1. _____ is any behaviour that results in an exchange of meaning.
2. _____ technologies deal with means and methods of data transfer from one location to another.
3. A _____ is a multi port bridge with a buffer and a design that can boost its efficiency.
4. Brouter It is also known as _____.
5. _____ is a continuous process.
6. Bandwidth is measured in _____.
7. _____ systems use very high frequency radio signals to transmit data through space.
8. _____ fibers are hair-thin threads of glass or plastic used as data transmission medium like copper wires or coaxial cables.
9. _____ as an interconnected collection of autonomous computers.
10. EDI stands for _____.

ANSWERS

1. Communication
2. Data communication
3. Switch
4. Bridging router
5. Communications
6. Bits per second
7. Microwave
8. Optical
9. Network
10. Electronic data interchange

UNIT IV

FUNCTIONAL AREAS OF INFORMATION SYSTEMS:

Management Levels and Functional Systems, Manufacturing, Production, Sales and Marketing Systems, Accounting, Finance and HR Systems,

ENTERPRISE SYSTEMS AND APPLICATIONS:

Concepts of ERP, SCM, CRM, CPFR, Knowledge Management Systems, System Development Life Cycle (SDLC), Electronic Fund Transfer (EFT).

4.1 MANAGEMENT LEVELS

Q1. Discuss about levels of management.

Ans : (Imp.)

The different levels of management activity are as follows,

(i) Strategic Level

In this level of management, senior-level managers formulate strategies in order to achieve organizational goals. The managers at this level are referred to as strategic managers and they are responsible for developing organizational goals, making beneficial strategies, crucial policies and objectives they achieve through long term plans. However, the strategic planning decisions are taken only once. On the other hand, they acquire information in a summarized data form through variety of sources such as external data including competitors policy, market condition, government policies etc.

(ii) Administrative Level

In this level, middle-level managers or executives are held responsible for defining business models and also to perform decisions on control actions. This level makes use of both internal and external data in the form of summary for decision making purpose. Apart from this, middle-level managers also make new decision rules (or) set new goals that are usually applied by senior level managers.

(iii) Operational Level

In this level of management, the executives spend time in taking operational decisions. Clearly, the operational control employs pre-established procedures and decision rules for supervising the activities. These decisions to a large extent are flexible and procedures in this regard are stable. As the managers at this level manage day-to-day activities, they maintain a detail report of these business affairs.

4.2 FUNCTIONAL SYSTEMS

Q2. Explain briefly about functional business system.

Ans :

Business information system in marketing, manufacturing, and human resources with a special emphasis on computer integrated manufacturing. It describes the most widely used types of accounting information systems as well as information needed for the effective financial management of a firm.

Functional Business information systems:

- Marketing
- Production/operations
- Accounting
- Finance
- Human resource management

4.2.1 Manufacturing**Q3. Discuss briefly about manufacturing information system.**

Ans : (Imp.)

Manufacturing information system is a complete set of tool for managing the flow of manufacturing production data throughout the enterprise. This IS was designed to provide tools for both IT and operations personnel who would deliver services to anyone in the plant.

Manufacturing consists of many different disciplinary areas including product engineering, facility design and scheduling, fabrications, and quality control management. Each of them can be dramatically improved by using information systems.

A manufacturing system takes material, equipment, data management and information systems technology as the input and uses manufacturing and information processes to generate better final product as output. The manufacturing designed around the transaction process of raw materials into usable components or materials. These systems are value added processes such as materials processing or support systems such as scheduling.

The decisions to be taken in manufacturing systems are as follows,

1. Product design
2. Plant location and layout
3. Production planning and control
4. Quality control.

1. Product Design

Product design is also called product engineering. It refers to the scenario of the product development starting from the initial stage to the start level of the manufacturing stage. Product design includes activities such as preparation of drawings, specifications, experimental and developmental efforts. Currently, product design involves CAD (Computer Aided Design) and CAE (Computer Aided Engineering) approaches.

2. Plant Location and Layout

Plant location is used for determining specific region or place to establish an organization. It is useful for partial determination of operating and capital costs. And each eventual location involves a new allocation of capacity to the corresponding market region. Plant location is a continuous process.

On the other hand, plant layout usually represents the physical arrangement of machines, equipments and other services within a pre-designed building with the assurity of steady, smooth and economical flow of material. It is also a continuous process, because there is always scope for enhancement over the existing design.

3. Production Planning and Control

Production planning and control includes the function of organizing the entire manufacturing system for producing a product. It is the planning for the production in manufacturing firm prior to the commencement of the actual production and then controlling it in order to make sure that the planned production is achieved in terms of quality, quantity, cost of its production and schedule of delivery.

Production planning and control is the foremost activity of production process wherein firms make decisions regarding the materials and physical facilities so as to optimally achieve the pre-determined objectives. It involves the planning, allocating and co-ordinating activities.

4. Quality Control

Quality control is usually a process in which the entire development process is inspected, analyzed deeply and suitably tested so as to make sure that the product produced satisfied all the specifications, which were laid prior to the development process.

When the product is analyzed through all the above mentioned processes, a feedback report is developed and is provided to the development team. This is an important activity through which, if any limitations existed in the product, can be easily eliminated. Hence, quality control mechanisms check to see that the product is up to date with all specifications and requirements.

4.2.2 Production

Q4. What is production information system?

Ans :

(Imp.)

Meaning of Production

Production may be defined as conversion of inputs-men, machine, materials, money, methods and management (6Ms) into output through a transformation process. Output may be goods produced or services rendered.

Production is a method employed for making or providing essential goods and services for consumers. It is a process that puts intangible inputs like ideas, creativity, research, knowledge, wisdom, etc. in use or action. It is a way that transforms (convert) tangible inputs like raw-materials, semi-finished goods and unassembled goods into finished goods or commodities.

Meaning of System

System is an arrangement or assembly of inter-dependent processes (activities) that are based on some logic and function. It operates as a whole and is designed (build) with an intention to achieve (fulfill) some objective or do some work. Huge systems are often a collection (assembly) of smaller sub-systems.

Definition of Production System

Production system may be defined as,

‘The methods, procedure or arrangement which includes all functions required to accumulate (gather) the inputs, process or reprocess the inputs, and deliver the marketable output (goods).’

Production system utilizes materials, funds, infrastructure, and labour to produce the required output in form of goods.

Components

Production system consists of three main components viz., Inputs, Conversion Process and Output.

- (a) **Inputs** include raw-materials, machines, man-hours, components or parts, drawing, instructions and other paper works.
- (b) **Conversion process** includes operations (actual production process). Operations may be either manual or mechanical or chemical. Operations convert inputs into output. Conversion process also includes supporting activities, which help the process of conversion. The supporting activities include; production planning and control, purchase of raw-materials, receipt, storage and issue of materials, inspection of parts and work-in-progress, testing of products, quality control, warehousing of finished products, etc.
- (c) **Output** includes finished products, finished goods (parts), and services.

The three components of a production system are depicted in this diagram.

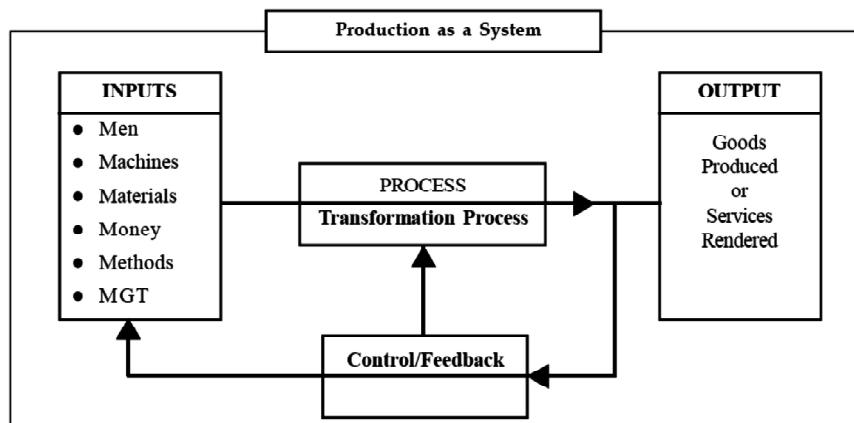


Fig.: Production as a System

Hence, we can say that, production system is a union or combination of its three main components viz., Inputs, Conversion Process, and Output. In short, everything which is done to produce goods and services or to achieve the production objective is called production system.

Examples

The examples of a production system are as follows:

- (a) **Tangible goods :** Consider an example of a manufacturing industry like a Sugar Industry. Here, sugarcane is first used as an input, then the juice of sugarcane is processed through a conversion process, finally to get an output known as a refined sugar (used for mass consumption).
- (b) **Intangible goods :** Consider an example from a service industry that of a software-development firm or company. Here, initially, written program codes are used as an inputs. These codes are then integrated in some database and are provided with a user-friendly interface through a conversion process. Finally, an output is made available in form of an executable application program.

Production system is a result of arranging inputs, their conversion process and output based on some logic and functions. Production system fails if any such arrangement made don't give a desired level of outcome.

4.2.3 Sales and Marketing Systems

Q5. Discuss about the Marketing information system (MKIS).

Ans :

(Imp.)

The role of MKIS is to assess the marketing managers information needs then develop the framework for collecting information and distribute the information gathered to the end users in time. The marketing information system is generally carried out marketing need analysis, planning, and implementation and control functions of marketing managers.

The needed information is developed through internal company records, marketing intelligence activities, marketing research and marketing decision support analysis.

Different parts of MKIS

- Accounting information system
- Marketing , sales and customer services
 - sales force automation
 - saves company labours hours and telephone expenses

- capture customer data
- response time to customer inquiries
- market research and intelligence information system
 - customer research
 - market research
 - competitor intelligence
 - Competitor's products.
 - Competitor's Operating strengths and weaknesses.
 - Customer service level and customer policies.
 - New product line.

The important functions of the marketing process are discussed below,

1. Marketing Identification Function

It is important to determine the potential buyers and their characteristics so that their needs and desires can be made satisfiable. This will help the marketer to know about the buyers with the following information,

- Buyers location
- Time of buying
- Buying routine
- Quantity of buying.

2. Purchase Motivation Function

This function is used to make an evaluation of different social, economical and psychological forces that have impact on the purchase behaviour of the market.

3. Product Adjustment Function

This function is used to perform all those activities essential for matching the product/ services offerings with the market. Since the requirements of customer keeps on varying, therefore some corresponding modification is needed in the form of product planning.

4. Physical Distribution Function

This function considers the actual movement of goods starting from the production to the consumption.

5. Communication Function

This function is used to establish communication between the buyers and the sellers for exchange of information and messages. This function contains decisions related to advertisement personal selling, publicity, sales promotion, issues of packaging and so on.

6. Transaction Function

This function is used to perform all those activities that can help in transferring of ownership title of goods or services between the parties in a transaction. Some examples of such activities may include invoicing, insurance policy, credit arrangement and so on.

7. Post-transaction Function

This function is used to obtain the feedback regarding the performance of the product or service from the customer. This feedback helps in assuming the quality of product or service to satisfy the customer.

4.2.4 Accounting

Q6. Discuss briefly about Accounting information system.

Ans :

Accounting information system is the part of organizations information system. The information system processes a mixture of quantitative and qualitative data but the accounting information system focuses almost entirely on processing quantitative data. The accounting system and information system must work together in an effective and efficient way.

Accounting information system provide efficient delivery of information needed to perform necessary accounting work and to assist in delivery of accurate and informative data to users especially those who are not familiar with the accounting and financial reporting areas itself. A high value of data processing characterizes these applications. Data processing consists of 4 major tasks- data gathering, data manipulation, data storage, and document preparation.

Sources

- Procedures manual
- Management accounts / balance sheets
- Financial data
- Accounting policies
- Tax details
- Working capital

Types

- **General ledger system:** this module helps organizations leverage the GL processing speeds available streamline accounting processes and reduce the period end close cycle.
- **Asset management:** this module help streamline tracking, depreciation and maintenance scheduling of asset improve productivity with easier access to critical information derive maximum tax benefits and minimize risk of loss or damage to capital assets. It maintains an inventory of the company's long term assets.
- **Order entry system:** it captures and manages different kinds of data relating to a transaction such as number of units sold customer billing.
- **Account receivable and payable system:** this module helps organizations bill customers automatically from any sales channel, streamline accounts receivables processing and automate the invoicing process.
- **Inventory control system:** it captures processes and manages all issues related to the company's inventory such as items in inventory, inventory cost, lost items and damages items.
- **Payroll system:** it captures and processes data related to salaries including taxes, other deductions, benefits, overtime and other related data.

- **Cash management:** this module helps organizations forecast cash flows in any currency and in multiple time periods, streamline the reconciliation process, monitor exceptions and fraud and manage the cash cycle efficiently with control.

4.2.5 Finance**Q7. Discuss briefly about Financial information system.**

Ans :

Financial information system is a sub system of organisational management information system. This sub system supports the decision making process of financial functions at the level of an organization.

A brief description of each of the financial decisions that a financial manager has to take is given below.

- **Capital budgeting decision:** In this decision funds are allocated to long term asset which would yield benefits in the future. Example: funds allocated for land, building, machinery, etc...
- **Financial decision:** The financial manager has to decide about the proportion of equity and debt capital.
- **Dividend decision:** This decision relates to the dividend policy of the organization. A decision whether the organization should distribute all profits or retain them or distribute a portion and retain the balance has to be taken by the financial managers.
- **Current asset management:** In order to safeguard the organization against liquidity or insolvency current assets of the organization are also required to be efficiently managed.

4.2.6 HR Systems

Q8. Discuss about Human resources information system.

Ans :

(Imp.)

This functional information system supports the functions of human resource management of an organization. The function involves:

(i) Manpower planning

It is about deciding the present and future needs of manpower in the organization.

(ii) Staffing

This function includes recruitment, selection and placement of employees. Recruitment refers to attracting qualified and competent people for different jobs.

(iii) Training and development

The need to train and develop the employees is felt due to

- A gap between the job requirements and competence of the employee.
- The need to develop lower level managers to assume higher level responsibility when required.

(iv) Performance evaluation

This task is concerned with evaluating employee performance at work in terms of pre determined standards and norms. Evaluation or performance appraisal includes the formulation of performance appraisal plans, development of appraisal techniques and programmes etc...

(v) Separation activities

The employee employer relations may come to an end due to the resignation of an employee, layoff, death or retirement. HRM besides the above mentioned functions is also responsible for the wages and salary administration, sustaining and maintaining the work force in the organization and maintaining of healthy and peaceful labour management relations.

It contains 3 function flow of human resource information system.

- **Transaction data:** It is a basis for various types of output information or analysis. The data includes employee number, name, qualification, experience, joining data etc... Categories and grades of posting and daily performance etc...
- **Environmental data:** Includes data about the availability of personnel, trends in the labour force, competition, market offering to the employees, government and labour laws etc...
- **Organisational plans:** It also provide an important input in human resource information system, on the basis of which future planning for recruitment, job assignment, etc.,

4.3 ENTERPRISE SYSTEMS AND APPLICATIONS

Q9. Explain about enterprise application architecture.

Ans :

The enterprise application architecture is shown in the figure below.

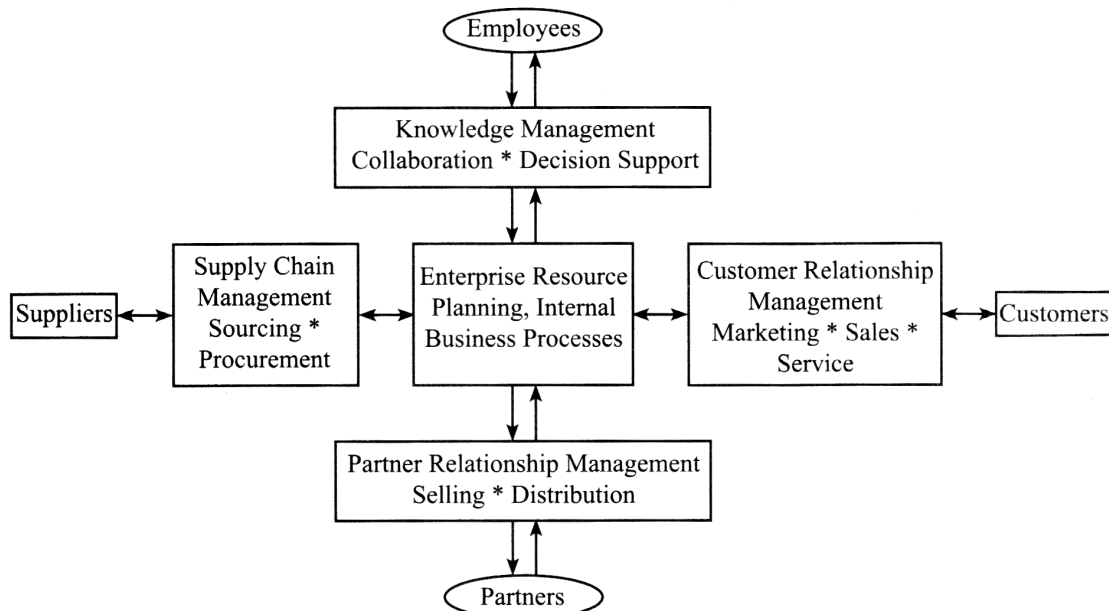


Fig. : Enterprise Application Architecture

Enterprise application architecture shows the interrelationship of cross-functional enterprise applications. This architecture specifies the conceptual framework that allows visualization of components, interfaces and processes of e-business applications. Besides this, interrelationship among various components, interfaces and processes of e-business applications. In addition to this, the enterprise application architecture also specifies the role of customers, suppliers, partners and employees in business system.

An enterprise application architecture includes the major cross-functional enterprise applications like,

1. Enterprise Resource Planning (ERP)
2. Customer Relationship Management (CRM)
3. Supply Chain Management (SCM)
4. Partner Relationship Management (PRM)
5. Knowledge Management (KM).

1. Enterprise Resource Planning (ERP)

Enterprise Resource Planning (ERP) focuses on improving efficiency with respect to internal production, distribution and financial processes of organizations.

2. Customer Relationship Management (CRM)

Customer Relationship Management (CRM) focuses on obtaining and retaining the customers who provides high profits to the organization/enterprise through sales, marketing and service processes.

3. Supply Chain Management (SCM)

Supply Chain Management (SCM) concentrates on defining most efficient and effective source and procurement processes to the firm suppliers for performing business product and service.

4. Partner Relationship Management (PRM)

Partner Relationship Management (PRM) focuses on obtaining and retaining those partners who are capable of enhancing the product and services of firms through sale and distribution.

5. Knowledge Management (KM)

Knowledge Management (KM) defines set of tools to employees that are used for group collaboration and decision support.

4.4 CONCEPTS OF ERP**Q10. What is ERP? Discuss the Evolution of ERP.**

Ans :

Meaning

Enterprise Resource Planning (ERP) consists of techniques and concepts to improve the efficiency of integrated business management and to make effective use of the management resources. ERP packages contain functions for the management of primary business processes and fundamental planning for different ERP modules like sales management, product management, financial and accounting systems, etc. These packages contains functions not only for manufacturing industry but for various types of industries. It uses an ERP software to model and automate many core processes of the business. It integrates major business processes of an organization such as customer order fulfillment and manufacturing that allows the information to flow automatically.

Evolution of ERP

Enterprise Resource Planning (ERP) is evolved in number of steps. The following figure shows the evolution of ERP.

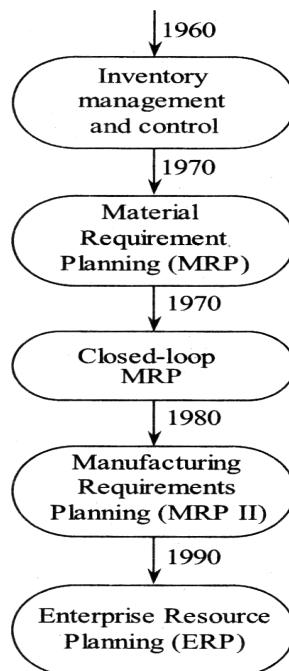


Fig.: Evolution of ERP

1. Inventory Management and Control

Inventory management and control evolved in the year 1960. It combines the business processes and information technology to maintain the appropriate inventory stock level in a warehouse. The inventory management performs the activities that include determining the requirements for inventory, providing techniques and options for replenishment, setting targets, examining the usages of items, reporting the status of inventory and unifying the inventory balances.

2. MRP

In mid 1960's Bill of Materials (BOM) was the main stream. The growth in the BOM process resulted in MRP (Materials Requirement Planning). MRP has evolved in 1960's but it become popular in 1970s. It fulfilled the needs of manufacturing and production people mainly in ordering materials and components. To know the products that are going to be produced in the industry MRP makes use of Master Production Schedule (MPS). It gets the information about the required material from the BOM and stock related details from inventory records. With MRP manufacturing process became simple.

3. Closed-loop MRP

Apart from preparing material reordering schedules, MRP even records all the order due dates and reminds if an item failed to arrive on the due date. This will be useful in production process to reduce uncertainty. These capabilities resulted in the development of new tools and techniques for requirement planning, production schedules, sales planning, capacity planning, forecasting, production levels and atomizing processes across entire organization. These achievements finally, helped in the creation of closed loop MRP

Closed-loop MRP evolved in 1970, which included series of functions to automate production processes and supports planning and execution. It gives priorities to the processes and depending on these priorities it updates the planning functions.

4. MRP II

MRP II (Manufacturing Resource Planning) evolved after the closed-loop MRP. It includes some extra features like operational planning, financial interface and capabilities for decision-making. It includes functions related to execution support systems, capacity requirements planning, demand management, production planning, material requirement planning, master scheduling, business planning, sales and operational planning. The results from the above functions is integrated based on the financial reports, shipping budget etc.

5. ERP (Enterprise Resource Planning)

ERP has evolved in 1990, the basics of ERP are similar to MRP II. It is an extension of MRP and includes the capabilities of MRP II.

To improve the level of performance of business processes ERP makes use of multi-module application software. It includes application modules for finance, accounting, human resources and marketing. They integrate 'business activities from different functional departments such as production planning, inventory control, order fulfillment, order tracking, purchasing and product distribution.

ERP is a collection of planning and scheduling tools, it connects suppliers, customers and provides foundation for effective supply-chain management and e-commerce. It coordinates sales, operations, logistics, marketing, finance, human resource, purchasing and product development. It focuses at productivity cost reduction, inventory turnover and customer services. ERP contains only one set of resource planning tools for entire enterprise.

Q11. Discuss the life cycle of ERP.**(OR)****Describe the various stages of ERP.****(OR)****Discuss how to develop ERP System.****Ans :** **(Imp.)****1. Pre-selection Screening**

This is the first phase of the ERP implementation system. When an organization decides to use the ERP system, it initially searches for the best ERP package. There are many packages available in the market and most of them are similar to each other.

The companies choose few packages to evaluate their features. It is better to limit the selection to not more than five. This is because, the process of package evaluation is time consuming. Each package has its own merits and demerits, the pre-selection screening process eliminates those packages which are of no use to the organization.

2. Detailed Package Evaluation

This is an important phase in the implementation of ERP system, since it determines whether the selected package results in the successful project or an unsuccessful project. Before purchasing the package, it is necessary to ensure that the purchased package alone can perform the required functionality. This is because if the selected package fails, then it is very difficult to switch to another process as it consumes both time as well as cost. While analyzing the package, the decision-making team should note that none of the packages are capable of fulfilling all the requirements of the company.

Therefore, the primary objective of selection process is not to search for the package that fulfill all the requirement of the

company but to identify a package that is flexible for satisfying the requirements of the company.

3. Project Planning Phase

In this phase, the designs of implementation process is carried out by a committee consisting of team leaders. This committee is in turn supervised by ERP incharge who regularly review the planning process.

4. Gap Analysis

It is one of the important phase of ERP implementation. In this step, the company develops a model that determines the existing progress level of the company and also the level where the company is deciding to move in the future. In other words, it can be said that, the model developed helps in determining the functional gaps. While evaluating the ERP packages, it has been inferred that even the best ERP package is not capable of fulfilling all the functional requirements of the company.

5. Reengineering

This phase considers the human factors that effect the ERP implementation. Re-engineering have been used as a "downsizing" tool by the top management officials to reduce the number of employees working in the organization. They have made purchase of the ERP package as the basis of the cut-down in employee strength.

The implementation of the ERP system changes the business process and employee responsibilities and makes the process easy and efficient. Therefore, implementation of ERP system must be considered as an investment for growth of the business rather than a tool to reduce the number of employees. In addition to this, another perspective of reengineering in ERP field is Business Process Reengineering (BPR), which is an ERP implementation mode.

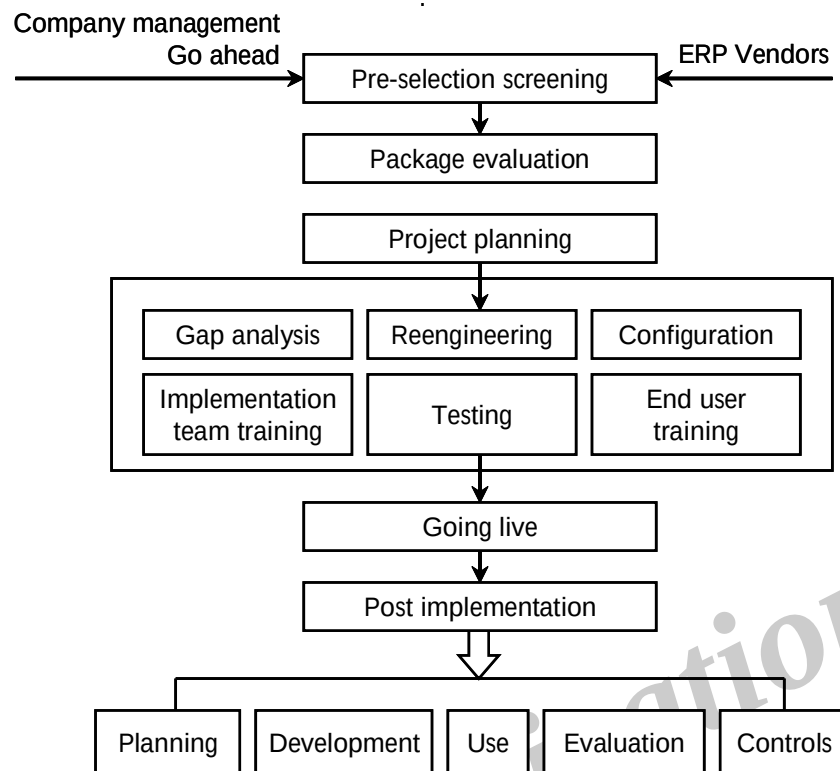


Fig. : Stages of ERP

6. Customization

It is one of the major functional area of ERP implementation process. As an ERP package is not perfect in satisfying all the requirements of a company, it is necessary to configure and customize the existing business process with regards to the ERP package.

This is done by completely under-standing the business processes and then mapping these processes such that they matches with the overall objectives of the company. However, while performing the mapping activity it is necessary for the company to simultaneously perform their operations. This can be achieved by developing a prototype which generally is a simulation of the actual business process.

7. Team Training

When the customization phase is underway, the management starts training the employees regarding the way of implementing the system. The employees are trained to adapt to the change bought by the ERP system and to run the business process in a new and efficient way. The employees are selected based on their capabilities and knowledge i.e., employees who are enthusiastic, good learners and have the potential are trained to use the ERP system.

8. Testing

Testing is a phase where the capability of the implemented system is tested. The system is tested so as to determine what actions are carried out when,

- (i) An invalid data is entered
- (ii) Hacker tries to hack into the system
- (iii) The system is overloaded

9. Going-live

It is a phase where the ERP system is practically implemented by all the members of the organization. From the technical perspective, all the required operations are performed including the data conversion. And from the functional perspective, the prototype is configured, tested and is used for performing the activities. The ERP system is considered operational even if the implementation team members are testing and executing it successfully only for certain period of time. Whenever, the new system is being implemented, then the existing system needs to be removed.

10. End-user Training

This phase is performed prior to going-live phase. In this phase, the end-users (i.e., the real users) who are going to use the ERP system and carryout the business activities are trained. Depending upon the capabilities, talent and skills, the employees are distributed among different groups and trained about the new system. This training helps the users to get used to the new system and understand their responsibilities regarding the new method of business process. This training is of high importance as the success and failure of the ERP system depends on the usage of the end-users.

Apart from this, the users are also trained about the task that they needs to perform after the ERP system goes live. However, because of the ignorance towards computers and technology, many people are scared to leave the traditional ways of business process. This makes it difficult for them to get adapted to new system and hence they become resistant towards the change. So, to overcome these situations, the top management of the company needs to take necessary measures such as interacting with the employees and building confidence in them.

End-user training is not only important but is also a complex process in contrast to the implementation team training. Hence, end-user training is taken up seriously and is given high priority by the organizations.

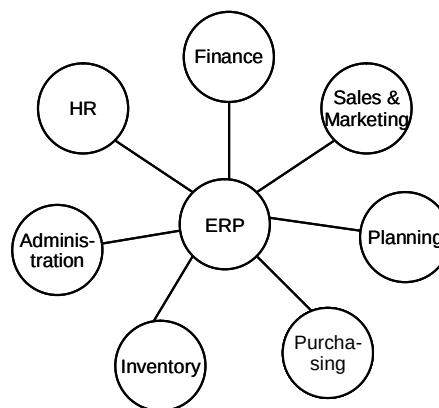
11. Post Implementation Phase

This phase deals with the operation and maintenance of the installed ERP system. After the implementation of the ERP system, the responsibilities of vendors and consultants are completed. Now, to achieve the benefits of ERP system it needs to be adapted by every individual employee of the organization. The employees or the users must be capable of handling any problem that may arise during the implementation of the new system. The company consists of technical expertise who have the ability of performing any improvements and enhancements within the system irrespective of the time.

Q12. What are the different ERP packages?**(OR)****Explain the various modules of ERP.****Ans :****(Imp.)**

In today's world Enterprise Resource Planning is termed as intelligent business solution that works to enhance productivity and increase profitability. The main purpose of ERP system is to interconnect different departments within an organization and improve flow of information. An ERP system consist several erp modules that work to improve different business processes which leads to overall increase in the efficiency of workforce.

In simple language, an ERP module can be referred as a group of software programs that performs an important function in ERP software. Let's take a look at different ERP modules present in ERP software.

**Fig.: ERP Modular**

(i) Administration module

The admin module in the ERP looks over defining and assigning role to User's. in simple language, it tells who has to do what in the ERP system. It also controls and manages User's password policy. User session tracking, back-up, and database check are some of the functions and routine activities performed by Admin module.

(ii) Finance module

It is one of the important ERP modules. The finance ERP module collects financial data and generates reports such as quarterly financial statements, overall balance sheets, Profit and Loss A/c, Creditors balance, ledgers and several other financial reports. The finance ERP module is capable of taking care of all financial entries in the database and their effect on the system

(iii) Sales and Marketing module

The Sales ERP module manages different business processes such as order scheduling, order placement, order execution, invoicing, and shipping.

Some ERP software companies offer combined Sales and Marketing module in ERP system. A combined Sales and Marketing module also handles business processes such as direct mailing campaign, lead generation and several other important marketing and sales functions.

(iv) Human Resources module

The main function of ERP HR module is to maintain employee data such as contact information, attendance, salary details, performance evaluation and several other important employee details. The HR ERP module stores and manages all employee information from application to retirement. In some ERP software solutions, the HR ERP module is divided in four major sections that include Recruitment, Training, Attendance and Payroll functions.

(v) Inventory module

The primary function of ERP Inventory module is to maintain appropriate stock in a warehouse. The module recognizes inventory requirement, monitor item utilization, provide replenishment options, and report inventory status of all items in warehouse.

(vi) Purchasing module

The purchasing ERP module streamlines procurement of raw materials. Different processes such as recognizing potential suppliers, price negotiation, awarding purchase order and billing requires no human intervention. The Purchase module is strongly integrated with other modules such as production planning, inventory control to avoid over purchasing.

These are some of the functional ERP modules in a generic and customized ERP system. Nowadays, large and small businesses approach ERP Software Company to order customized ERP solutions. When you order a customized ERP solution for your business, the ERP software company developing the software studies different business processes within your organization and designs and develops an ERP system that streamlines flow of information and enhances efficiency of all employees. A customizer ERP system may contain ERP modules other than mentioned above.

Q13. Explain Emerging trends in ERP market.

Ans :

Modern companies are putting an end to legacy systems and consolidating their fragmented IT environment. Moreover, small companies are also getting ready to implement integrated business systems. The AMR report gives the following trends of ERP market in the year 2004.

1. The use of Service-Oriented Architecture (SOA) in ERP packages is a major step towards new technology. The ERP market has already started this transition phase.

2. Big companies are acquiring small ERP firms. Recently, Oracle acquired 'Retek' even though it had already acquired PeopleSoft and JD Edwards. Moreover, small ERP vendors like Sage group, Epicor, SSA global etc., are actively participating in mergers and acquisitions and hence their market is rapidly increasing.
3. Now-a-days ERP customers do not purchasing large, up-front packages. Instead they are buying functional ERP modules incrementally. This paved way for discounting and smaller deals.
4. The vendors of ERP offers with large number of solutions related to enterprise application such as CRM and SCM. These applications are sold to present ERP customer base we observe that many specialized enterprise application vendors are taken over by large enterprise vendors as their survival becoming difficult.

Q14. Explain the issues related to ERP maintenance and support.

Ans :

(Imp.)

1. Managing Transitions

The ongoing maintenance and support of ERP system is based upon how successful is the transition from implementation to support team. The management of ERP implementation and support is done by two different teams. In other words, the support team must acquire necessary knowledge transfer document handover and changes of open issues from implementation team.

As soon as the implementation team finishes its project, it leaves the site within weeks of 'Go Live'. After this, the new team acquires the site and manages the system. At this point, the support team faces the challenges in the inception because, there exist various issues.

2. Managing Multiple Vendors

The organization demands one or many individual vendors for support of the ERP such that one vendor for hardware support

and other vendor for network support. This becomes a challenge as issues flow from one support to another.

3. Managing Regular Upgrades

Many ERP vendors consistently provide latest upgrades of their packages. Consequently, the ERP systems does not support the older versions of the packages. But, these systems needed to be updated even though the latest versions offers many new features which are of no use to the ERP vendors.

This updation can be expensive at time. As a consequence most of the companies perform only technical upgradation, this ascertains that the vendors are capable of supporting latest versions. The vendors treat every single upgrade as an individual project which consumes financial and different organizational resources.

4. Getting Right People

Getting the right people and making them do the same job regularly is a big challenge because highly qualified people show interest in new implementation rather than continuing in support role. As a consequence many organizations these days hire expertise IT organization to handover ERP maintenance job.

5. Technology Obsolence

The outdated technology or technology obsolence is said to be a biggest challenge in ERP systems. We observe that SaaS and cloud computing alters those models in which ERP solutions are established without the hardware and software investments. While the business requirements demands large developments previously, but now they are treated as a part of standard applications.

The SOA is new software development model whereas mobile collaborative applications are the necessity. Thus, organizations should manage technology obsolence and newly introduced technologies in an effective way.

6. Managing Large Application Portfolios

The ERP vendors introduces various applications for a particular business needs such as data warehousing applications reporting applications, supplier relationship management applications, customer relationship management applications and product life cycle management applications. Interestingly, such applications are obtained from multiple vendors such as ERP from SAP, CRM from Siebel and SRM from Ariba. Thus, management of these portfolio could be a challenging task for one or many vendors as they may have different support skills.

Q15. What are the challenges for the implementation of ERP system.

Ans :

- ERP systems are very expensive to purchase and implement.
- Extensive change is required to existing process.
- It can be difficult to integrate the ERP systems with existing legacy systems.
- There is an inherent risk associated with having a single vendor for all information systems.
- The risk and impact of implementation failure is increased.
- The conversion of data to the ERP systems from legacy systems is a complex process.

4.5 SUPPLY CHAIN MANAGEMENT (SCM)**Q16. What is supply chain management?**

Ans :

Supply chain management (SCM) is a management concept that integrates the management of supply chain processes. Many companies are making SCM a top strategic objective of their E-business initiatives. It is an absolute requirement if they want to meet their E-commerce customer value imperative. Companies are reengineering their supply chain processes through the aid of Internet technologies and supply chain management software.

Definitions

- (i) **According to Jones and Riley**, "Supply chain management deals with the total flow of material from supplier through end user".
- (ii) **According to Cooper and Ellram**, "Supply chain management is an integrative philosophy to manage the total flow of distribution channel from the supplier to the ultimate user".
- (iii) **According to Marty Weil**, "Supply chain management is the ability to get closer to the customer".
- (iv) **According to Professor Douglas M. Lambert**, "Supply chain management as the integration of business process from the end user through original suppliers who provide products, services, and information that adds value for the customer".

The goal of supply chain management is to:

- Give customer what they want
- Give customers what they want, and where they want it
- Give customers what they want, where they want it, and at the lowest possible cost.

Q17. Elucidate the Evolution of supply chain management?

Ans :

(Imp.)

1. Creation Era

The term supply chain management was first coined by a U.S. industry consultant in the early 1980s. However, the concept of a supply chain in management was of great importance long before, in the early 20th century, especially with the creation of the assembly line. The characteristics of this era of supply chain management include the need for large-scale changes, re-engineering, downsizing driven by cost reduction programs, and widespread attention to the Japanese practice of management.

2. Integration Era

This era of supply chain management studies was highlighted with the development of Electronic Data Interchange (EDI) systems and developed through the introduction of Enterprise Resource Planning (ERP) systems. This era has continued to develop into the 21st century with the expansion of internet-based collaborative systems. This era of supply chain evolution is characterized by both increasing value-adding and cost reductions through integration.

3. Globalization Era

The third movement of supply chain management development, the globalization era, can be characterized by the attention given to global systems of supplier relationships and the expansion of supply chains over national boundaries and into other continents. Although the use of global sources in the supply chain of organizations can be traced back several decades (e.g., in the oil industry), it was not until the late 1980s that a considerable number of organizations started to integrate global sources into their core business. This era is characterized by the globalization of supply chain management in organizations with the goal of increasing their competitive advantage, value-adding, and reducing costs through global sourcing.

4. Specialization Era—Phase One: Outsourced Manufacturing and Distribution

Companies abandoned vertical integration, sold off non-core operations, and outsourced those functions to other companies. This changed management requirements by extending the supply chain well beyond company walls and distributing management across specialized supply chain partnerships.

This transition also re-focused the fundamental perspectives of each respective organization. An Original Equipment Manufacturer (OEM) became brand owners that needed deep visibility into their supply base. They had to control the entire supply chain from above instead of from within.

Contract manufacturers had to manage bills of material with different part numbering schemes from multiple OEMs and support customer requests for work -in-process visibility and vendor-managed inventory (VMI).

The specialization model creates manufacturing and distribution networks composed of multiple, individual supply chains specific to products, suppliers, and customers, who work together to design, manufacture, distribute, market, sell, and service a product. The set of partners may change according to a given market, region, or channel, resulting in a proliferation of trading partner environments, each with its own unique characteristics and demands.

5. Specialization Era—Phase Two: Supply Chain Management as a Service

Specialization within the supply chain began with the inception of transportation brokerages, warehouse management, and non-asset-based carriers and has matured beyond transportation and logistics into aspects of supply planning, collaboration, execution and performance management.

At any given moment, market forces could demand changes from suppliers, logistics providers, locations and customers, and from any number of these specialized participants as components of supply chain networks. This variability has significant effects on the supply chain infrastructure, from the foundation layers of establishing and managing the electronic communication between the trading partners to more complex requirements including the configuration of the processes and work flows that are essential to the management of the network itself.

6. Supply Chain Management 2.0 (SCM 2.0)

Building on globalization and specialization, the term SCM 2.0 has been coined to describe both the changes within the supply chain itself as well as the evolution of the processes, methods and tools that manage it in this new "era".

Web 2.0 is defined as a trend in the use of the World Wide Web that is meant to increase creativity, information sharing, and collaboration among users. At its core, the common attribute that Web 2.0 brings is to help navigate the vast amount of information available on the Web in order to find what is being sought. It is the notion of a usable pathway. SCM 2.0 follows this notion into supply chain operations. It is the pathway to SCM results, a combination of the processes, methodologies, tools and delivery options to guide companies to their results quickly as the complexity and speed of the supply chain increase due to the effects of global competition, rapid price fluctuations, surging oil prices, short product life cycles, expanded specialization, near-/far- and off-shoring, and talent scarcity.

Q18. What are the objectives of Supply chain management ?

Ans :

The objectives of supply chain integration are to supply superior quality goods faster, with efficient processes and in essence be more responsive to the perceptions of the marketplace and be able to change directions at will. Some of the consequences of supply chain integration result in.

1. Supply chain planning

Planning sets directions for the enterprise

2. Procurement

Establishing what needs to be purchased, selecting suppliers & managing relations with them, reducing costs, improving possibly raw material.

3. Inventory management

Managing levels of inventory in order to satisfy internal and external customers demand.

4. Packaging

Ensuring correct package design in order to encourage the recycling of packaging and reducing packages costs.

5. Facility design

This includes insuring the best design that suits the internal or external customers. Here we are concerned with the issue such as : Size, Lightning, facilities, equipment , safety and security.

6. Warehousing

This includes stock management, efficient facility operations, layouts for effective transportation, safety, storage methods and equipment.

7. Transportation

This includes transportation modes, costs, transportation management, terminal utilization, and in-transit care of goods.

8. Reverse logistics

The reduction where possible of product errors so that reverse logistics may be reduced.

9. Logistics Systems

This includes decision support systems, technology and software

10. Customer service and marketing

This includes customer relationships, customer solicitation and retention and issues pertaining to the marketing mix variables.

Q19. State the functions of Supply chain management?

Ans : (Imp.)

1. Minimizing Uncertainty

Supply uncertainty due to unreliability of vendors, process planning information and joint attention to transport arrangements. Process uncertainty is due to machine breakdowns, uncertain yields and absenteeism, which can be addressed through good maintenance practices, better technology, etc. Demand uncertainty can be reduced to some extent by forecasting techniques and by better communication with customers.

2. Reducing Lead Times

Lead times at the stages of procurement, conversion and distribution can be cut down by faster modes of transport, better planning practices and process technologies.

3. Minimizing the Number of Stages

In general, the number of stages that goods and services flow through adds to the complexity of SCM. Unification of tasks and reducing the number of stages make the coordination of decisions easier. This is the essence of another management concept, namely Business Process Re-engineering.

4. Improving Flexibility

Reducing set - up or change overtimes in various processes and the use of flexible manufacturing and assembly techniques improves the flexibility of response. In transport, the use of smaller vehicles provides flexibility in making dispatches at short notice without being constrained by batching economies. As an extended principle, wherever possible, batch processes should be made continuous processes.

5. Improving Process Quality

A prerequisite to effective SCM in the light of reducing inventories and wastage is to do things right, the first time. This is deal for improving process quality. The techniques for this include statistical process control, root cause analysis of poor quality and improvement of process capability.

6. Minimizing Variety

Variety is one of the major causes for inventory in the downstream part of supply chains. One response appropriate promotion and branding. This will enable a better control of the supply chain, right from demand generation.

7. Delaying Differentiation

The value addition through product differentiation should be postponed as far as possible, so that precise customer needs can be met without holding committed stocks in the entire chain. There are numerous

examples of how this can be done, such as shipping of component level goods to major points and assembling according to customer needs, postponing, finishing operations like grinding and mixing of additives to cement till near the final point of consumption, etc.

8. Kitting of Supplies

In assembly systems, a major source of delay is the staging delay where some components for assembly have to wait since matching components are not available. Vendors or internal facilities that supply components can be arranged so that all components required for an assembly (or major sub assembly) are manufactured or supplied to one stage where they are kitted into sets of matching components, ready for assembly and further operations. This could involve some restructuring of vendors or internal activities and some vertical integration.

9. Focusing on 'A' Category

This is a well – known idea from classical economies and inventory theory, where items that account for a large part of the value, or which are critical, and / or customers who are significant, and / or territories that are important, receive special attention.

10. Planning for Multiple Supply Chains

doing better SCM would often require different supply chains for different customer segments based on response requirements. The tendency to club supply chains in the interest of efficiency can be counter – productive for effectiveness.

11. Modifying Performance Measures

These need to move from being single – actor focused to multi – actor focused in the supply chain. For example, in the context of a warehouse, instead of warehouse space utilization as the primary measure of warehouse performance the retrieval time

would be more in tune with SCM, since this focuses on both the warehouse and the downstream actor. Similarly, a transporter like the railways would focus more on time taken for delivering a wagon / rake to a customer from the time the indent is placed, rather than wagon utilization / turnaround.

12. Competing on Service

The big opportunity in SCM for long – term competitive advantage is on the service aspects of value delivery to the customer. Product quality and features can only be short – term advantages.

13. Moving from Functions to Processes

Improving supply chain practices will require integrated process orientation rather than functional organization. Job rotation, flatter and lean organizations will help.

14. Taking Initiatives at an Industry Level

This is very essential, especially in dealing with poor infrastructure. Industry – level (rather than firm - level) initiatives in specific product categories can focus on say transport and / or warehousing inadequacies and help to develop appropriate service providers. There is a big opportunity for third party logistics services here.

4.6 CUSTOMER RELATIONSHIP MANAGEMENT (CRM)

Q20. What is Customer Relationship Management?

(OR)

Explain about customer relationship management.

Ans : **(Imp.)**

Meaning

The concept of customer relationship management as a cooperative and collaborative

process has tended to be more common. Its purpose is mutual value creation on the part of the marketer and customer.

Definition

(i) According to white whale, customer relationship management which is sometimes referred to as relationship or marketing or one to one marketing is defined by as: the integration is a process, culture and systems to recognize, differentiate, service and develop an organizations most valuable customers.

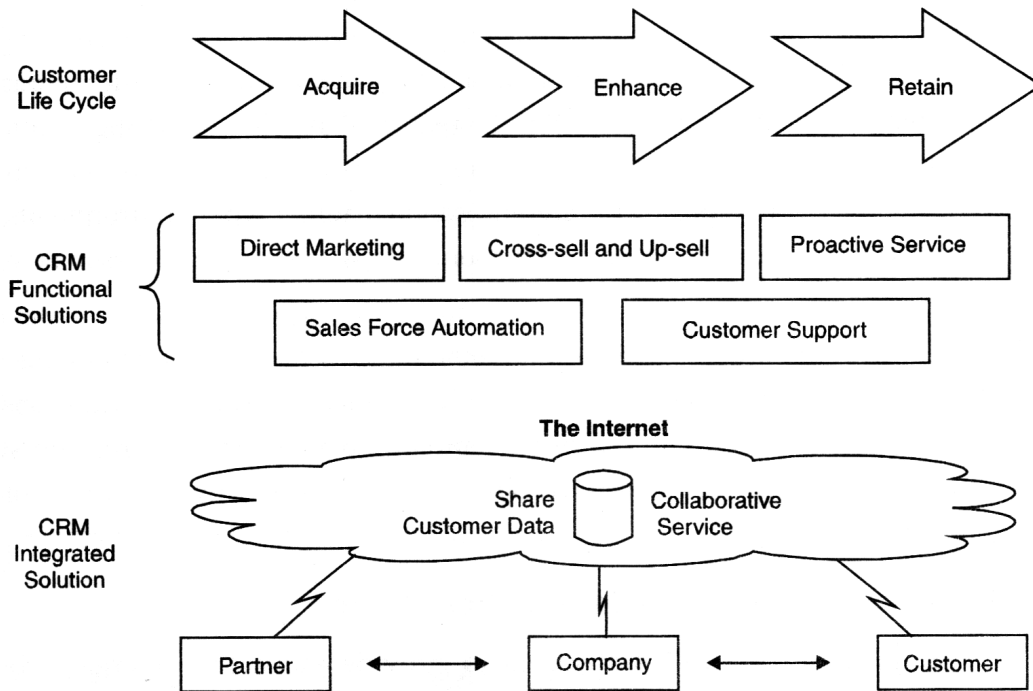
Processes in CRM

The key processes under CRM are as follows:

- **Marketing:** This process involves decision regarding which customers to target, how to target customers, and what products to offer, how to price products and how to manage the actual campaigns targeting customers.
- **Sell:** It focus on making an actual sale to a customer. The sell process includes providing the sale force the information they need to make a sale and then executing the actual sale.
- **Order management:** The process of managing customer orders as they flow through an enterprise is important for the customer to track his order and for the enterprise to plan and executives order fulfilment.
- **Call/services center:** It is often the primary point of contact between a company and its customer. Is center helps customer place orders, suggest products, solves problems, and provides information on order status.

Q21. Explain the different phases of Customer Relationship Management.*Ans :*

The three phases of CRM are

**(i) Acquire**

A business relies on CRM systems, which helps to acquire new customers by doing a superior job of contract management, sales prospecting, selling, direct marketing, and fulfillment. The goal of these CRM functions is to help customers perceive the value of a superior product offered by an outstanding company.

(ii) Enhance

Web-enabled CRM account management and customer service and support tools helps to keep customers happy by supporting superior service from a responsive networked team of sales and service specialists and business partners. CRM sales force automation and direct marketing and fulfillment tools help company's cross- sell and upsell to their customers, thus increasing their profitability to the business. The value perceived by customers is the convenience of one-stop shopping at attractive prices.

(iii) Retain

CRM analytical software and databases help a company proactively identify and reward its most loyal and profitable customers to retain and expend their business via targeted marketing and relationship marketing programs. The value perceived by customers is of a rewarding personalized business relationship with "their company".

Q22. Explain the benefits and failures of Customer Relationship Management.

Ans :

Benefits

- CRM allows a business to identify and target their best customers; those who are the most profitable to the business, so they can be retained as lifelong customers for greater and more profitable services.
- CRM enables real-time customization and personalization of products and services based on customer wants, needs, buying habits, and life cycles.
- CRM can keep track of when a customer contacts the company, regardless of the contact point.
- CRM enables a company to provide a consistent customer experience and superior service and support across all the contact points a customer chooses.

Failures

- Major reason for the failure of CRM systems is the lack of understanding and preparation.
- Rely on CRM to solve business problem without first developing the business process changes and change management programs that are required.
- CRM projects implemented without the participation of the business stakeholders.

Q23. Explain the different categories of Customer Relationship Management.

Ans :

Four types (or) categories of CRM that are being implemented by many companies today include:

(i) Operational CRM

Supports customer interaction with greater convenience through a variety of channels. Synchronizes customer interactions consistently across all channels.

(ii) Analytical CRM

Extracts in-depth customer history, preferences, and profitability information from data warehouse and other databases. Allows analyzing, predicting, and deriving customer value and behavior and forecasting demand. Customers are given offers that are tailored to their needs.

(iii) Collaborative CRM

Enables easy collaboration with customers, suppliers, and partners. Improves efficiency and integration throughout the supply chain. Allows greater responsiveness to customer needs through sourcing of products and services outside of your enterprise

(iv) Portal-based CRM

Provides all users with the tools and information that fit their individual roles and preferences. Empowers all employees to respond to customer demands more quickly and become truly customer-focused. Provides the capability to instantly access link, and use all internal and external customer information.

4.7 CPFR**Q24. Write in brief about CPFR.**

Ans :

Continuous replenishment supply chain strategy is also referred as (CPFR) Collaborative Planning, Forecasting and Replenishment. It concentrates more on sustaining relationships with the customers CPFR provides a bunch of business processes which helps the members of supply chain to share information, risks, costs and decisions in order to improve the performance of supply chain. The following are some of the characteristics of continuous replenishment supply chain strategy,

- (i) It has a base flow type where demand is predictable.

- (ii) It has a close and loyalty relations with the customers.
- (iii) Coaching style of leadership is required for this strategy.

CPFR is considered as a demand-driven supply chain in which the partners of supply chain must coordinate forecasting, planning, production and order fulfillment process. By implementing CPFR, the companies can improve the efficiency of supply chain with the help of demand planning, production scheduling, logistic planning and product design.

The CPFR systems and networks also help the participants of the supply chain by providing real-time visibility throughout the entire chain. It enables them to determine the impact of their decisions on the companies and detect the potential problems and trigger warnings.

The Voluntary Interindustry Commerce Solutions (VTCS) Association mainly focuses on improving the supply chain efficiency. It defines the activities of CPFR and the guidelines structure to implement on the supply chain. The collaboration activities of CPFR that are identified by VICS are as follows,

(i) Strategy and Planning

It includes the activities such as ground rules setting for collaborative relationship and specification of product mix.

(ii) Demand and Supply Management

It includes the activities such as forecasting consumer demand and forecasting shipment order requirements.

(iii) Execution

It includes the various activities such as order placing, shipping and delivery, making transactions, tracking orders etc.

(iv) Analysis

It includes the activities such as analyzing the results of planning and execution, determining the key performance metrics and modifying the plans to improve the results.

4.8 KNOWLEDGE MANAGEMENT SYSTEMS

Q25. What is Knowledge Management System? Explain briefly.

OR

What is Knowledge Management?

Ans :

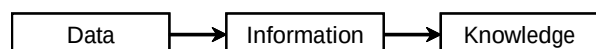
Meaning

Knowledge Management System (KM System) refers to a (generally IT based) system for managing knowledge in organizations for supporting creation, capture, storage and dissemination of information. It can comprise a part (neither necessary nor sufficient) of a Knowledge Management initiative.

The idea of a KM system is to enable employees to have ready access to the organization's documented base of facts, sources of information, and solutions. For example a typical claim justifying the creation of a KM system might run something like this: an engineer could know the metallurgical composition of an alloy that reduces sound in gear systems. Sharing this information organization wide can lead to more effective engine design and it could also lead to ideas for new or improved equipment.

The term KMS can be associated to Open Source Software, and Open Standards, Open Protocols and Open Knowledge licenses, initiatives and policies.

Knowledge hierarchy



Components

The basic components of the model are

- 1 A knowledge asset :** knowledge assets often contain the context behind the activity, recommendations for how to do the activity in future.
- 2. Learning before :** knowledge is assessed at the start of the project or a piece of work, to ensure that you start the work with a full knowledge base.

3. **Learning after :** after completion of a project cycle, the knowledge is collected from all those who took part and collated for future use.
4. **Accountable knowledge roles:** they are represented by the face with in the business activity cycle at the bottom of the model picture.

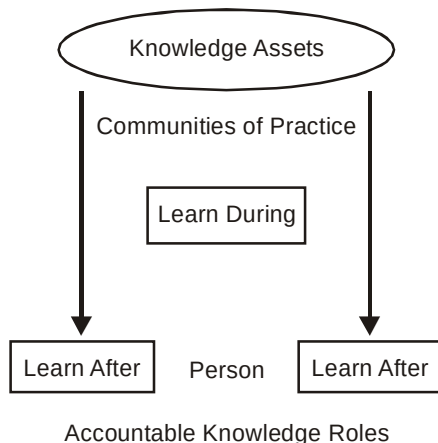


Fig.: Knowledge Management Model

4.9 SYSTEM DEVELOPMENT LIFE CYCLE(SDLC)

Q26. What are the various stages of System Development? Explain in detail each stages.

(OR)

Discuss the stages in system development.

(OR)

Briefly explain the phrases involved in system development.

Ans :

(Imp.)

In order to develop a system successfully, it is managed by breaking the total development process into smaller basic activities or phases. Any system development process, in general, is understood to have the following phases:

1. System Investigation

Some problem may be bothering a business organization. The managers in the organization

(user) may or may not be very clear about the problem. The user may invite a system analyst or information analyst (consultant) to assist him/her in defining and resolving the problem in a clear way.

Preliminary investigation is the first step in system development project. The preliminary investigation is a way of handling the user's request to change, improve or enhance an existing system. The objective is to determine whether the request is valid and feasible before any recommendation is made to do nothing, improve or modify the existing system, or build altogether a new one. It is not a design study, nor does it include the collection of details to completely describe the business system. These objectives should be accomplished, while working on the preliminary investigation. System investigation includes the following two sub-stages:

- (i) Problem definition, and
- (ii) Feasibility study.

(i) Problem Definition

Although the need for problem definition may seem obvious, this is perhaps the most frequently bypassed step in the entire system development process. So the first responsibility of a system analyst is to prepare a written statement of the objectives and scope of the problem. Based on interviews with the user, the analyst writes a brief description of his/her understanding of the problem, and reviews it with both groups, ideally in a joint user/information analyst meeting. People respond to written statements. They ask for clarifications and they correct obvious errors or misunderstandings. This is why a clear statement of objectives is so important.

Here are some possible definitions of problems:

- (i) The existing system has a poor response time, i.e. it is slow.
- (ii) It is unable to handle the workload.
- (iii) The problem of cost, i.e. the existing system is not economical.
- (iv) The problem of accuracy and reliability.

(ii) Feasibility Study

The literal meaning of feasibility is viability. This study is undertaken to know the likelihood of the system being useful to the organization. Feasibility study, is basically, a high-level capsule version of the entire process, intended to answer a number of questions like what is the problem? Is the problem even worth solving? However, as the name indicates in preliminary investigation, feasibility study should be relatively brief, as the objective at this stage is only to get an idea of the scope. The finding of this study should be formally presented to the user management. This presentation marks a crucial decision point in the life of the project. If the management approves the project, the feasibility study report represents an excellent model of the system analyst's understanding of the problem and provides a clear sense of direction for the subsequent development of the system.

2. System Analysis

Analysis is a detailed study of the various operations of a business activity (system), along with its boundaries. The objective of this phase is to determine exactly what must be done to solve the problem. Many system analysis have a technical background. The temptation of many technically trained people is to move too quickly to program design, to become pre-maturely physical. Such a temptation must be avoided. Rather a logical model of the system should be developed using various modern tools such as data flow diagrams, an elementary data dictionary and rough descriptions of the relevant algorithms. System analysis involves a detailed study of:

- (i) The information needs of the organization and its end users.
- (ii) Existing information systems (their activities, resources and products).
- (iii) The expected information system (in terms of capabilities of IS required to meet the information needs of users).

3. System Design

System analysis describes WHAT a system should do to meet the information needs of users. System design specifies HOW the system will accomplish this objective. The term design refers to the technical specification (analogous to the architect's blue prints) that will be implied in constructing the system. System design should stress on the following three activities:

- (i) User interface,
- (ii) Data design, and
- (iii) Process design.

4. Construction and Testing

Once the system specifications are understood, the system is physically created. The required programs are coded, debugged, and documented. The system should be tested with some test data to ensure its accuracy and reliability. In fact, construction of the system takes place on the basis of the system design specifications. So in this phase, the various directions as per system specifications are followed. In addition to the activities performed during system development, some activities are performed after the basic development is complete. Such activities are covered under the implementation phase and maintenance phase.

5. Implementation

The system implementation stage involves hardware and software acquisition, site preparation, user training and installation of the system. Here again, testing of the system, involving all components and procedures should be done. It must be realised that implementation may be the most crucial phase of System Development Life Cycle, because this step is vital in assuring the success of any newly developed system.

6. Maintenance

System maintenance involves the monitoring, evaluating and modifying of a system to make desirable or necessary improvements. In other words, maintenance include enhancements, modifications or any change from the original specifications. Therefore, the information analyst should take chance as his/her responsibility so as to keep the system functioning at an acceptable level.

Q27. Explain the different categories of Feasibility study.

Ans : (mp.)

The literal meaning of feasibility is viability. This study is undertaken to know the likelihood of the system being useful to the organization.

The aim of a feasibility study is to assess alternative systems and to propose the most feasible and desirable system for development. Thus, feasibility study provides an overview of the problem and acts as an important checkpoint that should be completed before committing more resources.

Categories

The feasibility of a proposed system can be assessed in terms of four major categories. These are summarised below.

(i) Organizational Feasibility

The extent to which a proposed information system supports the objective of the organization's strategic plan for information systems determines the organizational feasibility of the system project. The information system must be taken as a subset of the whole organisation.

(ii) Economic Feasibility

In this study, costs and returns are evaluated to know whether returns justify the investment in the system project. The economic questions raised by analysts during the preliminary investigation are for the purpose of estimating the following:

- (a) the cost of conducting a full system investigation.
- (b) the cost of hardware and software for the class of application being considered.
- (c) the benefits in the form of reduced costs, improved customer service, improved resource utilization or fewer costly errors.

(iii) Technical Feasibility

Whether reliable hardware and software capable of meeting the needs of the proposed system can be acquired or developed by the organization in the required time is a major concern of the technical feasibility. In other words, technical feasibility includes questions like:

- (a) Does the necessary technology exist to do what is suggested, if it does then can it be acquired?
- (b) Does the proposed equipment have the technical capacity to hold the data required to use the new system?
- (c) Will the proposed system provide adequate responses to inquiries, regardless of the number of locations and users?
- (d) Can the system be expanded?
- (e) Is there any technical surety of accuracy, reliability, ease of access and data security?

(iv) Operational Feasibility

The willingness and ability of the management, employees, customers, suppliers, etc., to operate, use and support a proposed system come under operational feasibility. In other words, the test of operational feasibility asks if the system will work when it is developed and installed. Are there major barriers to implementation. The following questions are asked in operational feasibility.

- (a) Is there sufficient support from the management? From employees? From customers? From suppliers?
- (b) Are current business methods acceptable to the users?
- (c) Have the users been involved in the planning and development of the system project?

4.10 ELECTRONIC FUND TRANSFER (EFT)

Q28. Define Electronic Fund Transfer (EFT). Explain the different categories of Electronic Fund Transfer.

Ans :

An electronic fund transfer moves money from one account to another. The accounts can be at the same financial institution or two different financial institutions. The transaction is done electronically over a computerised network. Although EFT refers to any transfer of funds initiated through an electronic terminal, including credit card, ATM, and point-of-sale (POS) transactions, one of the most widely-used EFT programmes is Direct Deposit, in which payroll is deposited straight into an employee's bank account. It is used for both credit transfers, such as payroll payments, and for debit transfers, such as mortgage payments. EFT can be segmented into three broad categories:

1. Banking and Financial Payments

- (i) Large-scale or wholesale payments (e.g., bank-to-bank transfer)
- (ii) Small-scale or retail payments (e.g., automated teller machines)
- (iii) Home banking (e.g., bill payment)

2. Retailing Payments

- (i) Credit Cards (e.g., VISA or Master Card)
- (ii) Private label credit/debit cards (e.g., J.C. Penney Card)
- (iii) Charge Cards (e.g., American Express).

3. On-line electronic commerce payments

- (i) Token-based payment systems
 - (a) Electronic cash (e.g., Digi Cash)
 - (b) Electronic checks (e.g., Net Cheque)
 - (c) Smart cards or debit cards (e.g., Mondex Electronic Currency Card)

- (ii) Credit card-based payments systems
 - (a) Encrypted Credit Cards (e.g., World Wide Web form-based encryption)
 - (b) Third-party authorization numbers (e.g., First Virtual)

(i) Large-scale (or) Wholesale Payments

Post demonetization, people prefer to transfer money using electronic fund transfer methods. The popularity of electronic payment options is sharply increasing as it allows users to transfer funds online using their mobiles and laptops, from the comfort of their homes and offices. Moreover, it eliminates geographical barriers and helps them transfer money in a hassle-free manner by simply using the EFSC Codes. For instance, if a consumer wants to transfer money to an SBI in Hyderabad, Vikramপুরi Branch, from his account, he needs to provide IFSC Code of that particular area. But it can be confusing to decide the best method of transferring the money. The following are the few direct transfer methods, if factors like transfer limit, time, costs are considered.

(a) NEFT (National Electronic Funds Transfer)

National Electronic Funds Transfer or NEFT is the most commonly used online payment option to transfer money from one bank account to another. Usually, salary transfers by companies are done using NEFT.

(b) RTGS (Real Time Gross Settlement)

One can transfer money from one bank to another on a real-time basis using Real Time Gross Settlement or RTGS method. There is no maximum transfer limit, but the minimum is ₹ 2 lakhs. The transactions are processed throughout the RTGS business hours. Usually, the amount is remitted within 30-minutes. To be able to transfer money through RTGS, it is required for the sender and

the receiver bank branch to be RTGS enabled. The list of RTGS authorized banks is available on the RBI website. It costs a little more than NEFT. But still, it will not cost you more than ` 30 for transactions up to ` 5 lakhs. The fee varies from bank to bank.

(c) IMPS or Immediate Payment Service

Immediate Payment Service is an interbank electronic instant mobile money transfer service through mobile phones. IMPS service helps customers to access their bank account and transfer funds instantly. The beneficiary account is credited immediately when a fund transfer request is made through customer's mobile phone or Internet banking. This service is available 24x7, throughout the year including Sundays and any bank holiday.

(d) Unified Payments Interface (UPI)

Unified Payments Interface (UPI) is a system that powers multiple bank accounts into a single mobile application (of any participating bank), merging several banking features, seamless fund routing and merchant payments into one hood. It also caters to the "Peer to Peer" collect request which can be scheduled and paid as per requirement and convenience. Each Bank provides its own UPI App for Android, Windows and IOS mobile platforms. No cost is involved in these transactions. The maximum transactional amount is one lakh per transaction and transfer limit is different to each bank.

(ii) Small-scale or Retail Payments

Retail payments usually involve transactions between two consumers, between consumers and businesses, or between two businesses. Withdrawing money from ATM machines and cash dispensers are examples of this kind of payments. An automated teller machine (ATM) is an electronic telecommunications device that enables customers of financial

institutions to perform financial transactions, such as cash withdrawals, deposits, transfer funds, or obtaining account information, at any time and without the need for direct interaction with bank staff. ATM machines are primarily used for withdrawing cash from a bank account. But one can also use many of them to check account balances, get cash advances from credit card accounts, make deposits and even to pay utility bills.

(iii) Home banking

The payments paid for personal finance, intermediate services include financial management and advanced services include trading, bill payment etc. in home-banking, are examples of this kind of payments. Online banking is the practice of making bank dealings through the Internet. It will give us an outstanding chance to bypass the time-consuming, paper-based aspects of usual banking in order to manage finances more competently. By switching to electronic bills, statements, and payments, customers can save lot of time, paper and fake transactions are intimated faster than traditional mailing. Electronic bill payment service through home banking allows a depositor to transfer money from his or her online account to a creditor or merchant, for example to a public utility or an outlet. Online trading is another facility added by many of the financial institutions (banks) to the home banking.

2. Retailing Payments

Financial institutions accept, collect, and process a variety of payment instruments and participate in clearing and settlement systems. Major portion of retailing payments are done through different types of cards and they are classified into three types namely

- (i) Credit Cards
- (ii) Private label credit/debit cards
- (iii) Charge Cards

(i) Credit Cards

General-purpose cards have the logo of one of the bankcard companies on the front. These cards are associated with

the consumer's or cardholder's revolving credit account at a financial institution or other business.

(ii) Private Label Credit/Debit Cards

Many companies, however, choose to issue their own credit cards, rather than accept any of the major labels. These are called "private label credit/debit cards". They are cards branded for a specific retailer, independent dealer or manufacturer. Retailers prefer to have their own card because it offers customers another way to shop with them, thus increasing sales. It strengthens the relationship between retailer and customer, increases sales and profitability, creates customer loyalty, builds brand awareness, and develops insight into customers' behaviour. The presence of a card containing the logo of a prominent company in the wallet of a customer has emotional impact and creates a kind of bond, as it were, with that company, precisely because of the exclusivity of such cards. Eg: Walmart, Shoppers Stop, Louis Philippe.

(iii) Charge Cards

A charge card is a plastic card issued by a financial institution that allows the user to make purchases with funds borrowed from that financial institution. Cards that charge no interest but require the user to pay his/her balance in full upon receipt of the statement, usually on a monthly basis. This type of card does not allow cardholders to carry a balance from one month to the next as they could with a credit card. Charge cards require a credit application for approval. They are generally only approved for high quality borrowers with excellent or good credit. These cards may allow unlimited spending, however, they must be paid in full each month which limits their use. Missed payments are reported to credit bureaus and can substantially affect a borrower's credit score.

The primary difference between charge cards and credit cards is credit cards have limits, meaning that there is a maximum amount the user can borrow. The issuer determines the limit based on the user's credit rating and credit history'. Charge cards have no limit. Charge cards are not the same as debit cards, which allow the user to withdraw funds directly from his or her own checking account to make purchases. Charge cards require the user to pay his or her balance in full, usually on a monthly basis. There is no paying the balance over time, as is the case with credit cards. Many charge cards also charge a yearly fee, late payment fees, cash-advance fees and foreign-currency conversion fees.

3. On-line Electronic Commerce Payments

The payments made on E-Commerce websites belong to this category. These payments are classified in to two types.

1. Token-based payment systems:
 - (i) Electronic cash
 - (ii) Electronic checks
 - (iii) Smart cards or debit cards
2. Credit card-based payments systems
 - (i) Encrypted Credit Cards
 - (ii) Third-party authorization numbers

1. Token-based payment systems

This type of payment system has many formats

(a) Electronic Cash

Electronic money (also known as e-cash, e-currency, digital money, digital cash etc.) refers to the money which is exchanged only electronically.

(b) Electronic cheques

A form of payment made through the Internet that is designed to perform the same function as a conventional paper

cheque. Because the cheque is in an electronic format, it can be processed in fewer steps and has more security features than a standard paper cheque. Security features provided by electronic checks include authentication, public key cryptology, digital signatures, encryption etc.

(c) Smart cards

It is a card with a microchip in it. Such cards are used as a method of identification and authentication. A smart card resembles a credit card in size and shape, but inside it is completely different. The inside of a smart card usually contains an embedded microprocessor. The microprocessor on the smart card is used for security. The most common smart card applications are credit card, electronic cash, computer security systems, loyalty systems (like frequent flyer points and shopping points), banking, government identification etc.

2. Credit Card-based Payments Systems

Credit cards are issued based on the customer's credit history, income level, and total wealth. The credit limit ranges from a few hundred dollars to several thousands of dollars. The customer uses these cards to purchase goods and services or obtain cash from the participating financial institutions. The customer is supposed to pay his or her debts during the payment period; otherwise interest will occur. In view of security, credit card based payments are of two types. They are

- (i) Encrypted Credit Cards
- (ii) Third-party authorization numbers

(i) Encrypted Credit Cards

In the past, systems used the magnetic stripe on the back of a card or the CV (Card Verification Value) number when

accepting purchases, but these systems became heavily corrupted with malware during the fraud crisis of 2014. Once the information is stolen, it can be stored into a new strip and used to make fraudulent purchases.

(ii) Third-party Authorization Cards

When a business at a point where it is stuck without it being able to process credit cards and to make it worse, the merchant account provider refuses providing with a merchant account, then the light in the dark is called third party credit card processing. Third party credit card processing enables a business to accept credit card payments through a third party merchant or a third party merchant affiliate programme. There are a lot of third party credit card processors available on the market today and understanding how third party credit card processing works may help businesses pick the right third party credit card processor.

The third party credit card processing process is much less complex than a merchant account credit card processing scheme:

1. A third party merchant account is setup and integrated into business.
2. The client, interested in product or service, fills in the relevant transaction and personal details at the checkout.
3. These details are sent through a secure gateway to the third party merchant processor.
4. These details, automatically processed, are then passed through a final gateway between the third party merchant processor, acting as a normal merchant, and the bank.
5. Transaction and commission fees are charged, and are subtracted from final payout, which is made once or twice a month, depending on the third party credit card processor.

Q29. Explain the advantages and Risks involved in EFT .

Ans :

(A) Advantages of EFT**1. Time Savings**

Money transfer between virtual accounts usually takes a few minutes, while a wire transfer or a postal one may take several days. Also, you will not waste your time waiting in lines at a bank or post office.

2. Expenses Control

Even if someone is eager to bring his disbursements under control, it is necessary to be patient enough to write down all the petty expenses, which often takes a large part of the total amount of disbursements. The virtual account contains the history of all transactions indicating the store and the amount you spent. And you can check it anytime you want. This advantage of electronic payment system is pretty important in this case.

3. Reduced Risk of Loss and Theft

You can not forget your virtual wallet somewhere and it can not be taken away by robbers. Although in cyberspace there are many scammers, in one of the previous articles we described in detail how to make your e-currency account secure.

4. Low Commissions

If you pay for internet service provider or a mobile account replenishment through the UPT (unattended payment terminal), you will encounter high fees. As for the electronic payment system: a fee of this kind of operations consists of 1% of the total amount, and this is a considerable advantage.

5. User-friendly

Usually every service is designed to reach the widest possible audience, so it has the intuitively under-standable user interface. In addition, there is always the opportunity to submit a question to a support team, which often works 24/7. Anyway you can always get an answer using the forums on the subject.

6. Convenience

All the transfers can be performed at any time, anywhere. It's enough to have an access to the Internet.

(B) Risks Involved in EFT

The risks that are associated with electronic payment system are,

1. Risks associated with fraud or mistakes
2. Risks associated with privacy
3. Risks associated with credit cards.

1. Risk Associated with Fraud (or) Mistakes

Every electronic payment system has the capability of recording data automatically and electronically. It is very easy and less expensive to store data in electronic devices. This automatic record gives the deflated description of the transactions without any external effort made by any other involved party.

When transactions are imperceptible and depend only on automatic records, then all the financial institutions follow a principle which states that "it is not necessary to delete any requirement of data". Characteristics of records that are stored automatically using electronic systems are,

- (i) Persistent storage
- (ii) Attainability and traceability
- (iii) Database for electronic payment system
- (iv) Capable of transferring data to financial institutes like banks.

One of the important purpose of maintaining automatic records is risk management that conflicts with the anonymity of currency. This conflict arises, because paper cash was introduced earlier before the development of electronic devices. Most of the customers or users always desire that there should be anonymity in their operation i.e., their transaction should be kept confidential because of the occurrence of many forged attempts such as tax evasion, smuggling. A query that is raised by anonymity is that, is it possible for an electronic payment system to exist without automatic record?

The problem of anonymity can be resolved by using regulation that provides security to customers. It is not possible for bankers or government to accept electronic payment system that is unremarkable in the absence of automatic record. With the help of statement of accounts, forgery and frauds can be solved easily only if regulation is applied correctly.

2. Risk Associated with Privacy

It is essential for all the electronic payment systems to maintain and ensure privacy. Whenever a purchase is made using smart card or credit card, the information is stored in the database that consists of various records. All these records in the payment system database are linked together to form a single folder that gives information about what or when the products were purchased, from where the purchase was made etc. However tracking these informations contradicts a law which states that privacy of customers should be ensured.

All customers must ensure that information about their transactions are confined to parties that are involved in the transaction process. Privacy should be provided by protecting the transaction from intruders present on the network and from persons that are not authorized to access the transaction. It should be protected from being deceived, cheated until the whole transaction processing is completed. This protection can be provided using trusted third party agents that can verify the identification of parties that are involved in transaction processing.

3. Risk Associated with Credit Cards

In order to handle credit card risk, digital online central bank have developed various procedures to reduce insolvencies. Every procedure has its own benefits and drawbacks,

- (i) Either the bank settles its net position with guarantee, or
- (ii) Bank settles its net position without guarantee.

(i) With Guarantee

This procedure eliminates the need of insolvency test because the bank presumes that risk associated with credit card is from different banks and not from buyers and sellers.

(ii) Without Guarantee

In this policy, it is necessary for digital banks to define the terms and conditions needed to extend the liquidity for settlement of their net position.

Rahul Publications

Short Question and Answers

1. Discuss about levels of management.

Ans :

The different levels of management activity are as follows,

(i) Strategic Level

In this level of management, senior-level managers formulate strategies in order to achieve organizational goals. The managers at this level are referred to as strategic managers and they are responsible for developing organizational goals, making beneficial strategies, crucial policies and objectives they achieve through long term plans. However, the strategic planning decisions are taken only once. On the other hand, they acquire information in a summarized data form through variety of sources such as external data including competitors policy, market condition, government policies etc.

(ii) Administrative Level

In this level, middle-level managers or executives are held responsible for defining business models and also to perform decisions on control actions. This level makes use of both internal and external data in the form of summary for decision making purpose. Apart from this, middle-level managers also make new decision rules (or) set new goals that are usually applied by senior level managers.

(iii) Operational Level

In this level of management, the executives spend time in taking operational decisions. Clearly, the operational control employs pre-established procedures and decision rules for supervising the activities. These decisions to a large extent are flexible and procedures in this regard are stable. As the managers at this level manage day-to-day activities, they maintain a detail report of these business affairs.

2. Marketing information system.

Ans :

The role of MKIS is to assess the marketing managers information needs then develop the framework for collecting information and distribute the information gathered to the end users in time. The marketing information system is generally carried out marketing need analysis, planning, and implementation and control functions of marketing managers.

The needed information is developed through internal company records, marketing intelligence activities, marketing research and marketing decision support analysis.

Different parts of MKIS

- Accounting information system
- Marketing , sales and customer services
 - sales force automation
 - saves company labours hours and telephone expenses
 - capture customer data
 - response time to customer inquiries
- market research and intelligence information system
 - customer research
 - market research
 - competitor intelligence
 - Competitor's products.
 - Competitor's Operating strengths and weaknesses.
 - Customer service level and customer policies.
 - New product line.

3. Financial information system.

Ans :

Financial information system is a sub system of organisational management information system. This sub system supports the decision making process of financial functions at the level of an organization.

A brief description of each of the financial decisions that a financial manager has to take is given below.

- **Capital budgeting decision:** In this decision funds are allocated to long term asset which would yield benefits in the future. Example: funds allocated for land, building, machinery, etc...
- **Financial decision:** The financial manager has to decide about the proportion of equity and debt capital.
- **Dividend decision:** This decision relates to the dividend policy of the organization. A decision whether the organization should distribute all profits or retain them or distribute a portion and retain the balance has to be taken by the financial managers.
- **Current asset management:** In order to safeguard the organization against liquidity or insolvency current assets of the organization are also required to be efficiently managed.

4. ERP.

Ans :

Meaning

Enterprise Resource Planning (ERP) consists of techniques and concepts to improve the efficiency of integrated business management and to make effective use of the management resources. ERP packages contain functions for the management of primary business processes and fundamental planning for different ERP modules like sales management, product management, financial and accounting systems, etc. These packages contains functions not only for manufacturing industry but for various types of industries. It uses an ERP software to model and automate many core

processes of the business. It integrates major business processes of an organization such as customer order fulfillment and manufacturing that allows the information to flow automatically.

5. What is supply chain management?

Ans :

Supply chain management (SCM) is a management concept that integrates the management of supply chain processes. Many companies are making SCM a top strategic objective of their E-business initiatives. It is an absolute requirement if they want to meet their E-commerce customer value imperative. Companies are reengineering their supply chain processes through the aid of Internet technologies and supply chain management software.

Definitions

- (i) **According to Jones and Riley,** "Supply chain management deals with the total flow of material from supplier through end user".
- (ii) **According to Cooper and Ellram,** "Supply chain management is an integrative philosophy to manage the total flow of distribution channel front the supplier to the ultimate user".
- (iii) **According to Marty Weil,** "Supply chain management is the ability to get closer to the customer".
- (iv) **According to Professor Douglas M. Lambert,** "Supply chain management as the integration of business process from the end user through original suppliers who provide products, services, and information that adds value for the customer".

The goal of supply chain management is to:

- Give customer what they want
- Give customers what they want, and where they want it
- Give customers what they want, where they want it, and at the lowest possible cost.

6. What are the objectives of Supply chain management ?

Ans :

The objectives of supply chain integration are to supply superior quality goods faster, with efficient processes and in essence be more responsive to the perceptions of the marketplace and be able to change directions at will. Some of the consequences of supply chain integration result in.

1. Supply chain planning

Planning sets directions for the enterprise

2. Procurement

Establishing what needs to be purchased, selecting suppliers & managing relations with them, reducing costs, improving possibly raw material.

3. Inventory management

Managing levels of inventory in order to satisfy internal and external customers demand.

4. Packaging

Ensuring correct package design in order to encourage the recycling of packaging and reducing packages costs.

5. Facility design

This includes insuring the best design that suits the internal or external customers. Here we are concerned with the issue such as : Size, Lightning, facilities, equipment , safety and security.

6. Warehousing

This includes stock management, efficient facility operations, layouts for effective transportation, safety, storage methods and equipment.

7. Transportation

This includes transportation modes, costs, transportation management, terminal utilization, and in-transit care of goods.

7. Customer relationship management.

Ans :

Meaning

The concept of customer relationship management as a cooperative and collaborative process has tended to be more common. Its purpose is mutual value creation on the part of the marketer and customer.

Definition

- (i) **According to white whale**, customer relationship management which is sometimes referred to as relationship or marketing or one to one marketing is defined by as: the integration is a process, culture and systems to recognize, differentiate, service and develop an organizations most valuable customers.

8. Benefits and failures of Customer Relationship Management.

Ans :

Benefits

- CRM allows a business to identify and target their best customers; those who are the most profitable to the business, so they can be retained as lifelong customers for greater and more profitable services.
- CRM enables real-time customization and personalization of products and services based on customer wants, needs, buying habits, and life cycles.
- CRM can keep track of when a customer contacts the company, regardless of the contact point.
- CRM enables a company to provide a consistent customer experience and superior service and support across all the contact points a customer chooses.

Failures

- Major reason for the failure of CRM systems is the lack of understanding and preparation.

- Rely on CRM to solve business problem without first developing the business process changes and change management programs that are required.
- CRM projects implemented without the participation of the business stakeholders.

9. CPFR

Ans :

Continuous replenishment supply chain strategy is also referred as (CPFR) Collaborative Planning, Forecasting and Replenishment. It concentrates more on sustaining relationships with the customers CPFR provides a bunch of business processes which helps the members of supply chain to share information, risks, costs and decisions in order to improve the performance of supply chain. The following are some of the characteristics of continuous replenishment supply chain strategy,

- (i) It has a base flow type where demand is predictable.
- (ii) It has a close and loyalty relations with the customers.
- (iii) Coaching style of leadership is required for this strategy.

CPFR is considered as a demand-driven supply chain in which the partners of supply chain must coordinate forecasting, planning, production and order fulfillment process. By implementing CPFR, the companies can improve the efficiency of supply chain with the help of demand planning, production scheduling, logistic planning and product design.

10. What is Knowledge Management?

Ans :

Meaning

Knowledge Management System (KM System) refers to a (generally IT based) system for managing knowledge in organizations for supporting creation, capture, storage and dissemination of information. It can comprise a part (neither

necessary nor sufficient) of a Knowledge Management initiative.

The idea of a KM system is to enable employees to have ready access to the organization's documented base of facts, sources of information, and solutions. For example a typical claim justifying the creation of a KM system might run something like this: an engineer could know the metallurgical composition of an alloy that reduces sound in gear systems. Sharing this information organization wide can lead to more effective engine design and it could also lead to ideas for new or improved equipment.

The term KMS can be associated to Open Source Software, and Open Standards, Open Protocols and Open Knowledge licenses, initiatives and policies.

Choose the Correct Answers

1. An enterprise system that integrates the downstream value chain is: [c]
(a) ERP (b) SCM
(c) CRM (d) None of the above
2. An enterprise system that integrates the upstream value chain is: [b]
(a) ERP (b) SCM
(c) CRM (d) None of the above
3. A typical ERP system includes this module: [d]
(a) Financial accounting (b) Inventory
(c) Bill of materials (d) All of the above
4. Which of these is not currently listed as marketing an ERP system? [c]
(a) Oracle (b) Peoplesoft
(c) IBM (d) SAP
5. Systems that communicate across organizational boundaries are: [a]
(a) Inter-organizational systems (b) Intra-organizational systems.
(c) Extra-organizational systems (d) None of the above
6. An older system that is still of use to an organization despite the need for frequent maintenance is a(n): [b]
(a) obsolete system (b) legacy system
(c) repository (d) None of the above
7. The value chain connection between a firm and its suppliers is called: [a]
(a) inbound logistics (b) outbound logistics
(c) SCM (d) None of the above
8. The value chain connection between a firm and its customers is called: [b]
(a) inbound logistics (b) outbound logistics
(c) CRM (d) None of the above
9. The transportation of finished goods, raw materials, or supplies is: [d]
(a) Procurement (b) Marketing
(c) Production (d) logistics
10. The initial stage of the supply chain process is the _____. [c]
(a) Sourcing Stage (b) Organizing Stage
(c) Planning stage (d) Directing Stage

11. The term supply chain management was first coined by _____. [c]
(a) Frankel & Paulraj (b) Peter Drucker
(c) Keith Oliver (d) Philip Kotler
12. In supply chain management, after planning, the next step involves _____. [d]
(a) Developing (b) Building a strong relationship with suppliers
(c) Sourcing (d) All of the above
13. In Supply Chain Management, ATP stands for _____. [b]
(a) Acquire Track & Perform (b) Available To Promise
(c) Active Transport Protocol (d) Access To Point
14. The purpose of supply chain management is to _____. [b]
(a) Increase the production level
(b) Manage and integrate supply and demand management
(c) Enhance the quality of a product and services
(d) Provide satisfaction to the customer

Fill in the blanks

1. _____ or executives are held responsible for defining business models and also to perform decisions on control actions.
2. _____ system is a complete set of tool for managing the flow of manufacturing production data throughout the enterprise.
3. Product design is also called _____.
4. _____ is used for determining specific region or place to establish an organization. It is useful for partial determination of operating and capital costs.
5. _____ system is the part of organizations information system.
6. _____ focuses on improving efficiency with respect to internal production, distribution and financial processes of organizations.
7. _____ concentrates on defining most efficient and effective source and procurement processes to the firm suppliers for performing business product and service.
8. _____ defines set of tools to employees that are used for group collaboration and decision support.
9. CPFR stands for _____.
10. VTCS stands for _____.

ANSWRS

1. Middle-level managers
2. Manufacturing information
3. Product Engineering.
4. Plant location
5. Accounting information
6. Enterprise Resource Planning
7. Supply Chain Management
8. Knowledge Management
9. Collaborative Planning, Forecasting and Replenishment.
10. Voluntary Interindustry Commerce Solutions

UNIT V

SECURITY AND ETHICAL CHALLENGES IN IT:

Need for Security - Security Threats and Attacks, Malicious Software, Hacking, Security Services - Security Mechanisms - Cryptography, Digital signature, Firewall - Types of Firewalls - Identification & Authentication - Biometric Techniques - Security policies - Need for legislation, cyber laws, cyber security issues, salient features of IT Act.

5.1 NEED FOR SECURITY

Q1. What is meant by security? Discuss the need of security.

Ans :

Meaning

It refers to the branch of computer science that describes the application of 'secure' behaviour on the operation of computers. Hence, with the advancements in computer science, the requirement for protecting and securing files and other useful information by using a variety of automated tools has been introduced. This type of security is more prevalent in case of shared systems such as time-sharing systems. Thus, the technique of employing a wide variety of tools for protecting data and preventing hackers from accessing the data is called 'computer security'

Need

Computer security not only refers to the security of computers but even refers to the security of networks, wherein communication networks are protected from malfunctioning so as to perform reliable data transmission. The computer security focuses on the following three important areas,

1. Security attacks
2. Security mechanisms
3. Security services

1. Security Attacks

Attacks on security of a system or a network can be best described by analyzing the functionality of a computer system in providing the required information. These attacks

are the main cause for breaking the security policy.

2. Security Mechanisms

Security mechanisms are the tools that include algorithms, protocols or devices. These tools are employed for detecting, preventing and recovering a system from security attacks.

3. Security services

A security service is a service that is used to enhance the security of data processing system and the information flow within an organization. These services are meant to deal with security attacks by employing one or more security mechanisms.

5.2 SECURITY THREATS AND ATTACKS

Q2. Explain various security threats in business.

Ans :

(Imp.)

1) Security Threat

A threat refers to the capability for violating the security that arises upon the occurrence of an event, action or a circumstance and affects the network security and cause damage to it. In short, a threat is an expected danger that may attain vulnerability. The possible threats to network security are discussed as follows,

1. Insecure Network Architecture

A network which is not configured in a proper manner becomes an easy entry point for intruders. Keeping a trust-based local network open to an insecure

internet ultimately, causes someone to make use of this opportunity to enter the network in an unauthorized way.

2. Broadcast Networks

Many system administrators fail to analyze the significance of networking hardware in providing the feature of security. The hardware devices such as hubs and routers are dependent on the broadcast or non-switched principles i.e., once the data is transmitted to a recipient over a network, the connecting device i.e., a hub or a router broadcasts the data packets till the reception of a node by the receiver and to process it. It causes a vulnerable effect on the Address Resolution Protocol (ARP) and Media Access Control (MAC) addressing.

3. Centralized Servers

The use of centralized computing is another threat to network security. This can be reduced by integrating all the services into a single server rather than distributing on multiple server configurations. This reduces the overall cost and eases the task of network management. But the problem with this approach is that it leads to network failure, if some malfunctioning occur in the centralized server. In such situations, a central server acts as an entry point for the unauthorized users to enter and disrupt its functioning.

4. No Firewall

The most common error, often made by the administrators and home-users is their assumption about the network security and hence they relinquishes the implementation of a firewall or network packet filtering service. The firewall installation in a stand-alone or a gateway is important for segmenting internal and external network open, make the task of finding the network's external IP address for the crackers, easier. Hence, an intruder enters into the network and acts as a proxy. This problem can be prevented by

employing firewalls that performs the task of packet filtering, port forwarding and network address translation. Improper firewall implementation makes the network completely vulnerable.

II) Vulnerability

Vulnerability refers to the faults, defects, weakness of the system that makes it susceptible to threats. It is an intersection of the following three elements,

- System susceptibility or flaw
- Attacker access to flaw
- Attackers ability in exploiting the flaw.

If a system or any of its resource is vulnerable, then an attacker can easily gain unauthorized access in order to cause disastrous harm the systems. According to NIST publications, vulnerability is defined as the existence of weakness in system's security procedures, algorithms, due to which there is a security breach of security policy. There are many software tools that are designed in order to detect and remove vulnerabilities within a system.

Vulnerabilities are related to the following components of the system,

1. Hardware
2. Software
3. Communication equipment
4. Physical environment of system
5. Network.

Examples

1. Natural calamities damage the computer system installed within an organization i.e., system is vulnerable to natural calamities.
2. Malicious software installed by an attacker (who finds and access the system flaws) damages confidential data stored within the system i.e., system's data is vulnerable to malicious software.

Q3. Explain various security attacks in business.

Ans : (Imp.)

Attacks on the security of a system or a network can be best described by analyzing the functionality of a computer system in providing the required information. Two types of attacks are possible they are,

1. Passive attacks
2. Active attacks.

1. Passive Attacks

It refers to the process of monitoring or wiretapping of the ongoing transmission. Here, the goal of the opponent is to capture the transmitting information. Two possible types of passive attacks are,

- i) Release of message contents
- ii) Traffic analysis.

i) Release of Message Contents

This can be easily understood. In case of sensitive or confidential information transmission, such as telephonic-conversation, sending of an e-mail message, etc., an opponent is prevented from learning or capturing the contents of the transmitted information.

ii) Traffic Analysis

Any type of hacking involves footprints which is done by carrying out traffic analysis. This type of passive attack is more subtle. A masking technique, for the information being transmitted, is employed in such a way that an opponent is unable to extract the information even if it is captured. The common masking technique is encryption.

Hence, passive attacks are very difficult to detect as there are no alterations in the transmitted data. Thus, it would be advantageous to prevent such type of attacks rather than detecting them after their occurrence.

2. Active Attacks

In this type of attack, an attacker can alter the information or sometimes generates fraudulent information into the network. The four categories of the active attacks are as follows,

i) Masquerade

This type of an active attack occur when one entity counterfeits to be a different entity. It usually includes the other types of active attack. Consider an example, the authentication sequences can be seized and replayed after the occurrence of a valid authentication sequence thereby allowing an authorized entity with limited privileges to get additional privileges by pretending an entity that has these benefits.

ii) Replay

It refers to the process of passively capturing a particular data unit along with its succeeding retransmission for causing an unauthorized effect.

iii) Message Modification

It refers to the alteration of a specific portion of an authorized message or delay and reordering of the messages to generate an unauthorized effect.

iv) Service Denial

It inhibits the normal usage of various facilities provided by the system or network. It attacks some specific target and all the messages destined to it will be suppressed or destroyed. Another form of it, is the destruction of the entire network, either by overloading it with the messages or by disabling it to reduce the overall performance.

In contrast to passive attacks, active attacks are very difficult to prevent as they require protection for all the communication facilities. Hence, they must be accurately detected and recovered.

Generally, security attacks are made on the following,

i) Attacks on User

Attacks on users result in gaining unauthorized access over the name and password of legitimate users. Such access enables the attacker to steal the identity and privacy of the users. If attack is made on the identity of user, then there is a possibility that the attacker uses the intercepted personal information in performing his/her illegal activities on behalf of the authorized user. However, if attack is made on privacy of user, then it is possible for an attacker to easily track the habits and actions of the user.

ii) Hardware

Attacks on hardware result in damaging the valuable resources of the system. These attacks occur because of the following reasons,

- i) Natural calamities (fire, flood, earthquake)
- ii) Power issues (fluctuations)
- iii) Theft.
- iii) Software

Attacks on software result in destroying the confidential data stored within the system. The reasons for such security attacks include,

- i) Malicious software
- ii) Hacking.

5.3 MALICIOUS SOFTWARE

Q4. Define malicious software. Explain about the different types of malicious software.

Ans : **(Imp)**

Meaning

Malicious software is a software program that is intentionally attached with a legitimate program for causing damage to systems's confidential data or resources.

Types

The following are different types of malicious software that can be installed within the system.

1. Virus
2. Logic bombs
3. Trojan horse
4. Worms
5. Applet and Active X controls.

1. Virus

A virus is a software program that replicates itself and infects another computer without the knowledge of the user. The computer virus gets its name from biological virus. For replicating itself, a virus must execute code and should be written to the memory. For this reason, many viruses attach themselves to executable files that are part of authentic program.

A virus propagates by transmitting itself across the network and bypassing security system. Viruses are otherwise said to be in dormant phase (idle) until certain events cause their codes to be executed. Virus also propagates from one system to another when its host is taken to an uninfected system. They are transmitted as attachments in an email message or in a downloaded file.

Virus contains malicious code that causes damage to the system by destructing important programs, deleting necessary files or by reformatting the hard disk. Some of other viruses are designed only to replicate themselves but not to cause any damage.

Virus may be classified into two types based on their behaviour exhibited during execution,

- (i) Non-resident virus
- (ii) Resident virus.

i) Non-resident Virus

It searches for other uninfected host program and infects them. Later it transfers the control to infected application program.

ii) Resident Virus

These viruses do not search for host program instead load themselves into the memory during execution and transfer control to the host program.

Viruses can be detected and eliminated by installing anti-virus software, once the executable files are executed.

Life Cycle of Virus

There are four phases, that a virus undergoes during its lifetime,

- (a) Dormant (idle) phase
- (b) Propagation (cloning) phase
- (c) Triggering (action) phase
- (d) Execution (implementation) phase.

(a) Dormant (Idle) Phase

A virus is said to be dormant or inactive until certain events such as date, presence of other file etc cause their program code to be executed.

(b) Propagation (Cloning) Phase

In this phase, virus replicates itself and attaches itself to the other program. Each program that is infected contains a copy of virus which itself enters cloning phase.

(c) Triggering (Action) Phase

In this phase, virus is activated to execute the action which it is intended to perform. A virus is activated only if certain events are triggered including number of times a virus replicates itself.

(d) Execution (Implementation) Phase

In this phase, virus executes the intended function that are either malicious or nondestructive.

2. Logic Bombs

Logic bomb is a primitive computer threat that existed earlier to viruses and worms. It is a piece of program code i.e., a slag code that is intentionally inserted into an authentic software program. This code on its activation perform certain malicious functions such as

clearing hard disk when specific events are triggered. Logic bombs are usually malicious in nature and act in the same way as an activated virus or Trojan horse. They lie idle until a predetermined period of time elapses or until an event occurs. When a logic bomb is executed, it displays fake or faulty messages, corrupts data or may lead to undesirable effects. These bombs can attack the system on a specific date or when a user is executing specific application program.

It is possible to detect and eliminate some logic bombs before they get executed. This can be done by regularly scanning all executable files including compressed files or by constantly monitoring the system using different anti-virus software packages.

3. Trojan Horse

A Trojan horse is a computer program or procedure that contains hidden code, which once executed results in malicious functioning. They are referred to as loopholes that allow users to access information for which they are not authorized. These programs are not static in their actions and can vary when compared to other possible software programs.

Trojan horse programs give privileges to unauthorized user (attacker) to gain access to functions indirectly. These programs pretend to be an effective software, but it is actually deleting files, damaging the system's resources without users knowledge. The majority of Trojan horse infections are caused because the authentic user is trapped to execute an infected malicious program.

The important feature of Trojan horse is that it has all capabilities and permission of an authorized user. Trojan horse can either be malicious or non-malicious program. Malicious program finds a way to effect the secure system by allowing an intruder to gain unauthorized access. Non- malicious programs are used for handling system, utilizing software and for suspecting a spy or criminal. Some of the damages that are caused by Trojan horse include,

- (i) Deleting or overwriting data on the computer.
- (ii) Corrupting files in mysterious way.
- (iii) Deactivating anti-virus software program.
- (iv) Randomly shutting down the system.

A common example of Trojan horse can be a program called "waterfall.scr" which unloads hidden program scripts when executed without user's knowledge. Trojan horse can be a program that allegedly generates a list of user's file in a useful format. Trojan horse can create backdoor, which is a secret entry point into the program that gives unauthorized access to the user to interpret confidential or personal information of authentic user. This type of Trojan horse cannot be detected by just reading the login program's source code.

The best way to detect Trojan horse is to identify executable files that are modified by comparing CRC (Cyclic Redundancy Check) values for all executable files in the system. Trojan horse programs are powerful threat to security of system, network. They cannot be eliminated using firewalls, intrusion detection system or access control list.

4. Worms

Worms are software programs that replicate themselves and transmit the cloned copy of themselves to other computer using network. They are reproducing program that execute independently and travel across network connection. These worms are termed as network worms.

Worms are similar to viruses but the only difference is that a worm does not attach themselves to existing program. The difficult task for a worm is that, it requires a program code to be executed on a remote host system.

Worms propagate by utilizing software vulnerabilities available in operating system.

E-mail virus has same behaviour as that of the computer worms but, the former requires a human to perform the actions whereas, the

latter independently searches for the system to perform its actions network worm can exhibit similar property as a computer virus, once it has been activated to perform destructive action. These worms propagate over network connection using network vehicles like,

(i) E-mail Facility

In this a worm sends a mail containing its cloned copy to other system.

(ii) Remote Host Execution Ability

In this, a worm independently runs a copy of itself on other system.

(iii) Remote Login Ability

In this, a worm does login on a remote system by pretending as an authentic user and replicate itself using commands.

Network worms have the same life-cycle phases as that of computer virus. They are as follows,

1. Dormant phase
2. Propagation phase
3. Triggering phase
4. Execution phase.

The functions performed by propagation phase are,

- (i) By monitoring the host table, network worm searches for other host system to infect.
- (ii) This phase is responsible for establishing a connection with remote host.
- (iii) Replicates itself on remote host and allows the cloned copy to execute and implement its functions.

Network worm is capable of determining if the system was previously infected before replicating itself. In a multiprogramming environment, network worm hides themselves and pretend themselves as a system processor by using other names that are not detected by a person operating the system.

A system can be prevented from worms attack by receiving regular updates about the patches and upgrades regarding operating system and for other applications. The other way to protect a system from worms is to reduce the services and application executing on the system.

Types of Worms

(i) Morris Worm

It is one of the best known worm that was released on internet by Robert Morris in 1998. These worms are basically designed for propagating on Unix operating system and employs variety of methods for propagation. When the execution of cloned copy initiates, it tries to find other systems which are known to the system containing worms so that it allows the infected system to pass through it without undergoing any security related function. This task is accomplished by analyzing different lists and tables including the mail forwarding files of users, tables using which user grants themselves the privileges for accessing remote host accounts and tables that contain information about systems which are trusted by infected system.

After finding a system for infection, worms apply the following methods for gaining access over uninfected system,

1. Worm tries to pretend as an authentic user for logging into remote host account. This is done by cracking the password file and using it to reveal out the passwords and their respective user ID. In order to gain access over password file, password cracking program is executed by worms.
2. Worms utilized a bug in the protocol that report about the location of remote user.

3. Worms use backdoor in debugging option present in remote process that is capable of sending and receiving mails.

(ii) Code Red Worm

Code red worm is a worm threat that was released in July 2001. It utilized a hidden protective hole in Microsoft Internet Information server for propagating. The actions performed by code red worm are,

1. System file checker program in Microsoft Windows is disabled.
2. In order to propagate to other uninfected system, worms perform analysis of random IP address.
3. It starts denial-of-service attack against authorized sites by overwhelming it by receiving packets from many systems.

Code red worm causes destruction by infecting approximately 360,000 servers within 14 hrs. Code red worm consumes many internet resources.

(iii) Ninda Worm

Ninda propagates by using following strategies,

1. It spreads from client-to-client using email messages, open network connection.
2. It spreads from server to client while browsing infected web site.
3. It spreads from client to server by utilizing different vulnerabilities of microsoft IIS directory.

5. Applets and Active X Control

Applets and Active X control are Java programs that are downloaded on client's browser so as to support certain enhanced functionality including sound and animation. If these programs are designed with a maligned intention, then execution of such programs results in excessive damage within

client machine. Unlike Applets, Active X control does not contain any security checks due to which it is difficult for a user to understand what operations can or cannot be performed by an Active X control. Therefore, it is preferable to keep the option of active X control always in disable mode while working on internet.

Q5. What are the different types of viruses ?

Ans :

The different types of viruses are as follows,

1. Parasitic Virus

Parastic virus is one of the most common type of virus. It attaches itself to executable files like .com and .exe in order to propagate. When the program that is infected is executed, the cloned copy of parasitic virus is transmitted to other executable files.

2. Memory-resident Virus

Resident viruses loads themselves into the memory, during the execution of infected program and transfer the control to the infected host program. In this case, virus infects every suitable program that is being executed on the system.

3. Boot-sector Virus

It is a type of virus, that infects the master-boot record and propagates while booting the system from infected disk.

4. Stealth Virus

It is designed in a way that, it hides itself from being detected by any anti-virus software program. Stealth virus tricks the anti-virus program by intercepting request, made to operating system and passing it to the virus. The virus returns an uninfected file to anti-virus program so as to masquerade the operating system that the file is clean. For example, stealth virus is the one which employs compression techniques to make the length of infected program same as that of uninfected program length. Therefore, it is considered as a technique that bypasses virus detection.

5. Polymorphic Virus

Polymorphic virus is one of the serious threat to virus scanner. It is a virus that modifies with each infection. It replicates itself and every cloned copy of virus performs the same action but does not have any parts that are identical i.e., every individual virus differ in their bit-pattern. Because of this, it is very difficult to perform virus detection directly using signature specific scanner. Polymorphic virus achieves this variation in their bit patterns using encryption technique where a part of virus called as polymorphic engine (mutation engine) generates encryption keys randomly. These keys are used to perform encryption on the left-over part of the virus. When a program that is infected is executed, the virus makes use of these keys to decrypt the virus and on each infection the value of key is modified.

Anti-virus software can be used to detect the polymorphic virus by decrypting the virus by using an emulator.

6. Metamorphic Virus

Metamorphic virus also modifies with every infection as that of polymorphic virus. But the difference is that, a metamorphic virus rewrites itself completely while infecting a new executable file. Due to this, the difficulty of detecting the virus is increased. To generate metamorphic virus, metamorphic engine is required. Every individual virus generated differ in their functionality and bit pattern.

7. Macro Virus

Macro virus is one among the most common type of virus. These viruses cause much damage to system's data or its resources. Macro virus have become a threat because of the following reasons,

- (i) Macro viruses are independent of executing platform. It infects Microsoft Word application virtually by inserting

unnecessary words or phrases. Due to this all hardwares and operating system supporting the word documents are also infected.

- (ii) Macro viruses infect only documents but not the executable part of program code, since large part of system information is in the form of document instead of program code.
- (iii) Macro viruses can be propagated without any difficulty. The most common method used for propagation is through attachments in email messages.

A macro virus is a virus that exists as a macro, which is a small piece of executable program code attached to a data file such as word document. Macros are mostly present in office applications like MS-Word, MS-Excel. They are generally used to reduce the time consumed by automating repetitive tasks. Thus macro, controls and customizes the behaviour of the documents.

Advanced version of office application have enhanced security mechanism so as to prevent the documents from being infected by macro virus. Many Anti-virus softwares are developed to detect and eliminate macro-viruses.

8. E-mail Virus

An e-mail virus is one of the last developed malicious program. Melissa virus is one of the fast spreading e-mail virus that uses Word macros that are inserted in an e-mail attachment. When attachment is opened, then.

- (i) E-mail virus is propagated to everyone present in the mailing list.
- (ii) These viruses are responsible for performing local damage.

5.4 HACKING

Q6. Define hacking. What are the various types of hacking.

Ans :

(Imp.)

Meaning

Hacking often refers to the unauthorized intrusion into a network or computer; normally carried out by one or more "hackers." However, a hacker can be anyone.

There are also many organizations who hire hackers as a part of their staff. These hackers use their skills to find flaws, vulnerable areas, and weak spots in the organization's security system. This is done to find and fix the weaknesses and prevent malicious hackers from breaking in the security system.

Types

1. 'Black Hat' Hackers

The term "black hat" originated from Western movies, where the bad guys wore black hats and the good guys wore white hats.

A black-hat hacker is an individual who attempts to gain unauthorized entry into a system or network to exploit them for malicious reasons. The black-hat hacker does not have any permission or authority to compromise their targets. They try to inflict damage by compromising security systems, altering functions of websites and networks, or shutting down systems. They often do so to steal or gain access to passwords, financial information, and other personal data.

2. 'White Hat' Hackers

White-hat hackers, on the other hand, are deemed to be the good guys, working with organizations to strengthen the security of a system. A white hat has permission to engage the targets and to compromise them within the prescribed rules of engagement.

White-hat hackers are often referred to as ethical hackers. This individual specializes in ethical hacking tools, techniques, and methodologies to secure an organization's information systems.

Unlike black-hat hackers, ethical hackers exploit security networks and look for backdoors when they are legally permitted to do so. White-hat hackers always disclose every vulnerability they find in the company's security system so that it can be fixed before they are being exploited by malicious actors.

Some Fortune 50 companies like Facebook, Microsoft, and Google also use white-hat hackers.

3. 'Grey Hat' Hackers

Grey hats exploit networks and computer systems in the way that black hats do, but do so without any malicious intent, disclosing all loopholes and vulnerabilities to law enforcement agencies or intelligence agencies.

Usually, grey-hat hackers surf the net and hack into computer systems to notify the administrator or the owner that their system/network contains one or more vulnerabilities that must be fixed immediately. Grey hats may also extort the hacked, offering to correct the defect for a nominal fee.

5.5 SECURITY SERVICES - SECURITY MECHANISMS

Q7. Write about Security Services.

Ans :

The security objectives are accomplished through security policies and security services. A security policy is the set of criteria that define the provision of security services, where a security service is a service which is provided by a layer of communicating open systems, in order to ensure adequate security of the systems or of data transfers. The basic security services are following :

- 1) Authentication
- 2) Access control
- 3) Data confidentiality
- 4) Data Integrity
- 5) Non-repudiation

1. **Authentication** service may be used to prove that the claimed identity of a communicating principle is valid (peer entity authentication) or that the claimed source of a data unit is valid (data origin authentication).
2. **Access control** service can be used to protect the information assets and resources available via OSI from unauthorized access. It also applied to various types of access, such as read, write or execute or combinations of the above.
3. **Data confidentiality** service protects the data from disclosure to unauthorized principles. It includes : connection confidentiality, connectionless confidentiality, selective field confidentiality, traffic flow confidentiality.
4. **Data Integrity** service ensures that during their transmission the data is not altered by unauthorized principles.
5. **Nonrepudiation** services that a principal cannot deny the receipt of a message. This may take one or both of two forms.
 - with nonrepudiation with proof of origin recipient of data is provided with proof the origin of data, so that the sender later deny that he or she sent the particular data.
 - with nonrepudiation with proof of delivery the sender of data is provided with proof of the delivery of data, so the receiver cannot later deny having received the particular data.

Q8. Write about Security Mechanisms.

Ans :

The implementation of the security services is provided through security mechanisms. These mechanisms are :

- Encipherment mechanisms
- Digital Signatures
- Access Control mechanisms

- Traffic-padding mechanisms
- Routing Control mechanisms
- Notarization mechanisms

1. **Encipherment mechanisms** provide data confidentiality services by transforming the data forms not readable by unauthorized principles. It can also component a number of other security mechanisms. These mechanisms concern with two keys: public key and private key. Here the knowledge of public key does not imply knowledge of private key.

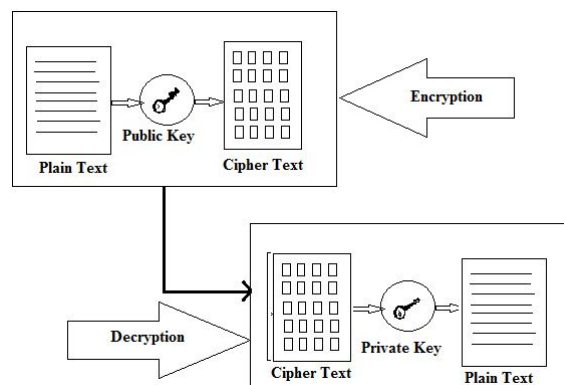


Fig.: Encryption and Decryption mechanisms

2. **Digital signatures** are the electronic equivalent of ordinary signatures in electronic data. Such mechanisms are constructed by properly plying asymmetric encipherment. The decipherment of a data unit with the private key of an entity corresponds to be signature procedure of the data unit. The result of digital signature of the particular data unit produced by the holder of the private key.
3. **The access control mechanisms** are used to provide access control services. These mechanisms may use the authentication identity of an entity or order to determine and enforce the access rights of the entity. For example – firewalls and operating system access privileges.
4. **Traffic-Padding mechanisms** provide protection from traffic analysis attacks. Several protocols and security mechanisms include padding mechanisms to protect the exchanged communication.
5. **The routing control mechanisms** allow the selection of a specific route for the communicating data, either dynamically or statically through prearranged routes.
6. **Notarization mechanisms** are used to assure the integrity, the source or destruction and the time of sending or delivering of transmitted data. Notarization mechanisms may be supported by other mechanisms such as digital signatures, encipherment, or integrity mechanisms.

5.6 CRYPTOGRAPHY

Q9. Define the term cryptography. Explain in detail the three cryptographic schemes.

Ans :

(Imp.)

Meaning

Cryptography refers to the technique of transforming usable information into a form that is readable only by the either authorized users. This techniques is called encryption. The encrypted information can

be converted back to its original form i.e., plain text by any authorized user, possessing the cryptographic key. This process is called decryption. Hence, cryptography is a means of providing information security thereby protecting information from unauthorized access and disclosure while transmitting and storing the information.

Thus, cryptography provides security to the information as well as to other useful applications for improving authentication methods, message digests, digital signatures, non-repudiation and encrypted network communications. If it is not implemented properly then, it would lead to many security problems. The length and strength of an encryption key are also important, because the strength of an encryption algorithm is also dependent on the key.

Schemes

The following are three cryptographic schemes used in computer security,

1. Secret key cryptography
2. Public key cryptography
3. Hash function cryptography.

1. Secret Key Cryptography

Secret key cryptography (Symmetric Cryptography) is a traditional form of cryptography in which a secret key is generated and transmitted between two communicating parties. The same secret key is used both by sender and receiver for encrypting and decrypting the message respectively. Sender encrypts the plain text into cipher text using the secret key and then the receiver applies the same secret key so as to decrypt the received cipher text into original plain text.

The two basic forms of secret key cryptography include,

i) Stream Cipher

Stream cipher operates on streams of plain text, which are encrypted by considering one bit at a time.

ii) Block Cipher

Block cipher operates on blocks (groups of bits) of plain text. Every block is processed multiple times, and in each iteration the same secret key is applied in different manner. Whenever the number of iteration increases, the time required for performing the encryption process also increases. However, increasing the number of iterations, results in generating a more secure cipher text.

Secret key cryptography is a fast and an efficient cryptographic scheme, which not only ensures authenticity but also ensures integrity of the message. The drawback this cryptography scheme is that there is a high risk of key being revealed to the parties other than the two communicating parties during the distribution process. This is because the key itself is being transmitted to the receiver due to which the key becomes highly susceptible to eavesdropping.

Examples

DES (Digital Encryption Standard), AES (Advanced Encryption Standard)

2. Public Key Cryptography

Public-key cryptography was invented by Diffie and Hellman in the year 1976. For this reason, it is sometimes known as Diffie-Hellman encryption. Public-key cryptography is also known as asymmetric cryptography. It is a form of cryptography in which a user has a pair of cryptographic keys i.e., a public-key and a private key. The private-key is kept secret, whereas the public-key is distributed widely. A message or text data which is encrypted with the public-key can be decrypted only with the corresponding private-key. For instance, when Johnny wants to send a secure message to Sunny, he uses Sunny's public-key to encrypt the message. Sunny then uses his private-key to decrypt it.

A public-key cryptography/encryption consists of the following five elements,

i) Text Data/Message

This can be any input data, such as text data or message.

For example, Johnny is a user of computer and wants to send his message, $M = \text{"Hello"}$ securely to his friend Sunny, who is also a user of computer.

ii) Encryption Algorithm

To encrypt the message, an encryption algorithm performs certain transformations on it.

There are various encryption algorithms, but the *RSA* public-key encryption algorithm is mostly used to perform certain transformations or calculations on the text data or message.

For example, Johnny uses the public-key of Sunny and encrypted his message by using *RSA* algorithm.

iii) Public-key and Private-key

These pair of keys are used to encrypt and decrypt the message respectively. The private-key is always kept secret, whereas public-key is widely distributed.

For example, Johnny uses a public-key of Sunny to encrypt his message, whereas Sunny uses his private key to decrypt the Johnny's message as shown in the figure.

iv) Cipher text/Unreadable Text

Once the encryption is done on the text data it is in unreadable format means it cannot be read by human beings.

For example, Johnny's message has converted into unreadable form so that nobody except Sunny can read his message, as he has a corresponding private-key for that message.

v) Decryption Algorithm

A decryption algorithm takes the unreadable text and its corresponding key is used to convert this text into original text. Hence, we can say that the decryption algorithm is the reverse of encryption algorithm.

For example, decryption algorithm takes the unreadable text of Johnny and also takes the Sunny's private key to decrypt that message and convert the unreadable text into readable form i.e., original text sent by Johnny as shown in the below figure.

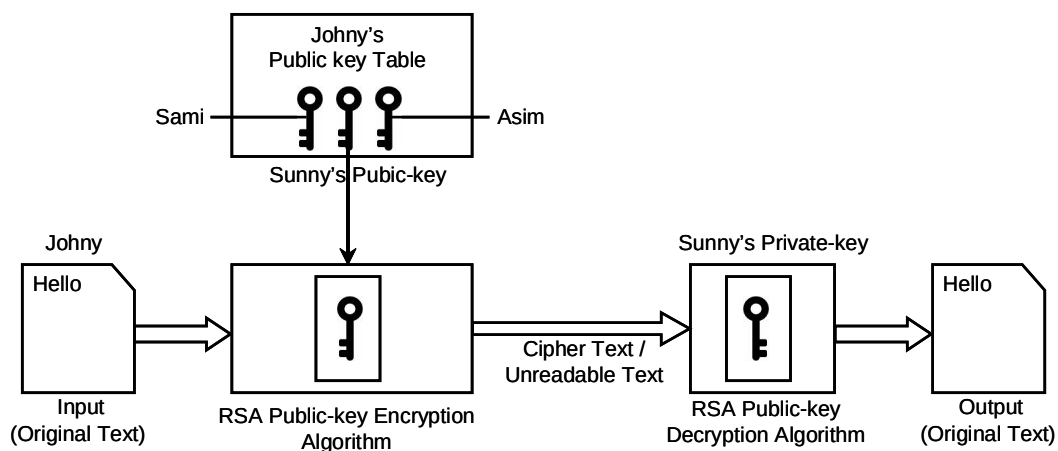


Fig.: Public-key Encryption

3. Hash Function Cryptography

Hash function builds a “fingerprint” of a message or file or any other block of data. It is basically a one-way encryption algorithm that doesn't make use of either public or private key. In this cryptographic scheme, a hash function which is of fixed length is computed using the plain text. The advantage of this scheme is that, it is very difficult for an intruder to recover the content or length of the plain text.

Hash function ensures that message content is not modified either by a malicious software or by any intruder. It does this, by performing a comparison between the hash values calculated by both sender and receiver i.e., if the computed value of a receiver doesn't match with the value placed by sender during the transmission, then it implies that the content of message has been altered. Otherwise, the message content is authentic and unaltered.

Examples : Message digest algorithm, Secure hash algorithm.

Q10. Define public key cryptography. Give merits and demerits of public key cryptography.

Ans :

Public-key cryptography was invented by Diffie and Hellman in the year 1976. For this reason, it is sometimes known as Diffie-Hellman encryption. Public-key cryptography is also known as asymmetric cryptography. It is a form of cryptography in which a user has a pair of cryptographic keys i.e., a public-key and a private key. The private-key is kept secret, whereas the public-key is distributed widely. A message or text data which is encrypted with the public-key can be decrypted only with the corresponding private-key. For instance, when Johnny wants to send a secure message to Sunny, he uses Sunny's public-key to encrypt the message. Sunny then uses his private-key to decrypt it.

Merits

1. Security and convenience are increased in public key cryptography because the private key of the sender and receiver is not transmitted, so there is no chance of third person discovering it during transmit.
2. Public key cryptography provides a method for digital signatures.
3. Public key cryptography preserves non-repudiation. Each user is responsible for protecting his own private key and no central database where all the private keys are stored exists.
4. It is best suited for open multiuser environment.

Demerits

1. Speed of public key cryptography is less than that of secret-key encryption methods.
2. Public key cryptography may be subjected to impersonation even if there is no availability of private keys. By attacking a certification authority, an adversary can impersonate whomever he wants to, just by using a public key certificate from it.
3. There are some situations where public key cryptography is not required and just secret key cryptography alone is sufficient. The situations include users meeting in a private place, environments where a single authority manages all keys like in closed banking system etc.

Q11. Define the following,

- (i) Plain text and cipher text
- (ii) Encryption and decryption.

Ans :

i) Plain Text and Cipher Text

Plain text refers to the original message that is not encrypted and is human readable. It forms an input to an encryption algorithm and an output of a decryption algorithm.

Cipher text is the scrambled version of plain text and is not human readable. The cipher text generated by the encryption algorithm depends on the code used for encrypting/decrypting the message. It is possible for an

encryption algorithm to generate different cipher text for the same plain text by using different combination of codes.

ii) Encryption and Decryption

Encryption is the process of transforming the plaintext to a cipher text by performing various transformation and substitutions.

Decryption is the reverse of encryption process. The decryption process takes the cipher text as input and decrypts it using the code used in encryption process so as to generate the plain text.

Q12. What is the significance of key in security?

Ans : (Imp.)

Key is a sequence of bits that are associated with every message being transmitted over the network. It is basically, a secret parameter, which acts as a vital component in every algorithm i.e., if there are no keys used within an algorithm then such an algorithm is considered to be a meaningless algorithm. The main purpose of using key is to encrypt the message being transmitted so that it becomes difficult for an unauthorized user to decrypt the message, thereby ensuring security of the message. Generally, the size of the key is the main factor in determining how much secure a message is, i.e., if the size of a key is large, then the message is said to be highly secured since it is very difficult for an unauthorized user to extract the key value. On the other hand if the size of a key is small, then the message is said to be less secured since an unauthorized user can easily extract the key value by using trial-and-error approach.

A cryptographic system uses the following two keys in performing encryption or decryption process,

i) Public Key

It is a key which is known to every one.

ii) Private Key

It is a key which is known only to its owner.

Role of Public and Private Keys

The pair of public and private keys are used for encrypting and decrypting the message respectively. Each public-key is published, and the

corresponding private-key is kept secret. The text data or message which is encrypted with your public-key can be decrypted only with your private-key. The figure below shows the role of public and private keys.

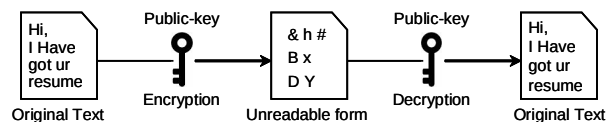


Fig.: Role of Public-key and Private-key

Each user generates a pair of keys i.e., a public-key and a private-key. The public-key is made public by placing it in a public register or a file accessible to other participants. The corresponding key i.e., the private-key is kept secret, therefore it is known only to its owner. Each user maintains the public keys of other users to exchange messages.

When user A wishes to send a message to user B he encrypts the message using B's public key which is known to it. When B receives the encrypted message, he decrypts it using his private-key. No other user except B can decrypt the message because only B knows its private-key. The communication is secure as long as the private-key is protected from an opponent. At any time, a user can change his private-key and publish its corresponding public-key.

Each user generates a pair of keys i.e., a public-key and a private-key. The public-key is made public by placing it in a public register or a file accessible to other participants. The corresponding key i.e., the private-key is kept secret, therefore it is known only to its owner. Each user maintains the public keys of other users to exchange messages.

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5.7 DIGITAL SIGNATURE

Q13. Explain the concept of digital signature.

Ans : (Imp.)

Meaning

A digital signature is one of the methods of encryption used to provide authentication. The main intent of the digital signature is to protect the message or data from modifications. Digital signature has gained much popularity in the world of network security. In addition to a digital signature, it is a kind of asymmetric cryptography used to encourage the security properties of a handwritten signature on paper. Basically, digital signature scheme provides two algorithms, one algorithm is for signing which requires the user's secret or private-key, and the other algorithm is for verifying signatures which requires the user's public-key. The result of the signature process is called the "digital signature".

Advantages

- i) It verifies the authenticity of signer and also the authenticity of the message
- ii) It reveals out any alteration or tempering (if performed) on the message
- iii) It provides a high degree of assurance and doesn't require additional resources for processing.

Algorithms in Digital Signature Scheme

The algorithms in digital signature has been designed to ensure the authenticity of a message. It doesn't perform encryption process over a message. These algorithms are used by the sender and receiver so as to generate a digital signature on the message and to verify the authenticity of the signature respectively. Both sender and receiver has a private and public keys which are used for performing signature generation, verification functions. The following are the three algorithms included within the digital signature scheme.

1. Key-generation Algorithm

This algorithm is used for generating private key and its corresponding public key.

2. Signing Algorithm

This algorithm generates a digital signature as output by considering message and private key as input.

3. Signature Verifying Algorithm

This algorithm verifies the authenticity of a signature by taking combination of message, public key and digital signature as input.

Methods for Creating and Verifying Digital Signature

The following are the two methods that are most commonly used for creating and verifying the digital signature,

1. Public and Private Key Approach

In this method, the signer applies the key-generation algorithm so as to generate public and private keys. The signer creates a digital signature for a message that is to be transmitted using the private key. This signature is used by the sender so as to encrypt the message. The encrypted message along with digital signature is transmitted to the receiver via the network. After receiving the message, the receiver verifies the authenticity of the signature using the public key. The advantage of this method is that an intruder cannot forge a digital signature even if public key of a signer is known. Though the intruder can verify the digital signature he/she cannot generate the same digital signature as private key of the signer is unknown.

2. Hash Function Approach

In this method, a hash function is computed so as to generate a digital signature. This is done by initially creating and then verifying the digital signature. The steps considered for creating a digital signature include,

- Signer generates the private and public keys using key-generation algorithm.
- Hash function (within the signer's software) compute an original hash result (H_0) for a message (M_0) that is to be transmitted. The computed ' H_0 ' is unique ' M_0 '.

- Signer applies the signing algorithm so as to generate a unique digital signature (digital signature is computed using H and signer's private key).
- Signer transmits the message 'M' along with the computed digital signature to the receiver via the network.

After receiving the message 'M', the receiver verifies the signature's authenticity. The message 'M' at receiver side becomes message M_R (received message). The steps considered for verifying the authenticity of the digital signature include,

- Hash function (that was used for computing the digital signature) ' H_0 ' computes the new hash result (H_g) for the message M_R .
- Receiver uses the verification software to verify whether private key of signer was used for creating the digital signature and whether " $M_R = M$ ". This is done by initially verifying the digital signature using the public key of signer. After verifying, the receiver extracts the value of ' H_0 ' and then it performs a comparison (using verification software) between H_0 and H_R .

5.8 FIREWALL

5.8.1 Types of Firewalls

Q14. What is firewall? Discuss various types of firewalls.

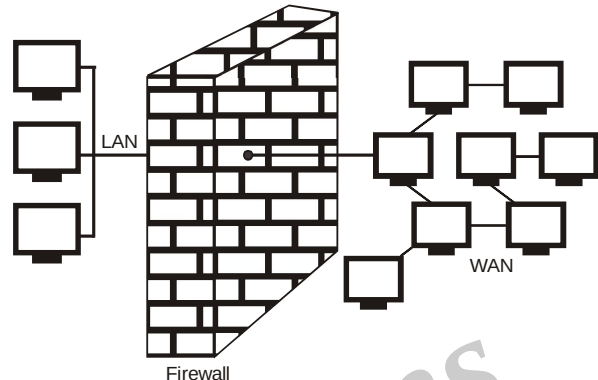
Ans :

(Imp.)

Meaning

A firewall can either be software based or hardware based and is used to help keep a network secure. A system designed to prevent unauthorized access to or from a private network. Firewalls are frequently used to prevent unauthorized Internet users from accessing private networks connected to the Internet, especially intranets. Its primary objective is to control the incoming and outgoing network traffic by analyzing the data packets and determining whether it should be allowed through or not, based on a predetermined rule set.

A network's firewall builds a bridge between an internal network that is assumed to be secure and trusted, and another network, usually an external network, such as the Internet, that is not assumed to be secure and trusted.



Characteristics

1. It is mandatory that the data flowing across the network (both from inside to outside and vice versa) must pass through the firewall. This is done by blocking all the access made to LAN physically, which are not through the firewall.
2. The legitimate data, which is defined by the local security constraints is only permitted to pass through the firewall. Different types of security policies are implemented by many firewalls.
3. Firewall itself is an immune system, which is not affected by any attack made directly on it.

Types

All the data that enter a local network must come through a firewall. The type of firewall used varies from network to network. The following are the various types of firewalls generally used:

1. Packet filter Firewall
2. Circuit Filter Firewall
3. Proxy server or Application-level Gateway

1. Packet Filter Firewall

Packet Filter Firewall is usually deployed on the routers. It is the simplest kind of mechanism used in firewall protection.

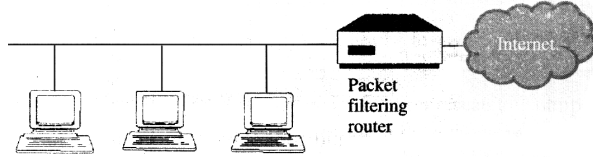


Fig.: Packet filtering

- It is implemented at the network level to check incoming and outgoing packets.
- The IP packet header is checked for the source and the destination IP addresses and the port combinations.
- After checking, the filtering rules are applied to the data packets for filtering. The filtering rules are set by an organization based on its security policies.
- If the packet is found valid; then it is allowed to enter or exit the local network.
- Packet filtering is fast, easy to use, simple and cost effective.
- A majority of routers in the market provide packet filtering capability. It is used in small and medium businesses.
- Packet filter firewall does not provide a complete solution.

2. Circuit Filter Firewall

Circuit filter firewalls provide more protection than packet filter firewalls. Circuit filter firewall is also known as a "stateful inspection" firewall.

- It prevents transfer of suspected packets by checking them at the network layer.
- It checks for all the connections made to the local network, in contrast, to the packet filter firewall which makes a filtering decision based on individual packets.
- It takes its decision by checking all the packets that are passed through the network layer and using this information to generate a decision table. The circuit level filter uses these decisions tables to keep track of the connections that go through the firewall.
- For example, when an application that uses TCP creates a session with the remote host, the TCP port number for the remote application is less than 1024 and the TCP port

number for the local client is between 1024 and 65535. A packet filter firewall will allow any packet which has a port number within the range 1024 and 65535. However, the circuit filter firewall creates a directory of all outbound TCP connections. An incoming packet is allowed if its profile matches with an entry in the directory for the TCP port numbers.

3. Application-Level Gateway

An application-level gateway or a proxy server protects all the client applications running on a local network from the Internet by using the firewall itself as the gateway.

- A proxy server creates a virtual connection between the source and the destination hosts.
- A proxy firewall operates on the application layer. The proxy ensures that a direct connection from an external computer to local network never takes place.
- The proxy automatically segregates all the packets depending upon the protocols used for them. A proxy server must support various protocols. It checks each application or service, like Telnet or e-mail, when they are passed through it.
- A proxy server is easy to implement on a local network.
- Application level gateways or proxy server tend to be more secure than packet filters. Instead of checking the TCP and IP combinations that are to be allowed, it checks the allowable applications.

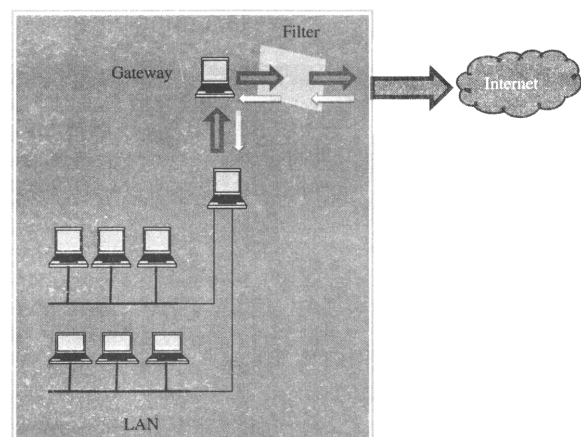


Fig.: Application-level gateway

Function of Firewall

1. Provide security by scanning every incoming data packet and allowing them to enter the network only if they doesn't contain any malicious software and are not vulnerable to security attack.
2. Hide the structure and implementation details of network from external users.
3. Provide user authentication so as to ensure that only authorized users access the secure network i.e., it prevent unauthorized access.

5.9 IDENTIFICATION & AUTHENTICATION**Q15. Explain about Users of Identification & Authentication****Ans :**

Identification is the process whereby a system recognizes a valid user's identity. *Authentication* is the process of verifying the claimed identity of a user. For example, a system uses user-password for identification. The user enters his password for identification. Authentication is the system which verifies that the password is correct, and thus the user is a valid user. Before granting access to a system, the user's identity needs to be authenticated. If users are not properly authenticated then the system is potentially vulnerable to access by unauthorized users. If strong identification and authentication mechanisms are used, then the risk that unauthorized users will gain access to a system is significantly decreased. Authentication is done using one or more combinations of - what you have (like smartcards), what you know (Password), and what you are (Biometrics like Fingerprints, retina scans).

We will now briefly discuss the following authentication mechanisms:

- User name and password
- Smart Card
- Biometrics - Fingerprints, Iris/retina scan

Once the user is authenticated, the access controls for the user are also defined. Access controls is what the user can access once he is authenticated.

Q16. What is a smart card? Explain various types of smart cards.**Ans :****Meaning**

As electronic tokens are not very secure and do not have the ability to manage multiple transactions, another form of electronic payment system was developed that replaced the electronic token. This form of system is called smart cards that provide more security while exchange transaction is being performed.

Smart cards are also known as store value card are similar to credit cards but with added enhanced features such as microprocessor or integrated circuit chip technology that store massive amount of customer specific information such as electronic money and is 80 times greater than the conventional magnetic strip cards.

Electronic payment in the form of smart card is mostly used on countries like Japan, France, Germany that uses these cards for transaction, phone calls payments.

Types of Smart Card

There are two types of smart cards,

1. Relationship based smart cards
2. Electronic purses.

1. Relationship Based Smart Cards

Relationships based smart cards are generally used to replace conventional credits cards in order to fulfill the demands of technical customers and to satisfy the need of using well-developed electronic payment system. Relationship based smart cards are nothing but improvement in services of existing cards or introducing new services that a bank give to its customers using integrated chip based card. New services such as,

- (i) Providing access to many financial accounts.
- (ii) Developing value-added marketing program.
- (iii) Storing customer-specific information.

Chip-based cards are used to meet particular accounting and personal needs of an individual. The customer-specific information is used by seller to track the behavior of a buyer.

Advantages

- (i) These cards, access to many financial accounts.
- (ii) Provides different kinds of functions like bill payment, balance enquiry etc.
- (iii) Provides various means of accessing the account that is situated at multiple locations using different types of devices such as ATM, PDA or a screen phone.

2. Electronic Purses

Though relationship-based smart cards are flexible and versatile their payment are done based on credit and there is no instant settlement using them. Electronic purses have been developed by many financial as well as government organizations for meeting their demands for developing a financial device that substitute paper cash. Electronic purses are wallet sized smart cards that includes a microchip for storing electronic money that a card holder utilizes for purchasing products or services.

Working of Electronic Purse

When the required amount of electronic money is stored on electronic purse, it can be used for purchasing any product or service. The transaction of electronic purse is processed using electronic device that is embedded with a card reader. The two things that an electronic device needs to verify is,

- (a) Authentication of card holder
- (b) Balance in the account (to know if there is sufficient money for the purchase).

When a purchase is made, the amount is deducted from the buyer's account immediately and saved in the electronic cash box. The balanced amount is displayed on the electronic machine or it can be checked by using balance reading device. When there is no amount left on electronic purse it can be recharged again at any ATM center or using special telephone. The drawback of electronic purses is that they are very expensive.

Q17. State the various Uses of Smart Card.

Ans :

Smart cards are used in a huge collection of applications as follows,

1. Pay phones
2. Mobile communications
3. Banking and retail
4. Health care sector
5. ID verification and access control.

1. Pay Phones

By integrating smart card option in the pay phone, both the customers and the company will be beneficial because the customer does not have to worry about carrying the appropriate number of coins, remembering large access codes, pin codes etc. On the other hand, the company does not require coin recognizer, storage box for coins etc. Also the need for a company professional to collect the coins from various terminals is eliminated.

2. Mobile Communication

In GSM digital mobile phones, smart card serves as an identification device because it contains all the significant information about the user so that the user will be billed according to his/her usage irrespective of the phone terminal utilized.

3. Banking and Retail

The smart card can also be used in banking and retail sector i.e., a smart card can serve as a credit card, debit card or a stored value card. The smart card is integrated with a highly powerful microchip that authenticates the user (Customer and merchant). Another microchip present in the smart card reader authenticates the bank thus, fraudulent usage is avoided. The smart card also supports other features like phone banking, automatic memory dialing and online services.

4. Health Care Sector

The smart card helps the hospital staff to obtain the history of the patient so that they could be treated by keeping their past medical

conditions in mind. Smart card also helps in the identification of doctors and provides them with a secured multi-level access to the private information. It also helps in designing an insurance policy for the patients.

5. ID Verification and Access Control

Smart cards are also capable of storing the finger prints of the user, their pictures etc. This information is used for revealing the identification of the card owner. A smart card reader enabled network can be easily accessed by the user after proper authentication.

5.9.1 Biometric Techniques

Q18. Explain in brief about the emerging biometric technologies.

Ans : (Imp.)

The following are the different emerging biometric techniques used for performing user identification and authentication,

1. Fingerprint scan
2. Iris/retina scan
3. Facial feature scan.

1. Fingerprint Scan

Fingerprint scan is a technique used for performing user identification based on the patterns found on the fingertips of every human. These are the patterns that remain same throughout the life of an individual. The main reason of selecting fingerprint as an identification technique is the difference between the ridge patterns of every individual i.e., the pattern of every individual is unique.

Working of Finger Print Scan

An electronic device called a fingerprint sensor is employed so as to perform line scan, wherein the image of the fingerprint pattern is captured in a digitized form. This captured image is processed in order to create a biometric template. The processing is done by maintaining the information about the different ridge patterns along with different print patterns. The created template is processed either as a image or as an computer algorithm that is in encoded format. Once the processing is done, the image is compared

with the other fingerprint records. This comparison is performed by initially determining the position of minutiae points on the finger and then searching the similar information regarding the minutiae within the database. This search is performed by implementing an algorithm that is capable of encoding the information in character format so that the time required for searching the match can be reduced.

Uses

- It is used in investigating criminal cases.
- Fingerprint reader is used for authorizing the users at ATMs.
- Fingerprint scan is used by vendors so as to automatically identify whether the credit card or debit account of a user is authentic or not.

Advantages

- It is very user-friendly i.e., the process of fingerprint scan can be easily understood with little training.
- It provides high performance, thereby making it the most accurate identification technology.
- It is an easy way of authenticating a person since numerous people have legible finger prints.

Disadvantages

- It is very intrusive i.e., it is not preferred by many people (not socially accepted).
- It is error-prone especially when there is dirt or dryness on the finger's skin.

2. Iris/Retinal Scan

Iris/retinal scan is another user identification technique which is preferred because of the uniqueness of irises i.e., no two irises are similar in the entire human population. This technique of identification is very robust as the iris does not change throughout the entire lifecycle of a human and is neither susceptible to any injury. This identification is done based on the patterns of blood vessels present at the back of retina.

Working of Retina Scan

A biometric identifier called retinal scan is employed for scanning the unique pattern of an individual retina. The light emitted by a light emitting device is easily absorbed by the blood vessels within the retina and the patterns are identified with appropriate lighting. A low-intensity infrared light is used for performing retinal scan which is casted within the eye of a person when they look through the eyepiece of the scanner.

Uses

- It is used in prisons for identity verification
- It is used by state agencies so as to stop unskilled person in obtaining license.

Advantages

- It is highly accurate since the false acceptance rate of this technique is below 0.001%.
- It is a reliable and stable technique as the blood vessel patterns are unique and remain same for the entire life period of an individual.
- It is very difficult to recreate or replicate the details of retinal patterns.
- It performs the verification process at a very high speed.

Disadvantages

- It is not very user friendly and is an expensive technique because of highly expensive equipments.
- The result may vary because of poor infrared light and vulnerability to degenerative diseases.
- It is highly invasive (spread quickly) and requires user involvement.

3. Facial Feature Scan

Facial feature scan is a natural biometric technology used for identification of an individual. This technique is inherent in every individual since it is possible to distinguish a person from other persons just by looking at

their face. The facial identification process performs the following two subprocesses,

- (a) Detection
- (b) Recognition.

(a) Detection

In this subprocess, a human face is located within the captured images and is then isolated from the remaining faces captured within the same image. The facial software scans the isolated face so as to determine the facial structure and measures the dimension (geometry) of each facial feature. Once the image is constructed, the software creates a binary mask of the image by cropping the unnecessary background details.

(b) Recognition

In this subprocess, a comparison is performed between the captured face and the other faces present in a database. The most commonly used recognition technology consists of eigen features or eigen faces approaches.

The eigen feature approach computes eigen vector values from the captured image by determining the distance between different facial features (like nose, mouth, eyebrows). Once the eigenvectors are known, then a comparison is performed wherein the computed eigenvectors are compared against the eigenvectors stored within the database.

The eigen face approach represents the facial image as 2D-set of light and dark area patterns. These patterns are converted and are represented as a computer algorithm. This algorithm is stored as a combination of eigen faces, which are then compared against the eigen faces saved in a database.

Working of Facial Recognition

The following steps are considered while performing facial recognition process.

Step 1: Capture Image

In this step, the existing photograph of an individual is digitally scanned so as to generate a line picture of the respective individual.

Step 2: Locate Face

Facial detection software is used to find the face from among the different faces within the captured image.

Step 3: Extract Feature

The feature of the identified face is extracted by facial recognition software. This is done by determining the spatial geometry of different facial features. Spatial geometry refers to the process of measuring the features in accordance to peaks and valleys (nodal points). The nodal points are then used in generating a template.

Step 4: Compare Template

The generated template is compared against the template saved within the database.

Step 5: Declare Match

After performing the comparison, the system declares the match only if the generated template is similar to the saved template.

Uses

- It is used in airport for protecting against terrorist attacks.
- It is used in multinational organizations for preventing unauthorized people from obtaining fake identification cards.
- It is used for surveillance purposes such as to find criminals, terrorists etc.
- It is used in law enforcement areas.

Advantages

- It is a non-intrusive, non-expensive technique.
- It makes use of legacy database and integrates with current surveillance technique.

Disadvantages

- The result is affected by change in age, hairstyle
- It imposes many restrictions on the way the images are to be captured.

5.10 SECURITY POLICIES**Q19. Explain in detail about security policy.**

Ans :

A formal statement that is prepared based on the security requirements, goals and objectives of an organization is referred to as "security policy". This policy basically specifies certain rules that are to be followed by every member of an organization. A security policy for an organization is defined in accordance to the existing technology, system and information present in the respective organization. The policy is practically implemented, by defining it using certain standards, guidelines and procedures. The main purpose of using these standards, guidelines and procedures is that, they provide the members with a particular way of interpreting the policy and also instruct them the method of implementing the policy.

Security policy includes the methods or measures that are followed by an organization so as to ensure the physical security of the valuable resources of an organization. Some of these measures include.

- Storing the hardware resources in a secure location
- Creating backups for preventing loss of data due to natural calamities, virus attack
- Securing the backup media

Apart from defining security measures, security policies even specify what actions (operations) are to be performed by the staff members and what actions are to be avoided.

Essential Features of Security Policy

- It must be comprehensive i.e., thoroughly defined.
- It must be up-to-date i.e., covering the current technologies of an organization.

- It must be presented in such a way that it is easily understood.
- It must be available to all the members of an organization.
- It must strictly be enforced by every staff member.

Q20. Explain the formulating a security policy.

Ans :

Security policies are defined based on an organization's needs. A security policy includes approaches and techniques that an organization is going to apply or include in order to secure its resources. The steps followed while formulating the security policy are:

➤ Analyzing Current Security Policies

The vulnerabilities and the current security policies must be analyzed (by the security administrators before defining an effective security policy. The security administrator is required to study the existing documents containing details of the physical security policies, network security policies, data security policies, disaster recovery plans, and contingency plans.

➤ Identifying IT Assets that Need to be Secure

The security administrator must identify the IT resources of an organization that need to be secure. It may include the following :

- Physical resources like computers, servers like database servers and web servers, local networks that are used to share the local computer with the remote computer, private networks shared by two or more organizations, corporate network permanently connected to the Internet, laptop, manuals, backup media, communication equipment, network cables, and CDs.
- Information resources like password, data, or applications. The data of an organization can be classified for security purposes based upon the sensitivity and

the integrity of data. For example, public information, internal information, confidential information, and secret information

➤ Identifying Security Threats and Likely Security Attacks

After identifying the IT assets and classifying them, a security administrator must identify the various security threats to the assets. For example, in a bank the security threat to the database storing the account details of the customers may be - unauthorized access to information, attacks of viruses, worms and Trojan horses, natural disasters like earthquake, fire etc.

➤ Defining the Proactive and Reactive Security Strategies

A *proactive strategy* is a pre-attack strategy. It involves identifying possible damage from each type of attack, determining the vulnerabilities that each type of attack can exploit, minimizing those vulnerabilities and making a contingency plan. A contingency plan specifies the actions to be taken in case an attack penetrates into a system and damages the IT assets of the organization. A contingency plan aims at keeping the computer functional and ensuring the availability, integrity, and confidentiality of data. However, it is not possible for the security administrator to prepare a computer against all attacks. A *reactive strategy* is implemented on the failure of the proactive strategy. It defines the steps to be taken after the attack. It aims at identifying the cause of attack, vulnerabilities used to attack the system, damage caused by the attack, and repairing of the damage caused by the attack.

5.10.1 Need for Legislation

Q21. What is the need for legislation ?

Ans :

Security policies are defined within a security plan, which provides a detail description regarding the way of implementing the rules specified in a security policy. The main reason of including a security policy within a security plan is to ensure

that every member of the organization has complete knowledge about the rules, boundaries and the consequences that they might face in case of violation or overstepping the specified boundary level.

5.11 CYBER LAWS

Q22. What is Cyber Law? Explain the need for Cyber Laws in India.

Ans : (Imp.)

Cyber law, also known as cyber crime law, is legislation focused on the acceptable behavioral use of technology including computer hardware and software, the internet, and networks. Cyber law helps protect users from harm by enabling the investigation and prosecution of online criminal activity. It applies to the actions of individuals, groups, the public, government, and private organizations.

A framework which is established to legally identify all the possible risks that may be associated with the usage of computers and computer networks. There are various aspects within the cyberlaw. They are, intellectual property, protection and restoration of private data, freedom of expression and crimes committed using computers. The ITA 2000 was the first cyberlaw passed by the Indian parliament with the purpose of providing legal infrastructure for successfully carrying out E-Commerce in India. This law mainly deals with all kinds of issues, legal results and conflicts related to cyberspace and internet. Indian ITA, 2000 Act provides security to electric data interchange and also to the transactions taking place through electronic networks.

The following are the reasons for the enactment of cyberlaws in India.

1. Indian legal system covers almost all situations and cases that took place or might occur in the future. But, in case of recently developed internet technology sector, there are no such laws made. Therefore, it is important to enact relevant laws as there has been an increased usage of internet in India.

2. It is required to provide legal recognition to the internet because, in modern era, internet has become the main source for dealing with the business activities.
3. Cyberterrorism has emerged with the growth of the internet. Cyberterrorism is a type of cybercrime which deals with disruptive activities i.e., causing problems or intentionally offensive social, ideological, religious and political objectives or to offence any person relating to such objectives in the cyber world. Hence, cyberlaws are essential to protect the users from cyberterrorism and other unethical activities which imposes risks to the interest of users.

Considering all the above reasons, Indian parliament passed the information technology bill on 17th May, 2000 which is commonly referred to as ITA, 2000. UNCITRAL law for E-commerce forms the basis for the introduction of this law. It emphasizes on cyberlaws and establishes a legal system for maintaining electronic records and also for maintaining information related to business activities performed electronically.

Q23. State the advantages and emerging trends in Cyber Laws.

Ans :

Advantages

The IT Act 2000 attempts to change outdated laws and provides ways to deal with cyber crimes. We need such laws so that people can perform purchase transactions over the Net through credit cards without fear of misuse. The Act offers the much-needed legal framework so that information is not denied legal effect, validity or enforceability, solely on the ground that it is in the form of electronic records.

In view of the growth in transactions and communications carried out through electronic records, the Act seeks to empower government departments to accept filing, creating and retention of official documents in the digital format. The Act has also proposed a legal framework for the authentication and origin of electronic records / communications through digital signature.

- From the perspective of e-commerce in India, the IT Act 2000 and its provisions contain many positive aspects. Firstly, the implications of these provisions for the e-businesses would be that email would now be a valid and legal form of communication in our country that can be duly produced and approved in a court of law.
- Companies shall now be able to carry out electronic commerce using the legal infrastructure provided by the Act.
- Digital signatures have been given legal validity and sanction in the Act.
- The Act throws open the doors for the entry of corporate companies in the business of being Certifying Authorities for issuing Digital Signatures Certificates.
- The Act now allows Government to issue notification on the web thus heralding e-governance.
- The Act enables the companies to file any form, application or any other document with any office, authority, body or agency owned or controlled by the appropriate Government in electronic form by means of such electronic form as may be prescribed by the appropriate Government.
- The IT Act also addresses the important issues of security, which are so critical to the success of electronic transactions. The Act has given a legal definition to the concept of secure digital signatures that would be required to have been passed through a system of a security procedure, as stipulated by the Government at a later date.
- Under the IT Act, 2000, it shall now be possible for corporates to have a statutory remedy in case if anyone breaks into their computer systems or network and causes damages or copies data. The remedy provided by the Act is in the form of monetary damages, not exceeding Rs. 1 crore.

Emerging Trends

Reports reveal that upcoming years will experience more cyber-attacks. So organizations are advised to strengthen their data supply chains with better inspection methods.

Some of the emerging trends of cyber law are listed below"

- Stringent regulatory rules are put in place by many countries to prevent unauthorized access to networks. Such acts are declared as penal offences.
- Stakeholders of the mobile companies will call upon the governments of the world to reinforce cyber-legal systems and administrations to regulate the emerging mobile threats and crimes.
- The growing awareness on privacy is another upcoming trend. Google's chief internet expert Vint Cerf has stated that privacy may actually be an anomaly.
- Cloud computing is another major growing trend. With more advancements in the technology, huge volumes of data will flow into the cloud which is not completely immune to cyber-crimes.
- The growth of Bitcoins and other virtual currency is yet another trend to watch out for. Bitcoin crimes are likely to multiply in the near future.
- The arrival and acceptance of data analytics, which is another major trend to be followed, requires that appropriate attention is given to issues concerning Big Data.

5.12 CYBER SECURITY ISSUES

Q24. What are the cyber security issues in India.

Ans :

- Cyber security is not a very easy process to manage. It requires both technological expertise and legal compliances which are lacking in the country.

- There are no dedicated cyber security laws in India, except the IT Act 2000 which also has its drawbacks such as lack of privacy, lack of civil liberties protection, absence of cyber security breaches disclosure norms etc.
- The information technology Act, IT Act 2000 was passed to govern legal issues of e-commerce, e-governance, cyber crimes, etc. But, according to experts, new and better techno-legal laws must be enacted in place of the old law.
- On 13 April 2015, the government announced that the Ministry of Home Affairs would form a committee of officials from the Central Bureau of Investigation, Intelligence Bureau, Delhi Police, National Investigation Agency and ministry itself to produce a new legal framework. It still needs to see the light of the day.
- Many critical issues need to be taken care of such as critical infrastructure protection, cyber warfare policy, cyber terrorism, e-commerce cyber security, e-governance cyber security, cyber security of banks, etc.
- The cyber security obligations of stakeholders such as e-commerce websites, directors of companies, law firms, thermal power sector, power and energy sector, Government departments, etc. must be properly understood and effectively implemented in India.

5.13 SALIENT FEATURES OF IT ACT

Q25. Explain in detail about IT Act 2000.

(OR)

Discuss about Indian Act 2000 with respect to Cyber crime.

Ans :

In 1996, the United Nations Commission on International Trade Law (UNCITRAL) adopted the model law on electronic commerce (e-commerce) to bring uniformity in the law in different countries.

Further, the General Assembly of the United Nations recommended that all countries must consider this model law before making changes to their own laws. India became the 12th country to enable cyber law after it passed the Information Technology Act, 2000.

The objectives of the Act are as follows :

- (i) Grant legal recognition to all transactions done via electronic exchange of data or other electronic means of communication or e-commerce, in place of the earlier paper-based method of communication.
- (ii) Give legal recognition to digital signatures for the authentication of any information or matters requiring legal authentication
- (iii) Facilitate the electronic filing of documents with Government agencies and also departments
- (iv) Facilitate the electronic storage of data
- (v) Give legal sanction and also facilitate the electronic transfer of funds between banks and financial institutions
- (vi) Grant legal recognition to bankers under the Evidence Act, 1891 and the Reserve Bank of India Act, 1934, for keeping the books of accounts in electronic form.

The key provisions under the Indian ITA 2000 (before the amendment)

Section Ref. and Title	Chapter of the Act and Title	Crime	Punishment
Sec. 43 (Penalty for damage to computer, computer system, etc.)	CHAPTER IX Penalties and Adjudication	Damage to computer	Compensation for ` 1 crore (₹ 10,000,000).
Sec. 66 (Hacking with computer system)	CHAPTER XI Offences	Hacking (with intent (or) knowledge).	Fine of ` 2 lakhs (₹ 200,000) and imprisonment for 3 years.
Sec. 67 (Publishing of information which is obscene in electronic form)	CHAPTER XI Offences	Publication of obscene material in electronic form.	Fine of ` 1 lakhs (₹ 100,000), imprisonment of 5 years and double conviction on second of offence.
Sec. 68 (Power of controller to give directions)	CHAPTER XI Offences	Not complying with of controller.	Fine up to ` 2 lakhs (₹ 200,000) and imprisonment of 3 years.
Sec. 70 (Protected system)	CHAPTER XI Offences	Attempting (or) securing to computer of another person without his/her knowledge	Imprisonment up to 10 years
Sec. 72 (Penalty for breach of confidentiality and privacy)	CHAPTER XI Offences	Attempting (or) securing access to computer for confidentiality of the information of computer.	Fine up to ` lakhs (₹ 100,000) and imprisonment up to 2 years.
Sec. 73 (Penalty for publishing Digital Signature Certificate false in certain particulars)	CHAPTER XI Offences	Publishing false digital signatures, false in certain particulars.	Fine of ` 1 lakh (₹ 100,000) (or) imprisonment of 2 years or both.
Sec. 74 (Publication for fraudulent purpose)	CHAPTER XI Offences	Publication of Digital Signatures for fraudulent purpose.	Imprisonment for the term of 2 years and fine of ` 1 lakh (₹ 100,000).

Q26. What are the features of IT Act 2000.**Ans :**

- All electronic contracts made through secure electronic channels are legally valid.
- Legal recognition for digital signatures.
- Security measures for electronic records and also digital signatures are in place.
- A procedure for the appointment of adjudicating officers for holding inquiries under the Act is finalized.
- Provision for establishing a Cyber Regulatory Appellant Tribunal under the Act. Further, this tribunal will handle all appeals made against the order of the Controller or Adjudicating Officer.
- An appeal against the order of the Cyber Appellant Tribunal is possible only in the High Court.
- Digital Signatures will use an asymmetric cryptosystem and also a hash function.
- Provision for the appointment of the Controller of Certifying Authorities (CCA) to license and regulate the working of Certifying Authorities. The Controller to act as a repository of all digital signatures.
- The Act applies to offences or contraventions committed outside India.
- Senior police officers and other officers can enter any public place and search and arrest without warrant.
- Provisions for the constitution of a Cyber Regulations Advisory Committee to advise the Central Government and Controller.

Q27. State the features of IT Act 2008.**Ans :****(Imp.)****Salient features of the Information Technology (Amendment) Act, 2008**

- (i) The term '**digital signature**' has been replaced with 'electronic signature' to make the Act more technology neutral.

- (ii) A new section has been inserted to define '**communication device**' to mean cell phones, personal digital assistance or combination of both or any other device used to communicate, send or transmit any text video, audio or image.
- (iii) A new section has been added to define cyber cafe as any facility from where the access to the internet is offered by any person in the ordinary course of business to the members of the public.
- (iv) A new definition has been inserted for intermediary.
- (v) A new section 10A has been inserted to the effect that contracts concluded electronically shall not be deemed to be unenforceable solely on the ground that electronic form or means was used.
- (vi) The damages of Rs. One Crore prescribed under section 43 of the earlier Act of 2000 for damage to computer, computer system etc. has been deleted and the relevant parts of the section have been substituted by the words, 'he shall be liable to pay damages by way of compensation to the person so affected'.
- (vii) A new section 43A has been inserted to protect sensitive personal data or information possessed, dealt or handled by a body corporate in a computer resource which such body corporate owns, controls or operates. If such body corporate is negligent in implementing and maintaining reasonable security practices and procedures and thereby causes wrongful loss or wrongful gain to any person, it shall be liable to pay damages by way of compensation to the person so affected.
- (viii) Sections 66A to 66F has been added to Section 66 prescribing punishment for offences such as obscene electronic message transmissions, identity theft, cheating by impersonation using computer resource, violation of privacy and cyber terrorism.

- (ix) Section 67 of the IT Act, 2000 has been amended to reduce the term of imprisonment for publishing or transmitting obscene material in electronic form to three years from five years and increase the fine thereof from Rs.100,000 to Rs. 500,000. Sections 67A to 67C have also been inserted. While Sections 67A and B deals with penal provisions in respect of offences of publishing or transmitting of material containing sexually explicit act and child pornography in electronic form, Section 67C deals with the obligation of an intermediary to preserve and retain such information as may be specified for such duration and in such manner and format as the central government may prescribe.
- (x) In view of the increasing threat of terrorism in the country, the new amendments include an amended section 69 giving power to the state to issue directions for interception or monitoring of decryption of any information through any computer resource. Further, sections 69A and B, two new sections, grant power to the state to issue directions for blocking for public access of any information through any computer resource and to authorize to monitor and collect traffic data or information through any computer resource for cyber security.
- (xi) Section 79 of the Act which exempted intermediaries has been modified to the effect that an intermediary shall not be liable for any third party information data or communication link made available or hosted by him if;
 - (a) The function of the intermediary is limited to providing access to a communication system over which information made available by third parties is transmitted or temporarily stored or hosted;
 - (b) The intermediary does not initiate the transmission or select the receiver of the transmission and select or modify the information contained in the transmission;
 - (c) The intermediary observes due diligence while discharging his duties. However, section 79 will not apply to an intermediary if the intermediary has conspired or abetted or aided or induced whether by threats or promise or otherwise in the commission of the unlawful act or upon receiving actual knowledge or on being notified that any information, data or communication link residing in or connected to a computer resource controlled by it is being used to commit an unlawful act, the intermediary fails to expeditiously remove or disable access to that material on that resource without vitiating the evidence in any manner.
- (xii) A proviso has been added to Section 81 which states that the provisions of the Act shall have overriding effect. The proviso states that nothing contained in the Act shall restrict any person from exercising any right conferred under the Copyright Act, 1957.

Short Question & Answers

1. What is meant by security.

Ans :

Meaning

It refers to the branch of computer science that describes the application of 'secure' behaviour on the operation of computers. Hence, with the advancements in computer science, the requirement for protecting and securing files and other useful information by using a variety of automated tools has been introduced. This type of security is more prevalent in case of shared systems such as time-sharing systems. Thus, the technique of employing a wide variety of tools for protecting data and preventing hackers from accessing the data is called 'computer security'

2. Define malicious software. Explain about the different types of malicious software .

Ans :

Meaning

Malicious software is a software program that is intentionally attached with a legitimate program for causing damage to systems's confidential data or resources.

Types

The following are different types of malicious software that can be installed within the system.

1. Virus
2. Logic bombs
3. Trojan horse
4. Worms
5. Applet and Active X controls.

3. Trojan Horse

Ans :

A Trojan horse is a computer program or procedure that contains hidden code, which once executed results in malicious functioning. They are referred to as loopholes that allow users to access information for which they are not authorized. These programs are not static in their actions and can vary when compared to other possible software programs.

Trojan horse programs give privileges to unauthorized user (attacker) to gain access to functions indirectly. These programs pretend to be an effective software, but it is actually deleting files, damaging the system's resources without users knowledge. The majority of Trojan horse infections are caused because the authentic user is trapped to execute an infected malicious program.

The important feature of Trojan horse is that it has all capabilities and permission of an authorized user. Trojan horse can either be malicious or non-malicious program. Malicious program finds a way to effect the secure system by allowing an intruder to gain unauthorized access. Non- malicious programs are used for handling system, utilizing software and for suspecting a spy or criminal. Some of the damages that are caused by Trojan horse include,

- (i) Deleting or overwriting data on the computer.
- (ii) Corrupting files in mysterious way.
- (iii) Deactivating anti-virus software program.
- (iv) Randomly shutting down the system.

A common example of Trojan horse can be a program called "waterfall.scr" which unloads hidden program scripts when executed without user's knowledge. Trojan horse can be a program that allegedly generates a list of user's file in a useful format. Trojan horse can create backdoor, which is a secret entry point into the program that gives unauthorized access to the user to interpret confidential or personal information of authentic user. This type of Trojan horse cannot be detected by just reading the login program's source code.

The best way to detect Trojan horse is to identify executable files that are modified by comparing CRC (Cyclic Redundancy Check) values for all executable files in the system. Trojan horse programs are powerful threat to security of system, network. They cannot be eliminated using firewalls, intrusion detection system or access control list.

4. Define hacking.

Ans :

Meaning

Hacking often refers to the unauthorized intrusion into a network or computer; normally carried out by one or more "hackers." However, a hacker can be anyone.

There are also many organizations who hire hackers as a part of their staff. These hackers use their skills to find flaws, vulnerable areas, and weak spots in the organization's security system. This is done to find and fix the weaknesses and prevent malicious hackers from breaking in the security system.

5. Security Services.

Ans :

The security objectives are accomplished through security policies and security services. A security policy is the set of criteria that define the provision of security services, where a security service is a service which is provided by a layer of communicating open systems, in order to ensure adequate security of the systems or of data transfers. The basic security services are following :

- 1) Authentication
- 2) Access control
- 3) Data confidentiality
- 4) Data Integrity
- 5) Non-repudiation

6. Cryptography.

Ans :

Meaning

Cryptography refers to the technique of transforming usable information into a form that is readable only by the either authorized users. This techniques is called encryption. The encrypted information can be converted back to its original form i.e., plain text by any authorized user, possessing the cryptographic

key. This process is called decryption. Hence, cryptography is a means of providing information security thereby protecting information from unauthorized access and disclosure while transmitting and storing the information.

Thus, cryptography provides security to the information as well as to other useful applications for improving authentication methods, message digests, digital signatures, non-repudiation and encrypted network communications. If it is not implemented properly then, it would lead to many security problems. The length and strength of an encryption key are also important, because the strength of an encryption algorithm is also dependent on the key.

7. Public Key Cryptography

Ans :

Public-key cryptography was invented by Diffie and Hellman in the year 1976. For this reason, it is sometimes known as Diffie-Hellman encryption. Public-key cryptography is also known as asymmetric cryptography. It is a form of cryptography in which a user has a pair of cryptographic keys i.e., a public-key and a private key. The private-key is kept secret, whereas the public-key is distributed widely. A message or text data which is encrypted with the public-key can be decrypted only with the corresponding private-key. For instance, when Johnny wants to send a secure message to Sunny, he uses Sunny's public-key to encrypt the message. Sunny then uses his private-key to decrypt it.

8. Digital signature.

Ans :

Meaning

A digital signature is one of the methods of encryption used to provide authentication. The main intent of the digital signature is to protect the message or data from modifications. Digital signature has gained much popularity in the world of network security. In addition to a digital signature, it is a kind of asymmetric cryptography used to encourage the security properties of a handwritten signature on paper. Basically, digital signature scheme provides two algorithms, one algorithm is for signing which requires the user's secret or private-key, and the other algorithm is for verifying signatures which requires the user's public-key. The result of the signature process is called the "digital signature".

9. Firewalls.

Ans :

Meaning

A firewall can either be software based or hardware based and is used to help keep a network secure. A system designed to prevent unauthorized access to or from a private network. Firewalls are frequently used to prevent unauthorized Internet users from accessing private networks connected to the Internet, especially intranets. Its primary objective is to control the incoming and outgoing network traffic by analyzing the data packets and determining whether it should be allowed through or not, based on a predetermined rule set.

A network's firewall builds a bridge between an internal network that is assumed to be secure and trusted, and another network, usually an external network, such as the Internet, that is not assumed to be secure and trusted.

10. What is a smart card?

Ans :

Meaning

As electronic tokens are not very secure and do not have the ability to manage multiple transactions, another form of electronic payment system was developed that replaced the electronic token. This form of system is called smart cards that provide more security while exchange transaction is being performed.

Smart cards are also known as store value card are similar to credit cards but with added enhanced features such as microprocessor or integrated circuit chip technology that store massive amount of customer specific information such as electronic money and is 80 times greater than the conventional magnetic strip cards.

Electronic payment in the form of smart card is mostly used on countries like Japan, France, Germany that uses these cards for transaction, phone calls payments.

11. Security Policy.

Ans :

A formal statement that is prepared based on the security requirements, goals and objectives of an organization is referred to as "security policy". This policy basically specifies certain rules that are to be followed by every member of an organization. A security policy for an organization is defined in accordance to the existing technology, system and information present in the respective organization. The policy is practically implemented, by defining it using certain standards, guidelines and procedures. The main purpose of using these standards, guidelines and procedures is that, they provide the members with a particular way of interpreting the policy and also instruct them the method of implementing the policy.

Choose the Correct Answer

1. The full form of Malware is _____ [c]
(a) Malfunctioned Software (b) Multipurpose Software
(c) Malicious Software (d) Malfunctioning of Security
2. Who deploy Malwares to a system or network? [a]
(a) Criminal organizations. Black hat hackers, malware developers, cyber-terrorists
(b) Criminal organizations. White hat hackers, malware developers, cyber-terrorists
(c) Criminal organizations. Black hat hackers, software developers, cyber-terrorists
(d) Criminal organizations, gray hat hackers. Malware developers, Penetration testers
3. _____ is a code injecting method used for attacking the database of a system / website. [b]
(a) HTML injection (b) SQL Injection
(c) Malicious code injection (d) XML Injection
4. XSS is abbreviated as _____ [d]
(a) Extreme Secure Scripting (b) Cross Site Security
(c) X Site Scripting (d) Cross Site Scripting
5. This attack can be deployed by infusing a malicious code in a website's comment section. What is "this" attack referred to here? [c]
(a) SQL injection (b) HTML Injection
(c) Cross Site Scripting (XSS) (d) Cross Site Request Forgery (XSRF)
6. When there is an excessive amount of data flow, which the system cannot handle, _____ attack takes place. [d]
(a) Database crash attack (b) DoS (Denial of Service) attack
(c) Data overflow Attack (d) Buffer Overflow attack
7. Compromising a user's session for exploiting the user's data and do malicious activities or misuse user's credentials is called _____ [a]
(a) Session Hijacking (b) Session Fixation
(c) Cookie stuffing (d) Session Spying
8. Which of this is an example of physical hacking? [b]
(a) Remote Unauthorised access (b) Inserting malware loaded USB to a system
(c) SQL Injection on SQL vulnerable site (d) DDoS (Distributed Denial of Service) attack
9. Which of them is not a wireless attack? [d]
(a) Eavesdropping (b) MAC Spoofing
(c) Wireless Hijacking (d) Phishing
10. An attempt to harm, damage or cause threat to a system or network is broadly termed as [b]
(a) Cyber-crime (b) Cyber Attack
(c) System hijacking (d) Digital crime

Fill in the blanks

1. A _____ refers to the capability for violating the security that arises upon the occurrence of an event, action or a circumstance and affects the network security and cause damage to it.
2. _____ is a software program that is intentionally attached with a legitimate program for causing damage to systems's confidential data or resources.
3. A _____ is a software program that replicates itself and infects another computer without the knowledge of the user.
4. _____ is a primitive computer threat that existed earlier to viruses and worms.
5. _____ programs give privileges to unauthorized user (attacker) to gain access to functions indirectly.
6. _____ refers to the technique of transforming usable information into a form that is readable only by the either authorized users.
7. A digital _____ is one of the methods of encryption used to provide authentication.
8. _____ is usually deployed on the routers.
9. _____ scan is a technique used for performing user identification based on the patterns found on the fingertips of every human.
10. UNCI TRAL stands for _____

ANSWERS

1. Threat
2. Malicious software
3. Virus
4. Logic bomb
5. Trojan horse
6. Cryptography
7. Signature
8. Packet Filter Firewall
9. Fingerprint
10. United Nations Commission on International Trade Law

FACULTY OF MANAGEMENT
M.B.A I Year I - Semester(CBCS) Examination
MODEL PAPER - I
IT APPLICATIONS FOR MANAGEMENT

Time : 3 Hours]

[Max. Marks : 80

PART - A (5 × 4 = 20 Marks)

[Short Answer type]

Note: Answer **All** the Questions in not more than one page each

ANSWERS

- | | |
|--------------------------------------|-------------------|
| 1. Compare and contrast RAM and ROM. | (Unit-I, SQA-8) |
| 2. What are the Objectives of MIS ? | (Unit-II, SQA-3) |
| 3. What is a network? | (Unit-III, SQA-1) |
| 4. ERP. | (Unit-IV, SQA-4) |
| 5. Define hacking. | (Unit-V, SQA-4) |

PART - B (5 × 12 = 60 Marks)

[Essay Answer type]

Note: Answer **All** the Questions by using internal choice in not exceeding four pages each

- | | |
|---|---------------------|
| 6. (a) Draw a block diagram of computer. Explain the working of various functional units. | (Unit-I, Q.No.4) |
| OR | |
| (b) Explain the various challenges of IT ? | (Unit-I, Q.No.30) |
| 7. (a) Explain the architecture of DSS. | (Unit-II, Q.No.13) |
| OR | |
| (b) What is Big data. State the characteristics of big data. | (Unit-II, Q.No.34) |
| 8. (a) List the advantages and disadvantages of each of the LAN Topologies Bus, Star, and Ring. | (Unit-III, Q.No.11) |
| OR | |
| (b) State the various Applications of Communications. | (Unit-III, Q.No.22) |
| 9. (a) Discuss about Human resources information system. | (Unit-IV, Q.No.8) |

OR

- (b) Discuss how to develop ERP System. (Unit-IV, Q.No.11)
10. (a) Explain various security threats in business. (Unit-V, Q.No.2)

OR

- (b) Explain in brief about the emerging biometric technologies. (Unit-V, Q.No.18)

FACULTY OF MANAGEMENT
M.B.A I Year I - Semester(CBCS) Examination
MODEL PAPER - II
IT APPLICATIONS FOR MANAGEMENT

Time : 3 Hours]

[Max. Marks : 80

PART - A (5 × 4 = 20 Marks)**[Short Answer type]****Note:** Answer **All** the Questions in not more than one page each**ANSWERS**

- | | |
|-----------------------------------|-------------------|
| 1. Application Software | (Unit-I, SQA-11) |
| 2. State the Applications of DSS. | (Unit-II, SQA-8) |
| 3. What is data communication? | (Unit-III, SQA-5) |
| 4. Marketing information system. | (Unit-IV, SQA-2) |
| 5. What is a smart card? | (Unit-V, SQA-10) |

PART - B (5 × 12 = 60 Marks)**[Essay Answer type]****Note:** Answer **All** the Questions by using internal choice in not exceeding four pages each

- | | |
|--|---------------------|
| 6. (a) Explain the role of IT in business. | (Unit-I, Q.No.29) |
| OR | |
| (b) What is Random accesses memory ? Explain different types of RAM. | (Unit-I, Q.No.13) |
| 7. (a) Define management information system. Explain the characteristics of manage-ment information system. | (Unit-II, Q.No.3) |
| OR | |
| (b) What are the differences between DSS and MIS? | (Unit-II, Q.No.16) |
| 8. (a) What is file transfer protocol(FTP)? List the steps involved in downloading/ uploading a file by using FTP service. | (Unit-III, Q.No.32) |
| OR | |
| (b) Describe briefly the function of each layer of the OSI Model. | (Unit-III, Q.No.20) |
| 9. (a) Explain the various modules of ERP. | (Unit-IV, Q.No.12) |

OR

(b) Explain about customer relationship management. (Unit-IV, Q.No.20)

10. (a) Define the term cryptography. Explain in detail the three cryptographic schemes. (Unit-V, Q.No.9)

OR

(b) What is firewall? Discuss various types of firewalls. (Unit-V, Q.No.14)

FACULTY OF MANAGEMENT
M.B.A I Year I - Semester(CBCS) Examination
MODEL PAPER - III
IT APPLICATIONS FOR MANAGEMENT

Time : 3 Hours]

[Max. Marks : 80

PART - A (5 × 4 = 20 Marks)**[Short Answer type]****Note:** Answer **All** the Questions in not more than one page each**ANSWERS**

- | | |
|--|--------------------|
| 1. Explain the importance of IT in Business. | (Unit-I, SQA-15) |
| 2. Define Decision Support System. | (Unit-II, SQA-6) |
| 3. Define Web Conferencing. | (Unit-III, SQA-11) |
| 4. CPFR | (Unit-IV, SQA-9) |
| 5. Trojan Horse | (Unit-V, SQA-3) |

PART - B (5 × 12 = 60 Marks)**[Essay Answer type]****Note:** Answer **All** the Questions by using internal choice in not exceeding four pages each

- | | |
|--|---------------------------|
| 6. (a) Define computer and explain its characteristics? | (Unit-I, Q.No.1) |
| OR | |
| (b) Define Hardware. Explain the classification of hardware. | (Unit-I, Q.No.9,10,11,12) |
| 7. (a) Explain the various types of decision support system. | (Unit-II, Q.No.11) |
| OR | |
| (b) Define 5G systems. List out various advantages and disadvantages of 5G | (Unit-II, Q.No.39,40) |
| 8. (a) Explain briefly about TCPI / IP Model. | (Unit-III, Q.No.21) |
| OR | |
| (b) Explain different types of networks. | (Unit-III, Q.No.3,5,8) |
| 9. (a) What are the various stages of System Development? Explain in detail each stages. | (Unit-IV, Q.No.26) |

OR

- (b) Explain the advantages and Risks involved in EFT . (Unit-IV, Q.No.29)
10. (a) Discuss about Indian Act 2000 with respect to Cyber crime. (Unit-V, Q.No.25)

OR

- (b) Define malicious software. Explain about the different types of malicious software. (Unit-V, Q.No.4)