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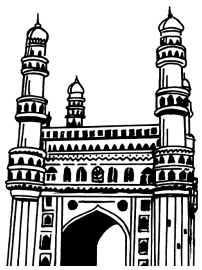

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CONTENTS

FUNDAMENTALS OF INFORMATION TECHNOLOGY

STUDY MANUAL

SOLVED PREVIOUS QUESTION PAPERS

SOLVED MODEL PAPERS

SYLLABUS

UNIT - I

INTRODUCTION TO COMPUTERS :

Introduction,Definition,Characteristicsofcomputer,EvolutionofComputer,BlockDiagramOf a computer, Generations of Computer, Classification Of Computers, Applications of Computer, Capabilities and limitations ofcomputer.

Role of I/O devices in a computer system.Input Units: Keyboard, Terminals and its types. Pointing Devices, Scanners and its types, Voice Recognition Systems, Vision Input System, Touch Screen, Output Units: Monitors and its types. Printers: Impact Printers and its types.

Non-Impact Printers and its types, Plotters, types of plotters, Sound cards,Speakers.

UNIT - II

COMPUTER ARITHMETIC & STORAGE FUNDAMENTALS:

Binary,Binary Arithmetic, Number System: Positional & Non Positional, Binary,Octal, Decimal, Hexadecimal, Converting from one number system to another.

Primary Vs Secondary Storage, Data storage & retrieval methods.Primary Storage: RAM ROM, PROM, EPROM, EEPROM. Secondary Storage: Magnetic Tapes, Magnetic Disks. Cartridge tape, hard disks, Floppy disks Optical Disks, Compact Disks, Zip Drive, Flash Drives.

UNIT - III

SOFTWARE :

Software and its needs, Types of S/W. System Software: Operating System, Utility Programs Programming Language: Machine Language, Assembly Language, High Level Language their advantages & disadvantages. Application S/W and its types: Word Processing, Spread Sheets Presentation, Graphics, DBMS s/w.

UNIT - IV

OPERATING SYSTEM:

Functions, Measuring System Performance, Assemblers, Compilers and Interpreters. Batch Processing, Multiprogramming, Multi Tasking, Multiprocessing, Time Sharing, DOS, Windows, Unix/Linux.

UNIT - V

DATA COMMUNICATION:

Data, Communication, Basic Networking Devices, Communication Process, Data Transmission speed, Communication Types(modes), Data Transmission Medias, Modem and its working, characteristics, Typesof Networks, LAN Topologies, Computer Protocols, Concepts relating to networking.

Contents

Frequently Asked & Important Questions

UNIT - I

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

Ans : **(Dec.-19 MGU, Dec.-19 KU)**

Refer Unit-I, Q.No. 4.

2. Explain the various generations of computer.

Ans : **(Aug.-21, Dec.-19 MGU, Imp.)**

Refer Unit-I, Q.No. 5.

3. What is scanner ? Explain the different types of scanner.

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

Refer Unit-I, Q.No. 17.

4. Explain the various types of output devices.

Ans : **(Dec.-19 KU, Imp.)**

Refer Unit-I, Q.No. 21.

5. What is impact printer ? Explain the different types of impact printers.

Ans : **(Aug.-21, Imp.)**

Refer Unit-I, Q.No. 24.

UNIT - II

1. What is number system ? Explain different types of number systems.

Ans : **(Dec.-20, Dec.-19, Imp.)**

Refer Unit-II, Q.No. 3.

2. Explain briefly about Octal Number System.

Ans : **(Aug.-21, Imp.)**

Refer Unit-II, Q.No. 5.

3. What is primary storage ?

Ans : **(Dec.-19 MGU, Dec.-19 KU, Imp.)**

Refer Unit-II, Q.No. 18.

4. What are the differences between RAM and ROM ?

Ans : **(Aug.-21, Imp.)**

Refer Unit-II, Q.No. 25.

5. What is meant by Magnetic Tapes ?

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

Refer Unit-II, Q.No. 27.

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

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

Refer Unit-II, Q.No. 25.

UNIT - III

1. What is software? Explain the features of software.

Ans : **(Dec.-19 MGU, Imp.)**

Refer Unit-III, Q.No. 1.

2. Define system software.

Ans : **(Aug.-21, Dec.-19 MGU, Dec.-19 KU)**

Refer Unit-III, Q.No. 2.

3. What is operating system ?

Ans : **(Dec.-19 MGU, Dec.-19 KU, Imp.)**

Refer Unit-III, Q.No. 3.

4. What is Programming Language?

Ans : **(Aug.-21, Dec.-19 KU, Imp.)**

Refer Unit-III, Q.No. 5.

5. What is Machine Language?

Ans : **(Aug.-21, Dec.-20, Dec.-19 MGU, Imp.)**

Refer Unit-III, Q.No. 6.

6. What is Assembly Language?

Ans : **(Aug.-21, Dec.-20, Dec.-19 MGU, Imp.)**

Refer Unit-III, Q.No. 8.

7. What is High Level Language?

Ans : **(Dec.-20, Dec.-19 MGU, Imp.)**

Refer Unit-III, Q.No. 10.

UNIT - IV

1. What is Operating System ?

Ans : **(Aug.-21, Dec.-19, Dec.-19 MGU, Imp.)**

Refer Unit-IV, Prob. 1.

2. What are the functions of Operating System ?

Ans : **(Aug.-21, Dec.-19 MGU, Imp.)**

Refer Unit-IV, Q.No. 3.

3. What do you understand by batch processing ? Explain advantages and disadvantages of batch processing ?

Ans : **(Dec.-19, Imp.)**

Refer Unit-IV, Prob. 9.

4. Explain various types of operating systems.

Ans : **(Dec.-19, Dec.-19 MGU, Dec.-19 KU, Imp.)**

Refer Unit-IV, Q.No. 10.

5. What is Multi - Tasking Operating System ?

Ans : **(Aug.-21, Imp.)**

Refer Unit-IV, Q.No. 14.

6. What is multi - processing ? What are the advantages and disadvantages of multi processing ?

Ans : **(Aug.-21, Imp.)**

Refer Unit-IV, Q.No. 16.

UNIT - V

1. Explain different types of commu-nication.

Ans : **(Aug.-21, Dec.-19 KU, Imp.)**

Refer Unit-V, Q.No. 8.

2. What is a wire pair ? In what situations they are suitable for use in data transmission.

Ans : **(Dec.-19, Imp.)**

Refer Unit-V, Q.No. 11.

3. Define networks.

Ans : **(Dec.-20, Dec.-19 KU, Imp.)**

Refer Unit-V, Prob. 18.

4. Explain various types of operating systems.

Ans : **(Dec.-19, Dec.-19 MGU, Dec.-19 KU, Imp.)**

Refer Unit-V, Q.No. 10.

5. What is Metropolitan Area Network (MAN). Explain advantages and disadvantages of Metropolitan area network.

Ans : **(Dec.-20, Dec.-19 MGU, Imp.)**

Refer Unit-V, Q.No. 24.

6. What is Wide Area Network (WAN). Explain advantages and disadvantages of Wide area network.

Ans : **(Dec.-20, Dec.-19 MGU, Imp.)**

Refer Unit-V, Q.No. 25.

7. Explain different types of topologies.

Ans : **(Aug.-21, Dec.-19, Dec.-19 KU, Imp.)**

Refer Unit-V, Q.No. 28.

8. Define Protocols ? Explain different types of computer protocols.

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

Refer Unit-V, Q.No. 29.

UNIT I

INTRODUCTION TO COMPUTERS: Introduction, Definition, Characteristics of computer, EvolutionofComputer,BlockDiagramOf a computer, Generations of Computer, Classification Of Computers, Applications of Computer, Capabilities and limitations ofcomputer. Role of I/O devices in a computer system.

Input Units: Keyboard, Terminals and its types. Pointing Devices, Scanners and its types, Voice Recognition Systems, Vision Input System, Touch Screen,

Output Units: Monitors and its types. Printers: Impact Printers and its types. Non-Impact Printers and its types, Plotters, types of plotters, Sound cards,Speakers.

1.1 INTRODUCTION TO COMPUTER

1.1.1 Definition of Computer

Q1. Define Computer.

Ans :

The word "computer" comes from the word "compute", which means, "to calculate". Hence, people usual consider a computer to be a calculating device that can perform arithmetic operations at high speed).

A computer is an electronic device or machine that can perform arithmetic operations like addition, subtraction, multiplication, division etc. as well as logical operations like comparisons at very high speed. A computer is also called a "Data Processor" because it can store, process, and retrieve data whenever desired.

In the present era, computers became more common in every field independent of discipline. Thus for every one it is essential to have knowledge about computers. Computers are playing a major role in promoting information technology (IT) and tied the entire world through information exchange. It is the fact that the day to day life of human beings is almost related to computers either directly or indirectly. Though computer can perform several jobs, it cannot do on its own. It follows the instructions given by users.

In general, the data and information are often used interchangeably. In particular, in IT, the data and information are two distinct objects and one should clearly understand the difference between them. **Data** represents raw facts and observation. Examples are number, word, amount, name concept, holiday, etc. **Information** is the result of processing of the data. That means, the data that has been transformed in useful and meaningful form is known as information.

A computer system is a combination of ***hardware*** and ***software***, which are used for processing and storing the data. Hardware refers to the physical components of a computer system. Examples are microprocessor, keyboard, Cathode Ray Tube (CRT), harddisk, floppy disk, mouse etc., Software is the set of instructions (called program) written for a computer to perform a particular task.

Software can be classified as ***system software*** and ***application software***. System software refers to a collection of programs such as compilers, operating systems, etc., which provides vital services to the users and makes the computer user friendly. Application software refers to the programs usually written by programmers for performing their desired tasks.

1.1.2 Characteristics of Computer

Q2. List and Explain some important characteristics of a computer.

Ans :

A computer is equipped with number of characteristics that helps it to handle the different problems more efficiently. Some of the main characteristics are :

- **Accuracy**

  Computer system always produces accurate results with valid data and instructions. In simple terms, one cannot expect correct and accurate results when the instruction set to manipulate the data is incorrect or the data which user is supplying to the computer is wrong.

- **Speed**

  A computer performs operations with very high speed. It can process millions of instructions in fraction of seconds. The speed of a computer varies from computer to computer. It is basically measured in nanoseconds (10^9 seconds) and picoseconds (10^{12} seconds). With the introduction of very fast processing units and other devices connected to computer the speed of the computer is increasing day by day.

- **Large Storage Capacity**

  A computer has large storage capacity. It can store large volume of data. We can store any kind of data in computer's storage. This data can be text, picture, sound, video etc.

- **Versatility**

  A computer is a versatile machine. It can perform a number of jobs depending upon the instructions fed to it. Like a computer can be used to write a letter to a friend in a word processor and at the same time listen to various songs through a media player. The same machine (computer) works in different fields with different applications to perform various tasks. This property of computer is called versatility.

- **Reliability**

  Computerized storage of data is much more reliable than the manual storage. We can store the data in computer's storage for a long period of time except until any kind of system failure occurs.

- **Diligence**

  Unlike human beings, the computer can work continuously without getting tired. It can perform the same task repeatedly with same processing speed. Without the lack of concentration they help us in doing a number of jobs that require a great accuracy.

- **Automatic**

  A machine that works itself without any human involvement is said to be an automatic machine. Computers are automatic machines; they can work on any given job automatically till it gets finished without any human interference.

- **Source of Entertainment**

  Today, computer has become a great source of entertainment. We can play video games, enjoy music and watch movies or various satellite channels through computer. We can also communicate with each other through computer by means of text messages, audio/ video messages.

- **Cost Effectiveness**

  Computers reduce the amount of paperwork and human effort, thereby reducing costs. For example: we can create and edit student reports easily using a computer. We can send electronic reports to management via e-mail.

- **No Intelligence**

  A computer has no intelligence of its own. It depends upon user's instructions for any kind of task. Now days, some artificial intelligence (AI) has been introduced that helps the computer to take some decisions on its own. Robots are the example of such AI systems.

1.2 Evolution of Computers

Q3. 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 modem 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 modem 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 modem 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.

1.3 Block Diagram of Computer

Q4. Draw a block diagram of computer. Explain the working of various functional units.

Ans : **(Dec.-19 MGU, Dec.-19 KU)**

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.

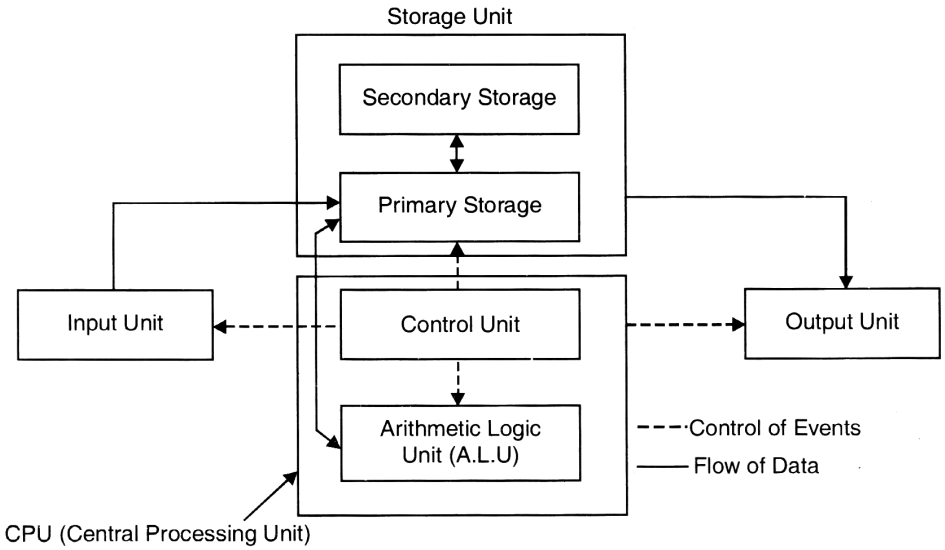


Fig. : (Block Diagram of a Computer)

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.

1.4 Generation of Computer

Q5. Explain the various generations of computer.

Ans : **(Aug.-21, Dec.-19 MGU, Imp.)**

"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. Willian 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 bum 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.

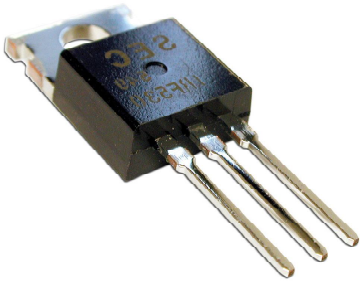


Fig. : A Transistor

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 VLSI (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. Flence. 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.

1.5 Classification of Computer

Q6. Explain the classification of computers based on size and working principle.

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

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 microprocessor 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 microprocessor 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 microprocessor 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 & 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 :

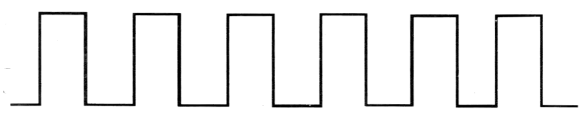


Fig. : (Clock Pulses)

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:

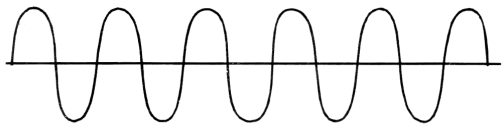


Fig.: (Data Flow in Analog Computer)

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.

Q7. 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 of.
- 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.

1.6 Applications of Computer

Q8. 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 art. 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 then 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.

1.7 CAPABILITIES AND LIMITATIONS OF COMPUTER

Q9. Explain the capabilities of computer.

Ans :

Capabilities of a computer system are the qualities of the computer that put it in a positive light and make the user experience more efficient.

1. Speed

Speed means the duration computer system requires in fulfilling a task or completing an activity. It is well-known that computers need very little time than humans in completing a task. Generally, humans take into account a second or minute as a unit of time.

Nevertheless, computer systems have such fast operation capacity that the unit of time is in fractions of a second. Today, computers are capable of doing 100 million calculations per second and that is why the industry has developed Million Instructions per Second (MIPS) as the criterion to classify different computers according to speed.

2. Accuracy

Accuracy means the level of precision with which calculations are made and tasks are performed. One may invest years of his life in detecting errors in computer calculations or updating a wrong record. A large part of mistakes in Computer Based Information System(CBIS) occurs due to bad programming, erroneous data, and deviation from rules. Humans cause these mistakes.

Errors attributable to hardware are generally distinguished and corrected by the computer system itself. The computers rarely commit errors and do all types of tasks precisely.

3. Reliability

Reliability is the quality due to which the user can stay dependable on the computer. Computers systems are well-adjusted to do repetitive tasks. They never get tired, bored or fatigued. Hence, they are a lot reliable than humans. Still, there can be failures of a computer system due to internal and external reasons.

Any failure of the computer in a highly automated industry is disastrous. Hence, the industry in such situations has a backup facility to take over tasks without losing much of the time.

4. Adaptability

Adaptability of computer system means the quality of it to complete a different type of tasks: simple as well as complex. Computers are normally versatile unless designed for a specific operation. Overall, a daily purpose computer is used in any area of application: business, industry, scientific, statistical, technological and so on.

A general purpose computer, when introduced in a company, can replace the jobs of multiple specialists due to its flexibility. A computer system can replace the functions of all these specialists because of being very versatile.

5. Storage

Storage is the ability of the computer to store data in itself for accessing it again in future. Nowadays, apart from having instantaneous access to data, computers have a huge ability to store data in a little physical space.

A general computer system has a capacity of storing and providing online millions of characters and thousands of pictures. It is obvious from the above discussion that computer capabilities outperform the human capabilities. Therefore, a computer, when used rightfully, will tenfold the effectiveness of an organization.

Q10. What are the benefits and limitations of a computer ?

Ans :

1. Benefits of Computers

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.

2. Limitations of Computers

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 turns 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.

1.8 Role of Input Devices in a Computer System

Q11. 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 of Input Devices

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

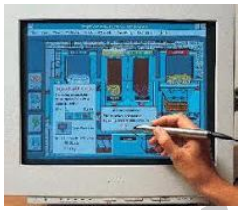
Track pad is a pointing input device. It is used in Lap top computers to control motion of pointer on screen. Track pad is a stationary input device. It has a flat surface of 1.5 to 2

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 he 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.

1.8.1 Keyboard, Terminals and its Types

Q12. What is key board ? Explain the various keys are used in key board.

Ans :

- Keyboard is the most common input device used for entering text data directly into a computer.
- A computer keyboard is similar to that of a typewriter, but it has additional keys as well.
- The most commonly available computer keyboard has 104 keys. Data is entered into a computer by pressing a set of keys available with the keyboard.

Fig. : Key board

- Keyboard is the oldest input device, which is still being used with the modern computers. When user presses a key, the corresponding character appears on screen.

Keyboard Keys

The keys of the keyboard are divided as :

a) Numeric keys

b) Character keys/Alphanumeric keys

c) Punctuation keys

d) Function keys

e) Special purpose keys

f) Cursor movement keys

a) Numeric keys

Numeric keypad is usually located on right side of the keyboard with its 10 digits (0 - 9) and mathematical operators (+ , -, *, /). These keys are used to input numeric information.

b) Character keys / Alphanumeric keys

These keys are mainly used to enter characters. These keys include keys for characters like a - z, A - Z, 0-9, Enter key and Shift key. These keys are arranged in the same way on almost every keyboard and look like a typewriter keys.

c) Punctuation keys

To type the special punctuation characters, punctuation keys, such as the colon (:), the semicolon (;), the question mark (?), single quotes (‘) and double quotes (“) are used.

d) Function keys

These keys are arranged at the topmost row of the keyboard and each one of them has a special function associated with it. The function associated with a function key differs from software to software. Normally, a standard keyboard has 12 function keys. (FI, F2, F3 FI2)

e) Special purpose keys

These keys are used to perform special functions like- deletions or moving a page up or down. (Del, Page Up, Page Down). Some others keys in this category are: Home, End, Insert, Ctrl and Alt etc.

f) Cursor movement keys

These keys allow us to move around the screen. Most keyboards have the keys such as - Arrow keys to move the cursor up/down (single row) or Left/ Right (one character space).

Q13. What is Multimedia Keyboard ?

Ans :

- A multimedia keyboard is designed to make it one-touch simple for the user to access often-used programs.
- Multimedia keyboard contains various additional keys to perform functions like - volume control, launching Internet explorer, changing song and video tracks, launching e-mail software etc.
- A typical multimedia keyboard contains buttons that control various computer processes, such as turning on the computer’s power, putting the CPU to sleep, and waking it up again.
- The web browser keys on a multimedia keyboard should be familiar to most Internet users. ***Back, Forward, Stop,*** **and** ***Refresh*** buttons are usually present on such keyboards.
- A specific type of multimedia keyboard called a *Gaming keyboard,* meant for use with high-tech video games, can be even more expensive.
- Multimedia keyboards come in various connection formats, including PS/2, USB, and wireless.

Q14. What is wireless keyboard ?

Ans :

- Wireless keyboards are also available today, but at a higher price than wired keyboard.
- These keyboards do not have any wire attached to them.
- Wireless keyboard interacts with the computer through *Bluetooth* or *Infrared* technology.
- Wireless keyboards transfer typing data to the computer via infrared beams. A beam of

information is sent from the keyboard, as you type, to a receiver, which is plugged into the computer.

- Wireless keyboard operates on battery power rather than using electricity from the user's computer.
- The main advantage of using a wireless keyboard rather than a regular keyboard is that it offers much more mobility. A wireless keyboard can be used on a lap, in a bed, or just used while on-the-go for laptop users.
- It can maintain required distance between the screen and the seating and also do not need to keep it placed on the working table always saving a lot of space when not using the system.
- One of the disadvantages of using a wireless keyboard is that it has to be installed and configured before it can be used. Regular keyboards, on the other hand, run on Plug and Play software and work immediately after they are plugged in.

Q15. What is Terminal ? Explain the different types of terminals.

Ans :

Terminal is a device that enables you to communicate with a computer.

Three basic types of terminals are :

- **Dumb terminal:** has no built-in data processing capabilities and serves only to send and receive data.
- **Smart terminal:** has limited data processing capabilities
- **Intelligent terminal:** has substantial data processing capabilities due to inbuilt processor and memory.

1.8.2 Pointing Devices

Q16. Explain the various pointing devices ?

Ans :

Interaction with computers was initially restricted mainly to text mode. However, it was soon realized that interacting with computers in text-mode is cumbersome and time-consuming. Hence, a new type of user interface, called *graphical user interface (GUI),* was devised for interacting with computers. A GUI provides a screen with graphic icons (small images on the screen) or menus and allows a user to make rapid selections from them to give instructions to a computer. For efficient utilization, GUI requires an input device that can be used to rapidly point to and select a graphic icon or menu item from the multiple options displayed on the screen.

The keyboard, though usable, was found to be inconvenient and unsuitable for this requirement. Hence, research efforts to find a suitable input device to meet this requirement gave birth to several input devices like mouse, track ball, joystick, light pen, and touch screen. Later it was realized that many of these devices, like mouse and light pen, could also be used very effectively to create graphic elements on the screen such as lines, curves, and freehand shapes. With this new ability, these devices came to be known as point-and-draw' devices.'

1. Mouse

- Mouse is another popular input device used with modern computer.
- It is basically a pointing device, which is used to provide input in graphic-user interface operating systems.

- It is a small palm size box, which appears a bit like a mouse.
- It has a round ball at its base which senses the movement of mouse and sends the corresponding signals to CPU on pressing the buttons.
- The mouse is represented on the screen in the form an arrow. This arrow is called a *Cursor.* Moving the mouse on your desk will move the arrow on the screen.
- A mouse allows us to create graphic elements on the screen, such as lines, curves and free hand shapes etc.
- It makes using menus and message boxes easier.
- The mouse contains one to three buttons to perform different functions.
- The mouse is attached to the computer system by using a wire.
- Wireless mouse are also available that don't have any wire attached to them.

Functions of Mouse

The main goal of any mouse is to translate the motion of your hand into signals that the computer can use.

There are five simple techniques to use the mouse:

a) Click

b) Double Click

c) Drag

d) Right Click

e) Scroll

a) Click

To click on something with a mouse means to move the pointer or cursor to the item on the screen and to press and release the mouse button once (usually left button).

b) Double Click

Press and release the mouse button twice in rapid succession.

c) Drag

After positioning the mouse pointer over the item, then press the button and hold it down as you move the mouse.

d) Right Click

Right click means to press the right button of mouse once without moving it. It helps to display a shortcut menu.

e) Scroll

Scrolling is the property of mouse by which it can scroll the window vertically. A third button, called the *scrolling button,* does it.,

2. Optical Mouse

- An optical mouse is an advanced computer-pointing device that uses a light-emitting diode (LED), an optical sensor, and digital signal processing (DSP) in place of the traditional mouse ball.
- It uses light to detect movement rather than by interpreting the motion of a rolling sphere.
- Inside each optical mouse, there is a small camera that takes more than a thousand snapshot pictures every second.
- Optical mouse is more reliable and easy to use than simple ball mouse.

- Early optical mouse required a special mouse pad, but modern devices can be rolled over traditional pads, as well as over almost any surface other than glass or mirror.
- Optical mice typically don't require a mouse pad and can be used on many surfaces, including those that are not entirely flat.
- There are typically no special PC requirements for optical mice and installation is usually as simply plugging the device in to the computer.
- A variety of optical mice can be found for Windows, Macintosh and Linux platforms and are available with either PS/2 or USB plugs.

3. Wireless Mouse/Cordless Mouse

- A wireless mouse is a computer mouse that needs no wires to send signals from the mouse to a computer.
- The wireless mouse uses radio frequency (RF) technology to communicate information to your computer.
- It contains a transmitter that sends radio signals that encodes the information about the mouse movements and the buttons you click to the receiver. The receiver accepts the signal, decodes it and passes it onto the mouse driver software and the computer's operating system.
- The major advantage of wireless mouse is that they can work for large range wireless communication. They don't need a clear line of sight between the transmitter and the receiver.}
- Wireless mice are well-suited for presentation settings. With a wireless mouse, a presenter can operate a Microsoft PowerPoint presentation from any point in a room.
- Wireless mice can also come equipped with laser pointers, for directing an audience's attention.
- Some wireless mice are also equipped with multiple buttons, such as play and stop controls, to run video and programs on a computer.
- Wireless mice are also convenient for laptop use because of their mobility and flexibility.

4. Trackball

- A trackball is a computer cursor control device that is mostly used in notebook or laptop computers.
- It is a specific style of computer mouse that allows the user to keep their hand and arm in one place, while manipulating a ball that moves the on-screen pointer.
- It is a pointing device similar to the mouse except one difference that in trackball, the ball is fixed in a container that is placed on the desk. Fingers are used to rotate the ball and thus the cursor.

- Track balls also have buttons like mouse. It is used to position the cursor at a specific locations and the input is supplied by pressing buttons attached with trackball.
- A trackball requires less space than a mouse because there is no need to move the whole device i.e. the trackball is stationary so it does not require much space to use it.
- The trackball mouse does not need a mouse pad or smooth surface underneath it to operate efficiently.
- A track ball comes in various shapes like a ball, a button and a square.

5. Joystick

- Joystick is another pointing device that has been designed to play games on the computer.
- It is used to move cursor position on a monitor screen.
- It consists of a small vertical lever (called a stick) mounted on the base that is used to steer the screen cursor around. Lever moves in all directions and controls the movement of a pointer.
- A joystick contains various buttons for various functions. The functioning of these buttons differs in different games.
- With a joystick, the pointer continues moving in the direction the joystick is pointing. To stop the pointer, you must return the joystick to its upright position.
- Joysticks are also used in the industry to control the operations of computer driven machines like huge cranes.

6. Light Pen

- Light Pen is another pointing device, which is similar to a pen.
- It is mainly used to draw pictures or lines on the monitor screen.
- The light pen contains a photocell and an optical system that is placed in the pen shaped small tube. Whenever this cell is brought closer to the screen, it senses the light coming from the screen and it generates the electrical pulses. These pulses are transmitted to a signal processor that identifies the particular pixel of the monitor, where the pen is touching.
- The light pen is used for correction in architecture design, data collection, digital signature and computer-aided-design (CAD) applications.
- In cricket matches, the commentators mark a portion of screen while explaining a particular area or the field set or a particular shot of a batsman in a cricket match. This is done with light pen.

1.8.3 Scanner and its Types

Q17. What is scanner ? Explain the different types of scanner.

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

- Scanner is a very popular input device, which works more like a photocopy machine.
- They are mainly used to transfer printed or handmade pictures, photographs and text-document into computer.

- It simply translates a paper document into digital image format that can be stored in a computer. The stored images can even be altered and manipulated in interesting ways, if the computer has image- processing software.
- Every scanner has a variety of specifications, including resolution, color depth and speed. These specifications will help you determine the best use for the scanner.
- Some major manufacturers of scanners include: *Epson, Hewlett- Packard* and *Microtek.*

Types of Scanner

Scanners come in various shapes and sizes. Some of the commonly used types are:

i) Flatbed Scanner

ii) Hand-held scanner

(i) Flatbed Scanner

- A Flatbed scanner is like photocopy machine consisting of a box having a glass plate on its top and a lid that covers the glass plate.
- A document to be scanned is placed upside down on the glass plate.
- A light source, situated below the glass plate once activated, moves horizontally from one end to another. After scanning one line, the light beam moves up a little and scans the next line. The process is repeated for all the lines.

ii) Hand-held Scanner

- A handheld scanner is a small manual scanning device which is moved over the object that needs to be scanned.

- It has a set of light emitting diodes (LED) encased in a small case that can be held in hand easily. To scan a document, the scanner is dragged slowly over it from its one end to the other end with its light on.
- Using a handheld scanner can prove to be a cumbersome task, as the hand needs to be steady all the time. Slight movement of the hand can lead to distortion of the image. Due to this reason, hand-held scanners are used only in those cases where high accuracy is not needed.
- They are much cheaper than flatbed scanners. One of the most utilized handheld scanners is the barcode scanner, typically used in shopping stores to valuate goods.

1.8.4 Voice Recognition System

Q18. What is Voice Recoginition System ?

Ans : **(Dec.-19, Imp.)**

Voice or speaker recognition is the ability of a machine or program to receive and interpret dictation or to understand and carry out spoken commands. Voice recognition has gained prominence and use with the rise of AI and intelligent assistants.

How Voice Recognition Works

Voice recognition software on computers requires that analog audio be converted into digital signals, known as analog-to-digital conversion. For a computer to decipher a signal, it must have a digital database, or vocabulary, of words or syllables, as well as a speedy means for comparing this data to signals. The speech patterns are stored on the hard drive and loaded into memory when the program is run. A comparator checks these stored patterns against the output of the A/D converter — an action called pattern recognition.

1.8.5 Vision Input System

Q19. What is Vision Input System ?

Ans : **(Dec.-19, Imp.)**

A vision-input system allows a computer to accept input by seeing an object. Input data in this case is normally an object's shape and features in the form of an image. The idea is to simulate the capability of a human vision system in a limited sense.

A computer with a vision-input device consists of a digital camera. Following steps are taken to recognize a given object :

1. The camera is focused on the input object to take its picture.
2. The camera creates an image of the object in digital form (in Is and Os) so that it can be stored and interpreted by the computer.
3. The digitized image of the object is matched against similarly formed pre-stored images in the computer's image database.
4. Depending on whether a match is found or not, the system takes appropriate action.

Vision-input devices are used mainly in factories for designing industrial robots used for quality control and assembly processes. For example, a robot used for quality control may inspect objects and separate those not meeting certain quality - control specifications. Another robot may be used to inspect shapes of objects and separate objects of different shapes in different bins.

1.8.6 Touch Screen

Q20. What is touch screen ?

Ans :

Touch screen is the most simple, intuitive, and easiest to use of all input devices. A touch screen enables a user to choose from available options by simply touching the desired icon or menu item displayed on a computer's screen with his/her finger.

Touch screens are often used in information kiosks. An *information kiosk* is an unattended system located at a public place that stores information of public interest and allows common people to access stored information as per their requirement. For example, information kiosks may be located:

1. At an airport or a railway station to provide information to arriving passengers about hotels, restaurants, tourist spots, etc. in a city.
2. In large museums or zoos to guide the visitors to the locations of various attractions and facilities, and to caution them against things they are not supposed to do while inside.
3. In a large bank, post office, or insurance company to introduce the various types of offered services to the customers, and to guide them to appropriate counters for their specific jobs.

1.9 Output Devices

Q21. Explain the various types of output devices.

Ans : **(Dec.-19 KU, Imp.)**

Out put 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 out put. 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

Fig. : 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

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

1.9.1 Monitor and its Types

Q22. What is monitor ? Explain the different types of monitors.

Ans :

- A monitor (sometimes called a visual display unit) is a soft copy output device that produces output in the form of a picture on the screen.
- It is just like a television screen usually used to see programs on a computer.
- The main difference between a monitor and a television is that a monitor does not have a television tuner to change channels.
- A monitor may be used to watch television if it is connected to a device, called television tuner card (TV Tuner Card).
- The monitor immediately displays the text & graphics as you create them & reflect changes to them as you perform.
- At present, computer monitors are available in a variety of shapes, designs and colors. However, based on the technology used in the making of computer monitors, they can be broadly categorized into following three types :

  i) CRT Monitor

  ii) LCD Monitor

  iii) TFT Monitor

i) CRT Monitor

- The monitors that use cathode ray tube for producing the output are known as CRT Monitors.

- In CRT monitors, a cathode ray tube is used as the picture tube of the monitor.
- In CRT monitors, cathode ray tubes are glass vacuum tubes into which an electron gun emits a flow of electrons guided by an electrical field towards a screen covered in small phosphorescent elements.
- The screen of this tube is divided into rows and columns. So, the intersection of rows and columns makes a cell and that cell is called a Pixel.
- The number of pixels per unit area of the screen is called Resolution. More the resolution, more clearly will be the picture.
- The image seen on the monitor screen is made up of thousands of pixels. The distance between individual pixels is called DOT PITCH.
- The CRT monitor comes in 15-inch to 21-inch sizes (38 — 53 cm) and even larger.
- Screens are measured diagonally from corner to corner, including the case.

- CRT monitors are considerably heavier than other types and use lots more power than Plasma or LCD displays.

ii) LCD Monitor

- The monitors, which use liquid crystals for producing the image, are known as LCD monitors.
- The cathode ray tube is large in size so it can't be fitted in small sized computers like laptops. For these devices, a compact output device is needed to produce the output on screen. The screen used in these devices is LCD screen.
- LCD screen produces the image by aligning molecular crystals. These crystals are packed in two screens. The front screen is transparent & back screen is reflective. The back screen reflects the light towards the front screen, which produces images on the front layer.
- The main advantage of LCD monitors is that they take up less desk space, lighter in weight and safer to human eyes as it does not flicker.
- LCDs use only one-third to one-half the electricity of their CRT counterparts.
- An LCD monitor comes in standard sizes from 15-inches to 21- inches, and larger. Screens are measured diagonally from corner to corner, including the case.
- LCDs are used in a wide range of applications, including computer monitors, television and instrument panels etc. They are common in consumer devices such as video players, gaming devices, clocks, watches, calculators, and telephones.

iii) TFT Monitor

- The thin film transistor or the TFT screen is commonly used interchangeably with the LCD monitors, but there is a difference between the two.
- The TFT screens for the computer monitors are also used in the LCD screens. It is an upgrading of the technology that is being used in the computer.
- The thin film transistor monitors are usually used in the Laptops and they are much more sensitive than the LCD monitors.
- They are also better as far as resolution is concerned. They have much better resolution than the LCD monitors.
- The benefit of a TFT monitor is a separate, tiny transistor for each pixel on the display. Because each transistor is so small, the amount of charge needed to control it is also small. This way, the display gets refreshed several times per second, ensuring great visual clarity.
- A TFT monitor delivers crisp text, vibrant color and an improved response time for multimedia applications.
- TFT monitors are ideal for games, video displays and everything involving multimedia.

1.9.2 Printers

Q23. Define printers ? Explain the hierarchy of printers.

Ans :

- Printers are the most important output devices, which produce hard copy output on different types of papers i.e. printers are used to print information on papers.
- Printed documents are essential in many working environments, where people share reports, budgets, memos and other type of information.
- Today, wireless printing technology makes the task of printing from a Notebook computer, PDA, Digital camera, or Smart phone much easier.
- Two common wireless technologies for printing are *Bluetooth* and *Infrared.*
- With Bluetooth printing, a computer or device transmits output to a printer via radio waves. The computer and devices do not have to be aligned with each other; rather, they need to be within an approximate 30-100 foot range.
- With infrared printing, a printer communicates with a device using infrared light waves.
- Some important factors generally considered while purchasing a printer are:
  a) Speed of the printer
  b) Image quality / Resolution of the printer
  c) Cost of operation.
- The speed of printer is either measured in character per second (CPS), lines per minute (LPM) or pages per minute (PPM).
- A printer can be broadly classified into two categories:
  i) Impact printers
  ii) Non Impact printers

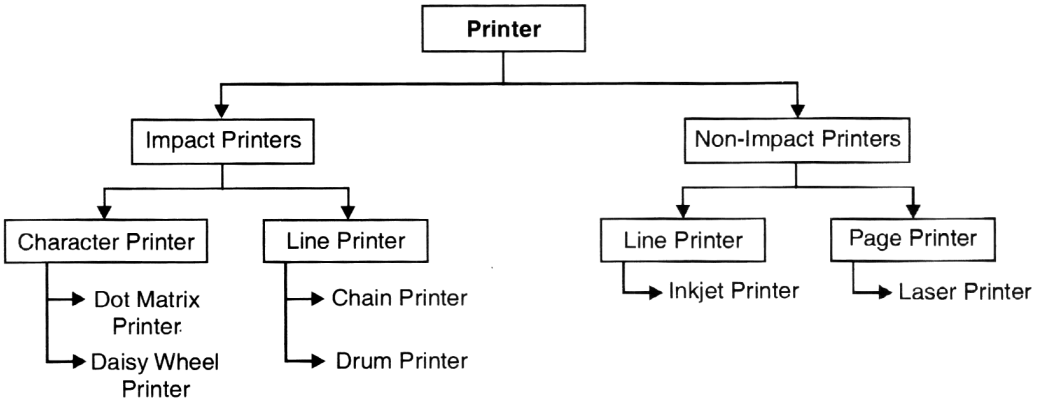


Fig. : (Printer Hierarchy)

An *impact printer* can be further divided into *character printer* and *line printer,* whereas a *non-impact printer* can be further divided into *line printer* and *page printer.*

1.9.2.1 Impact Printers and its types

Q24. What is impact printer ? Explain the different types of impact printers.

Ans : **(Aug.-21, Imp.)**

Those printers, which print by touching the print head to paper, are called *Impact printers.* That is in impact printers, different characters print on the paper with the impact of hammer. The impact printers are further divided into *character printers* and *line printers.* These printers use typewriter like mechanism to print the output.

1. Character Printer

- Character printers are also called *Serial Printers.* These are the printers, which print one character at a time in a serial order.
- In this type of printer, the print head moves across a line while printing the characters.
- The speed of the character printers ranges in 100 to 300 characters per second (CPS).
- The advantage of character printer is that they are low cost and are mainly used with personal computers.
- The disadvantage is, it is low speed and makes lot of noise while printing.
- Today, these printers are rarely used because of speed issues and because only text is capable of being printed.
- Character printers are of two types:
  - i) Dot matrix printer
  - ii) Daisy wheel printer

i) Dot Matrix Printer

- It is one of the most widely used printers. The head of these printers contains a matrix of dots or pins or hammers, that's why these printers are named *Dot matrix printers.*
- Pins or hammers of dot matrix printer are arranged in rows and columns. Generally a dot matrix printer has 9 or 24 pins in its head.
- A character is printed by striking the appropriate number of pins against the printer head.
- Due to the continuous striking of the pins on paper, these printers produce a lot of noise.
- These printers have lowest running cost. Dot matrix printer's ribbon costs around 20 rupees and gives you 1000 prints.
- The speed of a dot matrix printer is generally in the range of 100 to 300 characters per second. Due to least cost of per print, the dot matrix printers are widely used in banks, organizations etc.
- These printers are specially used to print characters only; they can print images but the quality of print of the image is not so good.

ii) Daisy Wheel Printer

- It is an uncommon character printer. It uses a circular printing mechanism, called a *Daisy wheel.*
- The head of this printer is in the shape of a flower.

- A motor spins this wheel at a rapid rate. When the desired character is brought forward by spinning the wheel, a print hammer strikes it to produce the output.
- Daisy wheel printers have low speed, ranges from 10 to 50 characters per second.
- These printers have a defined type and set of characters and they can print the defined characters and shapes only. No new shapes can be generated. That means you cannot print different fonts in this printer.
- Daisy-wheel printers cannot print graphics, and in general they are noisy.
- Daisy-wheel technology is now found only in some electronic typewriters.

2. Line Printer

- As character printers can print only one character at a time, line printers print a line in one printing cycle, i.e. it prints one line at a time.
- They are mostly associated with the early days of computing, but the technology is still in use.
- The line printer is typically enclosed in a cabinet that completely seals the unit from the outside world.
- The speed of line printers ranges from 250 to 2500 lines per minutes.
- Different line printers have different number of characters in their character set.
- The commonly used line printers are:
  - i) Chain printer
  - ii) Drum printer

i) Chain Printer

- Chain printers are the line printers that contain a moving chain called as the *print chain.*
- The chain rotates and when the desired character comes, hammer strikes the chain. This action presses the paper against a ribbon and against the character located at that position. The result leaves an impression of the character.
- When the requirements of the printed line are fulfilled, the printer carriage control moves the page to the next line position.
- The chain contains multiple copies of characters to increase the speed. More is the number of characters on the chain, lesser are the chances of full circle rotation of the chain, after printing a character.
- The chain printers can print at a speed of 400 to 2500 lines per minute.

ii) Drum Printer

- A drum printer is a type of line printer that prints by striking the paper against the inked ribbon.
- This printer uses a cylindrical drum that has different characters embedded on it. These characters are arranged in different number of bands.
- Print hammers are located above the paper, opposite to each band of the drum. These hammers strike the paper, along with the inked ribbon when the proper character on the drums comes at the printing position.
- The disadvantage of drum printers is that they take much time to position the characters, which degrades their performance.
- Drum printers have a speed of 300 to 2000 lines per minute.

1.9.2.2 Non-Impact Printers and its types

Q25. What is Non-impact printer ? Explain the different types of Non-impact printers.

Ans :

Non-impact printers print without any physical contact with the paper. The printers belonging to this category generally print by using *heat pressure or laser technology.*

Non-impact printers have greater resolutions and speed as compared to impact printers. The most important property, which is not available in impact printers, is that they can print colored outputs. The most commonly used non impact printers are *Inkjet printer (Line printer)* and *Laser printer (Page printer).*

1. Inkjet Printer (Line Printer)

- These printers contain cartridges of liquid ink. Separate cartridges are used for black and colored inks. These cartridges are arranged in a print head that contains tiny holes to spray the ink.
- When the print command is fired, the printer sends information signals to printer-head. By using these signals, the head sprays ink drops on the paper.
- The ink of the inkjet printer is manufactured in such a manner that the paper quickly absorbs it.
- These printers are considered as best printers to be used with personal computers.
- They offer good quality in lesser cost.
- Inkjet printers are capable of printing photo quality images.
- The speed of these printers ranges from 6 to 20 pages per minute.
- It needs only 3 or 4 primary colors to create thousands of colors.
- The initial cost of these printers is very low but running cost of these printers is very high, as their cartridges cost a lot.

2. Laser Printer (Page Printer)

- Laser printers are the other popular type of non-impact printers, which use laser and heating technologies to print.
- The main advantage of laser printer is speed. It can print one page at a time.

That's why it is also known as *page printer.*

- Laser printers provide a combination of high speed and best quality along with very low cost of printing.
- In laser printers, a head fires a laser on the drum to draw an inverted image on the paper. After his the paper is passed through a heater, which fixes the ink on the paper.
- The speed of laser printers ranges from 12 to 25 pages per minute.
- Where the cartridge of inkjet printer provides few hundred prints depending upon the type of the prints, the laser printer can produce thousands of prints from a single toner of dry ink.

1.9.3 Plotters - Types

Q26. What is plotter ? Explain the different types of plotters ?

Ans :

Plotter

- Plotter is an output device that draws pictures on a large piece of paper.
- Plotter is a very versatile tool. It is sometimes confused with a printer, but a plotter uses line drawings to form an image instead of using dots.
- A common type of plotter is one that uses a pen or pencil to draw lines on paper.
- It may be a component that is added to a computer system or it may have its own internal computer.
- Multicolor plotters use different-colored pens to draw different colors.
- Plotters are mainly used to print maps, layouts, banners and reports that are very large in size.
- The main advantage of plotter is producing line drawings with a very high degree or accuracy.
- In general, plotters are considerably more expensive than printers.
- They are used in engineering applications where precision is mandatory.
- A Plotter can be mainly categorized into two types :
  1) Drum plotter
  2) Flatbed plotter

Types

1. Drum Plotter

In a drum plotter, the paper on which the design is to be made is placed over a drum that can rotate in both clockwise and anti-clockwise directions to produce vertical motion. The mechanism also consists of one or more penholders mounted perpendicular to the drum's surface. The pen(s) clamped in the holder(s) can move left to right or right to left to produce horizontal motion.

A graph-plotting program controls the movements of the drum and pen(s). That is, under computer control, the drum and pen(s) move simultaneously to draw designs and graphs on the sheet placed on the drum. The plotter can also annotate the designs and graphs so drawn by using the pen to draw characters of various sizes. Since each pen is program selectable, pens having ink of different colors can be mounted in different holders to produce multi-colored designs. Figure shows a drum plotter.

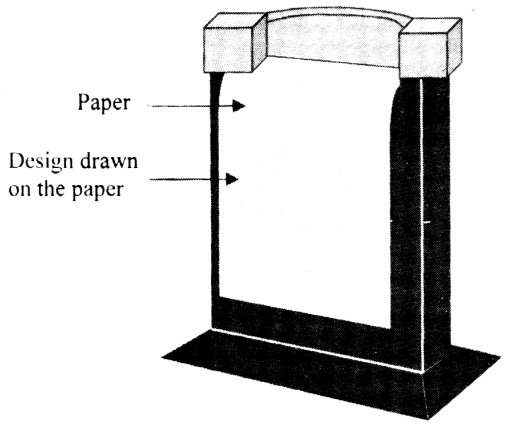


Figure : A drum plotter.

2. Flatbed Plotter

A flatbed plotter plots a design or graph on a sheet of paper spread and fixed over a rectangular flatbed table. In this type of plotter, normally the paper does not move and the pen holding mechanism provides all types of motions necessary to draw complex designs and graphs. That is, under computer control, the pen(s) move in the required manner to draw designs and graphs on the sheet placed on the flatbed table.

The plotter can also annotate the designs and graphs so drawn by using the pen to draw characters of various sizes. Provision is also there to mount more than one pen in the pen(s) holding mechanism. Since each pen is program selectable, pens having ink of different colors can be mounted in different holders to produce multi-colored designs.

The plot size is restricted by the area of the bed. Some may be as small as A4 size (8"x 11" page) while some very large beds used in the design of cars, ships, aircrafts, buildings, highways, etc. can be up to 20 ft. by 50 ft. Some plotters can also etch on plastic or metal plates. In this case, the plastic or metal sheet is spread on the bed and the drawing pen has a sharp-edged needle. Figure shows a flatbed plotter.

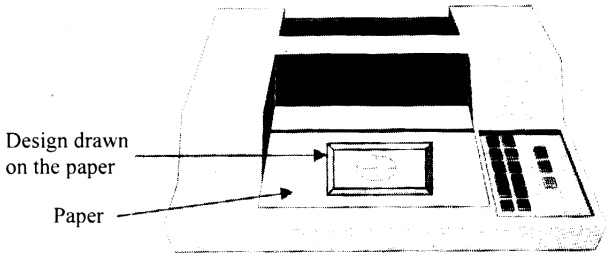


Figure : A flatbed plotter.

1.9.4 Sound Cards

Q27. Define Sound Cards.

Ans :

A sound card is an expansion component used in computers to receive and send audio.

Sound cards are configured and utilized with the help of a software application and a device driver.

The input device attached to receive audio data is usually a microphone, while the device used to output audio data is generally speakers or headphones.

The sound card converts incoming digital audio data into analog audio so that the speakers can play it. In the reverse case, the sound card can convert analog audio data from the microphone into digital data that can be stored on the computer and altered using audio software.

Sound cards are also known as audio adapters.

Sound cards have continued to evolve both in terms of hardware and software. The modern sound cards can output 3-D sound and surround sound of increasingly high quality. Computer games and other applications are being developed to make full use of the new capabilities of sound cards.

The use of sound cards is so widespread that most motherboard manufacturers offer built-in sound cards for computers. Advance users, however, generally prefer to customize using expansion cards selected to meet their specific needs rather than generic, built-in cards.

1.9.5 Speaker

Q28. Define speaker.

Ans :

Speakers

- Speakers also produce softcopy output in the form of sounds.
- Speakers are used to play sound in computers. They may be built-in or externally connected to your system.
- Speakers allow user to listen to music and hear sound effects and spoken text using computer.
- Speakers convert the digital signals coming from computer to analog sound waves.
- Computer speakers range widely in quality and in price. The computer speakers typically packaged with computer systems are small, plastic, and have average sound quality. Some computer speakers have equalization features such as bass and treble controls.
- A personal computer generally contains 200 to 500 watts speakers, which can produce sound output for a small room. To cover a bigger area, amplified speakers and woofer systems are used.
- Laptops come with integrated speakers. Restricted space available in laptops means these speakers usually produce low-quality sound.

Short Question and Answers

Q1. Define Computer

Ans :

The word "computer" comes from the word "compute", which means, "to calculate". Hence, people usual consider a computer to be a calculating device that can perform arithmetic operations at high speed).

A computer is an electronic device or machine that can perform arithmetic operations like addition, subtraction, multiplication, division etc. as well as logical operations like comparisons at very high speed. A computer is also called a "Data Processor" because it can store, process, and retrieve data whenever desired.

In the present era, computers became more common in every field independent of discipline. Thus for every one it is essential to have knowledge about computers. Computers are playing a major role in promoting information technology (IT) and tied the entire world through information exchange. It is the fact that the day to day life of human beings is almost related to computers either directly or indirectly. Though computer can perform several jobs, it cannot do on its own. It follows the instructions given by users.

In general, the data and information are often used interchangeably. In particular, in IT, the data and information are two distinct objects and one should clearly understand the difference between them. **Data** represents raw facts and observation. Examples are number, word, amount, name concept, holiday, etc. **Information** is the result of processing of the data. That means, the data that has been transformed in useful and meaningful form is known as information.

A computer system is a combination of ***hardware*** and ***software***, which are used for processing and storing the data. Hardware refers to the physical components of a computer system. Examples are microprocessor, keyboard, Cathode Ray Tube (CRT), harddisk, floppy disk, mouse etc., Software is the set of instructions (called program) written for a computer to perform a particular task.

Software can be classified as ***system software*** and ***application software***. System

Q2. ALU

Ans :

- 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.

Q3. Micro Computer

Ans :

- A microcomputer is a small, relatively inexpensive computer with a microprocessor 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 microprocessor 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.

Q4. Mainframe Computer

Ans :

- 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.

Q5. Benefits of Computers

Ans :

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.

Q6. Limitations of Computers

Ans :

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 turns 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.

Q7. What is key board ?

Ans :

- Keyboard is the most common input device used for entering text data directly into a computer.
- A computer keyboard is similar to that of a typewriter, but it has additional keys as well.
- The most commonly available computer keyboard has 104 keys. Data is entered into a computer by pressing a set of keys available with the keyboard.

Fig. : Key board

- Keyboard is the oldest input device, which is still being used with the modern computers. When user presses a key, the corresponding character appears on screen.

Q8. What is Multimedia Keyboard ?

Ans :

- A multimedia keyboard is designed to make it one-touch simple for the user to access often-used programs.
- Multimedia keyboard contains various additional keys to perform functions like - volume control, launching Internet explorer, changing song and video tracks, launching e-mail software etc.
- A typical multimedia keyboard contains buttons that control various computer processes, such as turning on the computer's power, putting the CPU to sleep, and waking it up again.
- The web browser keys on a multimedia keyboard should be familiar to most Internet users. ***Back, Forward, Stop,*** **and** ***Refresh*** buttons are usually present on such keyboards.
- A specific type of multimedia keyboard called a *Gaming keyboard,* meant for use with high-tech video games, can be even more expensive.
- Multimedia keyboards come in various connection formats, including PS/2, USB, and wireless.

Q9. What is wireless keyboard ?

Ans :

- Wireless keyboards are also available today, but at a higher price than wired keyboard.

- These keyboards do not have any wire attached to them.
- Wireless keyboard interacts with the computer through *Bluetooth* or *Infrared* technology.
- Wireless keyboards transfer typing data to the computer via infrared beams. A beam of information is sent from the keyboard, as you type, to a receiver, which is plugged into the computer.
- Wireless keyboard operates on battery power rather than using electricity from the user's computer.
- The main advantage of using a wireless keyboard rather than a regular keyboard is that it offers much more mobility. A wireless keyboard can be used on a lap, in a bed, or just used while on-the-go for laptop users.
- It can maintain required distance between the screen and the seating and also do not need to keep it placed on the working table always saving a lot of space when not using the system.
- One of the disadvantages of using a wireless keyboard is that it has to be installed and configured before it can be used. Regular keyboards, on the other hand, run on Plug and Play software and work immediately after they are plugged in.

Q10. Functions of Mouse

Ans :

The main goal of any mouse is to translate the motion of your hand into signals that the computer can use.

There are five simple techniques to use the mouse:

a) Click

b) Double Click

c) Drag

d) Right Click

e) Scroll

a) Click

To click on something with a mouse means to move the pointer or cursor to the item on the screen and to press and release the mouse button once (usually left button).

b) Double Click

Press and release the mouse button twice in rapid succession.

c) Drag

After positioning the mouse pointer over the item, then press the button and hold it down as you move the mouse.

d) Right Click

Right click means to press the right button of mouse once without moving it. It helps to display a shortcut menu.

e) Scroll

Scrolling is the property of mouse by which it can scroll the window vertically. A third button, called the *scrolling button,* does it.,

Q11. Optical Mouse

Ans :

- An optical mouse is an advanced computer-pointing device that uses a light-emitting diode (LED), an optical sensor, and digital signal processing (DSP) in place of the traditional mouse ball.
- It uses light to detect movement rather than by interpreting the motion of a rolling sphere.
- Inside each optical mouse, there is a small camera that takes more than a thousand snapshot pictures every second.
- Optical mouse is more reliable and easy to use than simple ball mouse.
- Early optical mouse required a special mouse pad, but modern devices can be rolled over traditional pads, as well as over almost any surface other than glass or mirror.

- Optical mice typically don't require a mouse pad and can be used on many surfaces, including those that are not entirely flat.
- There are typically no special PC requirements for optical mice and installation is usually as simply plugging the device in to the computer.
- A variety of optical mice can be found for Windows, Macintosh and Linux platforms and are available with either PS/2 or USB plugs.

Q12. What is scanner ?

Ans :

- Scanner is a very popular input device, which works more like a photocopy machine.
- They are mainly used to transfer printed or handmade pictures, photographs and text-document into computer.
- It simply translates a paper document into digital image format that can be stored in a computer. The stored images can even be altered and manipulated in interesting ways, if the computer has image- processing software.
- Every scanner has a variety of specifications, including resolution, color depth and speed. These specifications will help you determine the best use for the scanner.
- Some major manufacturers of scanners include: *Epson, Hewlett- Packard* and *Microtek.*

Types of Scanner

Scanners come in various shapes and sizes. Some of the commonly used types are:

i) Flatbed Scanner

ii) Hand-held scanner.

Q13. What is monitor ?

Ans :

- A monitor (sometimes called a visual display unit) is a soft copy output device that produces output in the form of a picture on the screen.
- It is just like a television screen usually used to see programs on a computer.
- The main difference between a monitor and a television is that a monitor does not have a television tuner to change channels.
- A monitor may be used to watch television if it is connected to a device, called television tuner card (TV Tuner Card).
- The monitor immediately displays the text & graphics as you create them & reflect changes to them as you perform.
- At present, computer monitors are available in a variety of shapes, designs and colors. However, based on the technology used in the making of computer monitors, they can be broadly categorized into following three types :

  i) CRT Monitor

  ii) LCD Monitor

  iii) TFT Monitor.

Q14. Define printers ?

Ans :

- Printers are the most important output devices, which produce hard copy output on different types of papers i.e. printers are used to print information on papers.
- Printed documents are essential in many working environments, where people share reports, budgets, memos and other type of information.
- Today, wireless printing technology makes the task of printing from a Notebook computer, PDA, Digital camera, or Smart phone much easier.
- Two common wireless technologies for printing are *Bluetooth* and *Infrared.*
- With Bluetooth printing, a computer or device transmits output to a printer via radio waves. The computer and devices do not have to

be aligned with each other; rather, they need to be within an approximate 30-100 foot range.

- With infrared printing, a printer communicates with a device using infrared light waves.
- Some important factors generally considered while purchasing a printer are:

a) Speed of the printer

b) Image quality / Resolution of the printer

c) Cost of operation.

Q15. Define Sound Cards

Ans :

A sound card is an expansion component used in computers to receive and send audio.

Sound cards are configured and utilized with the help of a software application and a device driver.

The input device attached to receive audio data is usually a microphone, while the device used to output audio data is generally speakers or headphones.

The sound card converts incoming digital audio data into analog audio so that the speakers can play it. In the reverse case, the sound card can convert analog audio data from the microphone into digital data that can be stored on the computer and altered using audio software.

Sound cards are also known as audio adapters.

Sound cards have continued to evolve both in terms of hardware and software. The modern sound cards can output 3-D sound and surround sound of increasingly high quality. Computer games and other applications are being developed to make full use of the new capabilities of sound cards.

The use of sound cards is so widespread that most motherboard manufacturers offer built-in sound cards for computers. Advance users, however, generally prefer to customize using expansion cards selected to meet their specific needs rather than generic, built-in cards.

Q16. Define speaker

Ans :

Speakers

- Speakers also produce softcopy output in the form of sounds.
- Speakers are used to play sound in computers. They may be built-in or externally connected to your system.
- Speakers allow user to listen to music and hear sound effects and spoken text using computer.
- Speakers convert the digital signals coming from computer to analog sound waves.
- Computer speakers range widely in quality and in price. The computer speakers typically packaged with computer systems are small, plastic, and have average sound quality. Some computer speakers have equalization features such as bass and treble controls.
- A personal computer generally contains 200 to 500 watts speakers, which can produce sound output for a small room. To cover a bigger area, amplified speakers and woofer systems are used.
- Laptops come with integrated speakers. Restricted space available in laptops means these speakers usually produce low-quality sound.

Choose the Correct Answers

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. _____ refers to the data and instructions given to the computes.
2. A computer has no _____ of its own.
3. _____ is considered as the father of the computer.
4. The _____ printers used for DTP Application
5. VDU is an _____ device.
6. Non-impact printers genrates _____ than input printers.
7. A machine that works itself without any human involvement is said to be an _____ machine.
8. _____ is raw material used as input and _____ is processed data obtained as output of data processing.
9. _____ refers to the data and instructions iven to the computer.
10. The heart of the computer is _____

ANSWERS

1. Input
2. Intelligence
3. Charless Babbage
4. Laser
5. Output
6. Much less noise
7. automatic
8. Data, Information
9. Input
10. CPU

UNIT II

COMPUTER ARITHMETIC & STORAGE FUNDAMENTALS

Binary,Binary Arithmetic, Number System: Positional & Non Positional, Binary,Octal, Decimal, Hexadecimal, Converting from one number system to another.

Primary Vs Secondary Storage, Data storage & retrieval methods. Primary Storage: RAM ROM, PROM, EPROM, EEPROM. Secondary Storage: Magnetic Tapes, Magnetic Disks. Cartridge tape, hard disks, Floppy disks Optical Disks, Compact Disks, Zip Drive, Flash Drives.

2.1 BINARY, BINARY ARITHMETIC

Q1. What do you understand the word binary ?

Ans :

1. Information is handled by computer's electronic/electrical components such as transistors, semiconductors, wires, etc., and all these can indicate only two states or conditions - ON (state 1) or OFF (state 0). Transistors are either conducting (state 1) or non-conducting (state 0), magnetic materials are either magnetized (state 1) in one or opposite direction or non-magnetized (state 0). a pulse or voltage is present (state 1) or absent (state 0) in wire. Information is represented within a computer by the presence or absence of these types of signals. Binary number system having only tw o digits (0 and 1) is most suitable for expressing the two possible states. Figure illustrates the concept of binary components.
2. By using binary numbers, computer circuits only have to handle two binary digits rather than ten decimal digits. This greatly simplifies the internal circuit design of computers resulting in less expensive and more reliable circuits.
3. Finally, all possible operations in decimal number system are also possible in binary number system.

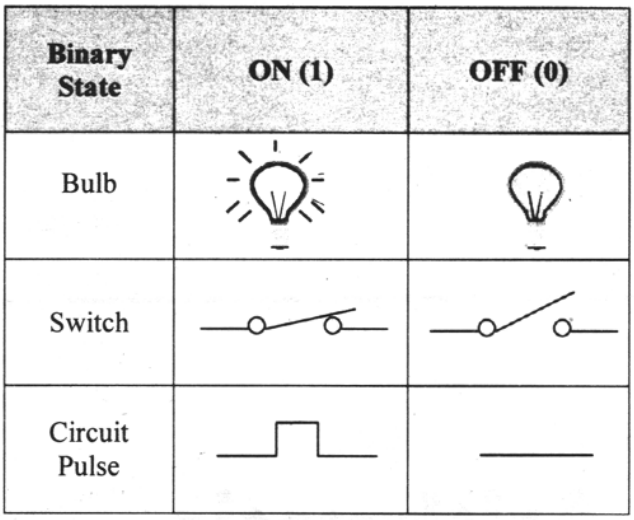


Fig. : Examples of devices that work in binary mode. These devices can only represent two states - ON (state 1) or OFF (state 0)

Q2. What are binary arithmetic operations?

Ans : **(Dec.-19)**

In this section, you will see how the four basic arithmetic operations are performed inside a computer by using binary numbers. Actually, binary arithmetic is simpler to learn because binary number system deals with only two digits - 0 and 1. Since all binary numbers are made up of only Os and Is, when arithmetic operations are performed on these numbers the results are also in Os and Is.

1. Addition

Binary addition is performed in the same manner as decimal addition. However, since binary number system has only two digits, the addition table for binary arithmetic is very simple and consists of only four entries. The complete table for binary addition is as follows:

0 + 0 = 0

0 + 1 = 1

1 + 0 = 1

1 + 1 = 0 plus a carry of 1 to next higher column

Carry-overs are performed in the same manner as in decimal arithmetic. Since 1 is the largest digit in binary number system, any sum greater than 1 requires a digit to be carried over. For instance, 10 plus 10 binary requires addition of two Is in the second position. Since 1 + 1 = 0 plus a carry-over of 1, the sum of 10 + 10 is 100 in binary.

2. Subtraction

The principles of decimal subtraction can as well be applied to subtraction of numbers in other number systems. It consists of two steps that are repeated for each column of the numbers. The first step is to determine if it is necessary to borrow. If the subtrahend (the lower digit) is larger than the minuend (the upper digit), it is necessary to borrow from the column to the left. It is important to note here that the value borrowed depends upon the base of the number system and is always the decimal equivalent of the base. Hence, in decimal 10 is borrowed, in binary 2 is borrowed, in octal 8 is borrowed, and in hexadecimal 16 is borrowed. The second step is simply to subtract the lower value from the upper value. The complete table for binary subtraction is as follows:

0 – 0 = 0

0 – 1 = 1 with a borrow from the next column

1 – 0 = 1

1 – 1 = 0

Observe that the only case in which it is necessary to borrow is when 1 is subtracted from 0.

3. Multiplication

Multiplication in binary number system also follows the same general rules as multiplication in decimal number system. However, learning binary multiplication is a trivial task because the table for binary multiplication is very short, with only four entries, instead of 100 entries necessary for decimal multiplication. The complete table for binary multiplication is as follows:

0 × 0 = 0

0 × 1 = 0

1 × 0 = 0

1 × 1 = 1

The example given below illustrates the method of binary multiplication. It is only necessary to copy the multiplicand, if the digit in the multiplier is 1 and to copy all Os, if the digit in the multiplier is 0. The ease with which each step of the operation is performed is apparent.

4. Division

Once again, division in binary number system is very simple. As in decimal number system (or in any other number system), division by zero is meaningless. A computer deals with this problem by raising an error condition called 'Divide by zero'

error. Hence, the complete table for binary division is as follows:

0 ÷ 0 = Divide by zero error

0 + 1 = 0

1 + 0 = Divide by zero error

1 + 1 = 1

Binary division is performed in a manner similar to decimal division. The rules for binary division are:

1. Start from the left of the dividend.
2. Perform a series of subtractions, in which the divisor is subtracted from the dividend.
3. If subtraction is possible, put a 1 in the quotient and subtract the divisor from the corresponding digits of dividend.
4. If subtraction is not possible (divisor greater than remainder), record a 0 in the quotient.
5. Bring down the next digit to add to the remainder digits. Proceed as before in a manner similar to long division.

2.2 NUMBER SYSTEM

2.2.1 Positional & Non Positional

Q3. What is number system ? Explain different types of number systems.

Ans : **(Dec.-20, Dec.-19, Imp.)**

The technique to represent and work with numbers is called number system.

Number systems are basically of two types:

(i) Non-positional Number Systems

(ii) Positional Number Systems

(i) Non-Positional Number Systems

In early days, human beings counted on fingers. When ten fingers were not adequate, stones, pebbles, or sticks were used to indicate values. This method of counting uses an additive approach or the non-positional number system. In this system, we have symbols such as I fdr 1, II for 2, III for 3, IIII for 4, IIIII for 5, etc. Each symbol represents the same value regardless of its position in the number and the symbols are simply added to find out the value of a particular number. Since it is very difficult to perform arithmetic with such a number system, positional number systems were developed as the centuries passed.

(ii) Positional Number Systems

In a positional number system, there are only a few symbols called digits. These symbols represent different values, depending on the position they occupy in a number. The value of each digit in such a number is determined by three considerations:

1. The digit itself,
2. The position of the digit in the number, and
3. The base of the number system (where base is defined as the total number of digits available in the number system).

In our day-to-day life, we use decimal number system. In this system, base is equal to 10 because there are altogether ten symbols or digits (0, 1, 2, 3, 4, 5, 6, 7, 8, and 9). You know that in decimal number system, successive positions to the left of the decimal point represent units, tens, hundreds, thousands, etc. However, notice that each position represents a specific power of the base (10). For example, decimal number 2586 (written as 2586_{10}) consists of digit 6 in units position, 8 in tens position, 5 in hundreds position, and 2 in thousands position, and its value can be written as:

$(2 \times 10^3) + (5 \times 10^2) + (8 \times 10^1) + (6 \times 10^0) = 2000 + 500 + 80 + 6 = 2586$

Observe that the same digit signifies different values, depending on the position it occupies in the number. For example,

In 2586_{10} the digit 6 signifies $6 \times 10^0 = 6$

In 2568_{10} the digit 6 signifies $6 \times 10^1 = 60$

In 2658_{10} the digit 6 signifies $6 \times 10^2 = 600$

In 6258_{10} the digit 6 signifies $6 \times 10^3 = 6000$

Hence, we can represent any number by using the available digits and arranging them in various positions.

The principles that apply to decimal number system, also apply to any other positional number system. It is important to keep track of only the base of the number system in which we are working.

The value of the base in all positional number systems suggests the following characteristics:

1. The value of the base determines the total number of different symbols or digits available in the number system. The first of these choices is always zero.
2. The maximum value of a single digit is always equal to one less than the value of the base.

2.2.2 Binary Number System

Q4. Explain briefly about Binary Number System.

Ans : **(Aug.-21, Imp.)**

Binary number system is like decimal number system, except that the base is 2, instead of 10. We can use only two symbols or digits (0 and 1) in this number system. Note that the largest single digit is 1 (one less than the base). Each position in a binary number represents a power of the base (2). Hence, in this system, the rightmost position is units (2^0) position, the second position from the right is 2's (2^1) position, and proceeding in this way, we have 4's (2^2) position, 8's (2^3) position, 16's (2^4) position, and so on. Therefore, decimal equivalent of binary number 10101 (written as 10101_2) is:

$$(1 \times 2^4) + (0 \times 2^3) + (1 \times 2^2) + (0 \times 2^0) + (\text{I} \times 2^0) = 16 + 0 + 4 + 0 + 1 = 21$$

In order to be specific about which system we are referring to, it is a common practice to indicate the base as a subscript. Hence, we write:

$$10101_2 = 21_{10}$$

The short form of "binary digit" is bit. Hence, a "bit" in computer terminology means either a 0 or 1. An n-bit number is a binary number consisting of 'n' bits. Figure 3.1 lists all 3-bit numbers along with their decimal equivalent. Remember that we have only two digits, 0 and 1, in binary number system and hence, binary equivalent of decimal number 2 has to be stated as 10 (read as one, zero). Another important point to note is that with 3 bits (positions), only 8 (2^3) different patterns of 0s and 1s are possible, and it may be seen from Figure that a 3-bit number can have one of the 8 values in the range 0 to 7. In fact, any decimal number in the range 0 to 2^{n-1} can be represented in binary form as an n-bit number.

Binary	Decimal Equivalent
000	0
001	1
010	2
011	3
100	4
101	5
110	6
111	7

Fig. : 3-bit numbers with their decimal values

Every computer stores numbers, letters, and other special characters in binary form. There are several occasions when computer professionals need to know the raw data contained in a computer's memory. A commonly used way of doing this is to print memory contents on a printer. This printout is called a memory dump. Memory dumps, which are in binary numbers, would have many pages of 0s and 1s. Working with these numbers would be very difficult and error prone for computer professionals.

2.2.3 Octal Number System

Q5. Explain briefly about Octal Number System.

Ans : **(Aug.-21, Imp.)**

In octal number system, the base is 8. Hence, there are only eight symbols or digits: 0, 1,2, 3, 4, 5, 6, and 7 (8 and 9 do not exist in this system). The largest single digit is 7 (one less than the base 8). Each position in an octal number represents a power of the base (8). Therefore, decimal equivalent of octal number 2057 (written as 2057_8) is :

$$(2 \times 8^3) + (0 \times 8^2) + (5 \times 8^1) + (7 \times 8^0) = 1024 + 0 + 40 + 7 = 1071$$

$$\text{Hence, } 2057_8 = 1071_{10}$$

Observe that since there are only 8 digits in octal number system, 3 bits ($2^3 = 8$) are sufficient to represent any octal number in binary.

2.2.4 Decimal Number System

Q6. What is decimal number system?

Ans : **(Aug.-21, Imp.)**

Decimal Number System

Decimal number system is a base 10 number system having 10 digits from 0 to 9. This means that any numerical quantity can be represented using these 10 digits. Decimal number system is also a positional value system. This means that the value of digits will depend on its position. Let us take an example to understand this.

Say we have three numbers – 734, 971 and 207. The value of 7 in all three numbers is different-

- In 734, value of 7 is 7 hundreds or 700 or 7 × 100 or 7 × 10^2
- In 971, value of 7 is 7 tens or 70 or 7 × 10 or 7 × 10^1
- In 207, value 0f 7 is 7 units or 7 or 7 × 1 or 7 × 10^0

The weightage of each position can be represented as follows -

10^5	10^4	10^3	10^2	10^1	10^0

In digital systems, instructions are given through electric signals; variation is done by varying the voltage of the signal. Having 10 different voltages to implement decimal number system in digital equipment is difficult. So, many number systems that are easier to implement digitally have been developed. Let's look at them in detail.

2.2.5 Hexadecimal Number System

Q7. Explain briefly about Hexadecimal Number System.

Ans : **(Aug.-21)**

In hexadecimal number system, the base is 16. Hence, there are 16 symbols or digits. The first 10 digits are the same digits of decimal number system – 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9. The remaining six digits are denoted by the symbols A, B, C, D, E, and F, representing decimal values 10, 11, 12, 13, 14, and 15, respectively. Hence, the largest single digit is F or 15 (one less than the base 16). Each position in hexadecimal number system represents a power of the base (16). Therefore, decimal equivalent of hexadecimal number 1AF (written as $1AF_{16}$) is :

$(1 \times 16^2) + (A \times 16^1) + (F \times 16^0)$

$= (1 \times 256) + (10 \times 16) + (15 \times 1)$

$= 256 + 160 + 15 = 431$

Hence, $1\ AF_{16} = 431_{10}$

Observe that since there are only 16 digits in hexadecimal number system, 4 bits ($2^4 = 16$) are sufficient to represent any hexadecimal number in binary.

2.3 Converting from One Number System to Another

Q8. What do you understand by Converting from One Number System to Another

Ans : **(Dec.-19 KU)**

Numbers expressed in decimal number system are much more meaningful to us, than are numbers expressed in any other number system. This is because we have been using decimal numbers in our day-to-day life, right from childhood. However, we can represent any number in one number system in any other number system. Because the input and final output values are to be in decimal, computer professionals are often required to convert numbers in other number systems to decimal and vice-versa. Many methods can be used to convert numbers from one base to another.

Q9. Explain the various steps converting from another base to decimal.

Ans : **(Dec.-19 KU)**

The following steps are used to convert a number in any other base to a base 10 (decimal) number:

Step 1 : Determine the column (positional) value of each digit (this depends on the position of the digit and the base of the number system).

Step 2 : Multiply the obtained column values (in Step 1) by the digits in the corresponding columns.

Step 3 : Sum up the products calculated in Step 2. The total is the equivalent value in decimal.

PROBLEMS

1. Convert $11001_2 = ?_{10}$

Sol :

Step 1 : Determine column values

Column Number (from right)	Column Value
1	$2^0 = 1$
2	$2^1 = 2$
3	$2^2 = 4$
4	$2^3 = 8$
5	$2^4 = 16$

Step 2 : Multiply the column values by the corresponding column digits

16	8	4	2	1
x1	x1	x0	x0	x1
16	8	0	0	1

Step 3 : Sum up the products

16 + 8 + 0 + 0 + 1 = 25

Hence, $11001_2 = 25_{10}$

2. Convert $4706_8 = ?_{10}$

Sol :

Step 1 : Determine column values

Column Number (from right)	Column Value
1	$8^0 = 1$
2	$8^1 = 8$
3	$8^2 = 64$
4	$8^3 = 512$

Step 2 : Multiply the column values by the corresponding column digits

512	64	8	1
x4	x7	x0	x6
2048	448	0	6

Step 3 : Sum of the products

$2048 + 448 + 0 + 6 = 2502$

Hence, $4706_8 = 2502_{10}$

3. Convert $1AC_{16} = ?_{10}$

Sol :

$1AC_{16} = 1 \times 16^2 + A \times 16^1 + C \times 16^0$

$= 1 \times 256 + 10 \times 16 + 12 \times 1$

$= 256 + 160 + 12$

$= 428_{10}$

4. Convert $4052_7 = ?_{10}$

Sol :

$4052_7 = 4 \times 7^3 + 0 \times 7^2 + 5 \times 7^1 + 2 \times 7^0$

$= 4 \times 343 + 0 \times 49 + 5 \times 7 + 2 \times 1$

$= 1372 + 0 + 35 + 2$

$= 1409_{10}$

5. Convert $1AC_{13} = ?_{10}$

Sol :

$1AC_{13} = 1 \times 13^2 + A \times 13^1 + C \times 13^0$

$= 1 \times 169 + 10 \times 13 + 12 \times 1$

$= 311_{10}$

Q10. Explain the various steps converting from decimal-to-another base.

Ans :

The following steps are used to convert a base 10 (decimal) number to a number in another base:

Step 1 : Divide the decimal number by the value of the new base.

Step 2 : Record the remainder from Step 1 as the rightmost digit (least significant digit) of the new base number.

Step 3 : Divide the quotient of the previous division by the new base.

Step 4 : Record the remainder from Step 3 as the next digit (to the left) of the new base number

Repeat Steps 3 and 4, recording remainders from right to left, until the quotient becomes zero in Step 3. Note that the last remainder, thus obtained, will be the most significant digit of the new base number.

PROBLEMS

1. Convert $25_{10} = ?_2$

Sol :

Steps 1 and 2: 25/2 = 12 and remainder 1

Steps 3 and 4: 12/2 = 6 and remainder 0

Steps 3 and 4: 6/2 = 3 and remainder 0

Steps 3 and 4: 3/2 = 1 and remainder 1

Steps 3 and 4: 1/2 = 0 and remainder 1

As mentioned in Steps 2 and 4, the remainders are now arranged in the reverse order, making the first remainder the least significant digit (LSD) and the last remainder the most significant digit (MSD).

Hence, $25_{10} = 11001_2$

2. Convert $42_{10} = ?_2$

Sol :

2	42	Remainder
	21	0
	10	1
	5	0
	2	1
	1	0
	0	1

Hence, $42_{10} = 101010_2$

3. Convert $952_{10} = ?_8$

Sol :

8	952	Remainders
	119	0
	14	7
	1	6
	0	1

Hence, $952_{10} = 1670_8$

4. Convert $100_{10} = ?_4$

Sol :

4	100	Remainders
	25	0
	6	1
	1	2
	0	1

Hence, $100_{10} = 1210_4$

5. Convert $1715_{10} = ?_{12}$

Sol :

12	1715	Remainders in base 12
	142	11 = B
	11	10 = A
	0	11 = B

Hence, $1715_{10} = BAB_{12} = 111011_2$

Q11. Explain the procedure to convert from a base other than 10 to another base other than 10.

Ans :

The following steps are used to convert a number in a base other than 10, to a number in another base other than 10 :

Step 1 : Convert the original number to a base 10 (decimal) number.

Step 2 : Convert the decimal number obtained in Step 1 to the new base number.

PROBLEMS

1. Convert $545_6 = ?_4$

Sol :

Step 1 : Convert from base 6 to base 10

$$545 = 5 \times 6^2 + 4 \times 6^1 + 5 \times 6^0$$
$$= 5 \times 36b + 4 \times 6 + 5 \times 1$$
$$= 180 + 24 + 5$$
$$= 209_{10}$$

Step 2 : Convert 209_{10} to base 4

4	209	Remainders
	52	1
	13	0
	3	1
	0	3

$209_{10} = 3101_4$

Therefore, $545_6 = 209_{10} = 3101_4$

Hence, $545_6 = 3101_4$

2. Convert $101110_2 = ?_8$

Sol :

Step 1 : Convert 101110_2 to base 10

$101110_2 = 1 \times 2^5 + 0 \times 2^4 + 1 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 0 \times 2^0$

$= 32 + 0 + 8 + 4 + 2 + 0$

$= 46_{10}$

Step 2 : Convert 46_{10} to base 8

8	46	Remainders
	5	6
	0	5

$46_{10} = 56_8$

Therefore, $101110_2 = 46_{10} = 56_8$

Hence, $101110_2 = 56_8$

Q12. Explain short-cut method for binary to octal conversion.

Ans :

The following steps are used in this method :

Step 1 : Divide the binary digits into groups of three (starting from the right).

Step 2 : Convert each group of three binary digits to one

The following steps are used in this method :

Step 1 : Divide the binary digits into groups of three (starting from the right).

Step 2 : Convert each group of three binary digits to one octal digit. Since there are only 8 digits (0 to 7) in octal number system, 3 bits ($2^3 = 8$) are sufficient to represent any octal number in binary. Moreover, since decimal digits 0 to 7 are equal to the octal digits 0 to 7, we use binary to decimal conversion method in this step.)

PROBLEMS

1. Convert $101110_2 = ?_8$

Sol :

Step 1: Divide the binary digits into groups of 3, starting from the right (LSD).

101 110

Step 2 : Convert each group into one digit of octal (use binary-to-decimal conversion method).

$101_2 = 1 \times 2^2 + 0 \times 21 + 1 \times 20$

$= 4 + 0 + 1$

$= 58$

$110_2 = 1 \times 2^2 + 1 \times 2^1 + 0 \times 20$

$= 4 + 2 + 0$

$= 6_8$

Hence, $101110_2 = 56_8$

---

2. Convert $1101010_2 = ?_8$

Sol :

1101010_2 = 001 101 010 (Group of 3 digits from the right)

= 152_8 (Convert each group to an octal digit)

Hence, $1101010_2 = 152_8$

Q13. Explain short-cut method for octal to - binary conversion.

Ans :

The following steps are used in this method:

Step 1: Convert each octal digit to a 3 digit binary number (the octal digits may be treated as decimal numbers for this conversion).

Step 2: Combine all the resulting binary groups (of 3 digits each) into a single binary number.

PROBLEM

1. Convert $562_8 = ?_2$

Solution :

Step 1 : Convert each octal digit to 3 binary digits.

$5_8 = 101_2$

$6_8 = 110_2$

$2_8 = 010_2$

Step 2 : Combine the binary groups.

$$562_8 = \frac{101}{5}\ \frac{110}{6}\ \frac{010}{2}$$

Hence, $562_8 = 101110010_2$

Q14. Explain short-cut method for binary to - hexa decimal conversion.

Ans :

The following steps are used in this method:

Step 1 : Divide the binary digits into groups of four (starting from the right).

Step 2 : Convert each group of four binary digits to one hexadecimal digit. Remember that hexadecimal digits 0 to 9 are equal to decimal digits 0 to 9 and hexadecimal digits A to F are equal to decimal values 10 to 15. Hence, for this step, we use binary to decimal conversion procedure and represent decimal values 10 to 15 as hexadecimal A to F.

PROBLEMS

1. Convert $11010011_2 = ?_{16}$

Solution :

Step 1 :

Divide the binary digits into groups of 4. starting from the right (LSD).

1101 0011

Step 2 : Convert each group of 4 binary digits to 1 hexadecimal digit

$1101_2 = 1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$ $0011_2 = 0 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$

$= 8+4+0+1$ $= 0+0+2+1$

$= 13_{10}$ $= 3_{16}$

$= D_{16}$

Hence, $11010011_2 = D3_{16}$

---

2. Convert $101101011002 = ?_{16}$

Solution:

$10110101100_2 = 0101\ \ 1010\ \ 1100$ (Group 4 digits from the right)

$= 5AC$ (Convert each group to a hexadecimal digit)

Hence, $10110101100_2 = 5AC_{16}$

Q15. Explain short-cut method for hexadecimal to binary conversion.

Ans :

The following steps are used in this method :

Step 1: Convert decimal equivalent of each hexadecimal digit to 4 binary digits.

Step 2: Combine all resulting binary groups (of 4 digits each) into a single binary number.

PROBLEM

1. Convert $2AB_{16} = ?_2$

Solution :

Step 1: Convert decimal equivalent of each hexadecimal digit to 4 binary digits.

$2_{16} = 2_{10} = 0010_2$

$A_{16} = 10_{10} = 1010_2$

$B_{16} = 11_{10} = 1011_2$

Step 2 : Combine the binary groups.

$$2AB_{16} = \frac{0012}{2}\ \frac{1010}{A}\ \frac{1011}{B}$$

Hence, $2AB_{16} = 001010101011_2$

Q16. Explain the relationship between decimal, hexadecimal, binary and octal.

Ans :

Summarizes the relationship among decimal, hexadecimal, binary, and octal number systems. Note that the maximum value for a single digit of octal (7) is equal to the maximum value of three digits of binary. The value range of one digit of octal duplicates the value range of three digits of binary. If we substitute octal digits for binary digits, the substitution is on a one-to-three basis. Hence, computers that print octal numbers instead of binary, while taking memory dump, save one-third of printing space and time.

Similarly, note that the maximum value of one digit in hexadecimal is equal to the maximum value of four digits in binary. Hence, the value range of one digit of hexadecimal is equivalent to the value range of four digits of binary. Therefore, hexadecimal shortcut notation is a one-to-four reduction in space and time required for memory dump.

Decimal	Hexadecimal	Binary	Octal
0	0	0	0
1	1	1	1
2	2	10	2
3	3	11	3
4	4	100	4
5	5	101	5
6	6	110	6
7	7	111	7
8	8	1000	10
9	9	1001	11
10	A	1010	12
11	B	1011	13
12	C	1100	14
13	D	1101	15
14	E	1110	16
15	F	1111	17
16	10	10000	20

Figure : Relationship among Decimal, Hexadecimal, Binary, and Octal number systems.

2.4 PRIMARY STORAGE

Q17. What is 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.

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.

Q18. What is primary storage ?

Ans : **(Dec.-19 MGU, Dec.-19 KU, Imp.)**

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.

Q19. What is secondary storage ?

Ans : **(Dec.-19, MGU)**

The data and instructions in primary storage (RAM) are purely temporary in Mature 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

2.4.1 RAM

Q20. 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.

(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.

2.4.2 ROM

Q21. What is read only memory? Explain different types of ROM.

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 Clip

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).

2.4.2.1 PROM

Q22. What is programmable read only memory?

Ans :

- It is also the read only memory like ROM. The only difference between ROM and PROM is that the instructions in ROM are designed by the manufacturer of the computer where as in PROM, the instruction are programmed by the user himself according to his requirement.
- PROM is also known as one-time programmable non-volatile memory.
- In PROM, user can design the instructions only for once; he cannot change the instructions later whenever required.
- The major disadvantage of PROM is that a shock of electricity can easily cause fuses in ROM to burn out thereby corrupting the PROM.

2.4.2.2 EPROM

Q23. What is erasable programmable read only memory?

Ans :

- Although, PROM is not a flexible memory, as the instructions in it cannot be changed. EPROM is designed to overcome the drawback of PROM.
- In EPROM, the user can program the instructions himself according to his requirement and later on, he can also erase the instructions by using Ultra-Violet Rays (UV Rays) and reprogram the new instructions in it.
- While the contents are being written in EPROM, user can not read any information.
- EPROM chips are used for research and development operations because there are regular changes in requirement due to testing of various computer systems.)

2.4.2.3 EEPROM

Q24. What is electrically erasable programmable read only memory?

Ans :

- It is also the read only memory and user can program/reprogram the instructions according to his requirement, but here the instructions will be reprogrammed through special electrical pulses.
- EEPROM such as Flash memory allow the entire ROM to be electrically erased then written to without taking them out of the computer.
- In EEPROM, user can electrically erase a portion of the contents of the ROM. This is very important in situations where minor changes to the ROM contents are needed.

Q25. What are the differences between RAM and ROM ?

Ans : **(Aug.-21, Imp.)**

RAM	ROM
• Information stored and retrieved anytime.	• Information is permanently stored.
• Volatile storage.	• Non-volatile storage.
• It is read / write memory.	• It is read only memory.
• Information can be altered.	• Information can not be altered.
• It is possible to randomly select and store the information.	• It is not possible to randomly select and store the information.
• Execution speed depends upon the capacity of RAM.	• No such dependency.
• RAM allows the computer to read data quickly to run applications.	• ROM stores the program required to initially boot the computer.
• The two main types of RAM are static RAM and dynamic RAM.	• The types of ROM include PROM, EPROM and EEPROM.

2.5 SECONDARY STORAGE

Q26. What is meant by Secondary Storage ?

Ans :

Secondary storage devices are primarily referred to storage devices that serve as an addition to the computer's primary storage- RAM, ROM. A secondary storage device is a non-volatile device that holds data until it is deleted or overwritten. Such storage devices or media are not constantly accessible by a computer system.

Some of the commonly used secondary storage devices are: Hard Disk, CDROM, DVD, Pen drive and Memory card.

2.5.1 Magnetic Tapes

Q27. What is meant by Magnetic Tapes ?

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

Magnetic tapes provide a compact and inexpensive method of storing data and programs. Magnetic tapes are mainly used for backup of data.

The main features of a magnetic tape are :

- Magnetic tape is half-inch wide tape of *Mylar* material, coated with magnetic material.
- Magnetic tapes have much higher data transfer rate and are preferred for high-speed applications.
- Magnetic tape is as same as playing an audio cassette in a tape recorder. Whenever we like to hear a particular song from an audio cassette, we need to rewind or forward the tape for that particular song.

- Data is stored as binary digits (i.e. 0 and 1) in magnetic tape, which represents the presence and absence of magnetic field.

Fig. : Magnetic Tape

- Magnetic tapes are portable in size i.e. we can carry this storage device easily from one place to another.
- Magnetic tape is reversible i.e. data can be erased from the tape and new data can be stored onto it.
- It is a multipurpose medium i.e. it can be used for input, output and storage.
- Magnetic tape is very economical device.
- The life of magnetic tape is very high as compared to some other storage devices.
- Magnetic tape is sensitive to dust, temperature, moisture and other environmental factors.

2.5.2 Magnetic Disks

Q28. Define magnetic disks. What are the different types of magnetic disks?

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

Magnetic disks are the most popular medium of data storage in these days. It is like a gramophone record, which is made up of plastic like material called *Mylar.*

The main features of a magnetic disk are:

- The data is stored in the same way as in magnetic tape.
- The read/write heads are small electro-magnets that are capable of reading, writing data and erasing the data stored in the form of magnetic spots.
- Data is randomly stored and retrieved from these disks i.e. the drive can access any portion of data directly.

Types of Magnetic Disk

On the basis of read/write mechanism, the magnetic disks are classified into two types:

(a) Floppy disk/Removable disk

(b) Hard disk/Fixed disk

(a) Floppy Disk / Removable Disk

Floppy disk is one of the most popular data storage medium, used for permanent data storage and data transfer before the invention of compact disks. The floppy disk was introduced by IBM in 1972. Floppy disk basically consists of a round, flat piece of plastic, coated with a magnetic material.

The main features of a floppy disk are :

- The two principal sizes or dimensions of floppy disk are 3.5 inch and 5.25 inch.
- Floppy disks are portable i.e. we can easily carry this storage device from one place to another for data storage.
- Floppy disks are slower to access than hard disks and have less storage capacity.
- Data stores on a floppy disk in *tracks,* which is further divided into small segments, called *sectors.*
- The storage capacity of a 3.5-inch floppy disks 1.44 MB and 5.25 inch floppy disk is 1.2 MB.
- Floppy disks are reusable i.e. we can write the new data on a floppy disk after erasing the previous one.
- Floppy disks allowed sequential as well as random access of data.

Fig. : Floppy Disk

- Floppy disks were not very much durable. It could be used for 3-4 times only. People used to carry same data in multiple floppies so that in case of damage of one floppy, the other one could be used.
- Floppy disk is sensitive to dust, temperature, moisture and other environmental factors.

(b) Hard Disk/Fixed Disk

Hard disk is another type of magnetic disk on which we can store data and information permanently. IBM (International Business Machine) invented hard disk in 1957. Initially, they were called fixed disks and later they were named hard disks.

Fig. : Hard Disk

A hard disk contains a number of platters of aluminum coated with magnetic material. Each of these platters is divided into tracks and sectors. All the platters are arranged on a spindle. This spindle is attached to a motor that can rotate at a speed of 5600 rotations per minute (rpm) or 7200 rpm.

The main features of hard disk are:

- Hard disks hold more data than floppy disk. Its storage capacity comes in Gigabyte (GB) and now also in Terabytes (TB). (1 TB = 1024 GB)
- Hard disk stores the data permanently.
- To store data on hard disks, it should be formatted. Formatting is a process of creating tracks and sectors on the surface of hard disk so that the data can be stored.
- Tracks are concentric circles and Sectors are the portions created by dividing the disks into number of portions.
- Hard disks are enclosed in a sealed container. The hard disk is a *non-removable* form of storage device but nowadays removable hard disk *(external hard disk)* is also available.
- Hard disks are faster in use than floppy disks i.e. the different data operations like- cut, copy, paste etc. are performed at a higher speed than floppy disk or any other magnetic storage device.
- Hard disks are more reliable than floppy disks because they are generally fitted inside the cabinet of the computer (internal hard disks), so they remain protected from external environmental factors like- dust, temperature etc.
- Hard disks are less portable than the floppies, although it is possible to buy removable hard disks. A removable hard disk is enclosed in a plastic box, so that they can be removed like floppy disk.

- Hard disks generally offer quicker access to data than floppy disks.
- Hard disks offer very low cost of data storage. Today, we can purchase a 1TB hard disk for around 4000 rupees.

2.5.3 Cartridge Tape

Q29. Discuss about Cartridge Tape (or) Magnetic Tape Cartridge.

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

A tape cartridge is a storage device that contains a spool of magnetic tape used to store different kinds of data, from corporate data to audio and video files. Each cartridge is designed to fit into a compatible audio/video recorder system or computer system. In the context of computing, however, a tape cartridge is the magnetic tape storage cartridge used in tape library units to store digital data on magnetic tape, which is packaged in cassettes and cartridges.

Tape cartridges are also known as data cartridges

A magnetic tape cartridge is an essential component of a robust backup system, which makes use of tape libraries for long-term backup storage. The tape cartridge is the actual piece of hardware that data is saved to; through an autoloader or a robot, the cartridge is inserted into one of many tape drives within a tape library unit for reading and writing.

Because of the nature of the tape cartridge, only sequential writing and reading are possible, so if a specific file needs to be located, the tape drive must read the tape cartridge from the beginning of the spool until it reaches the specific file location. This can take time and is the biggest drawback of a storage system using magnetic tape cartridges. However, tape is cheaper per gigabyte compared to hard drives and solid-state drives, making it ideal for long-term storage archiving.

2.5.4 Hard Disks

Q30. What is hard disks ? Explain the different types of hard disks.

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

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 of hard disks

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'/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.

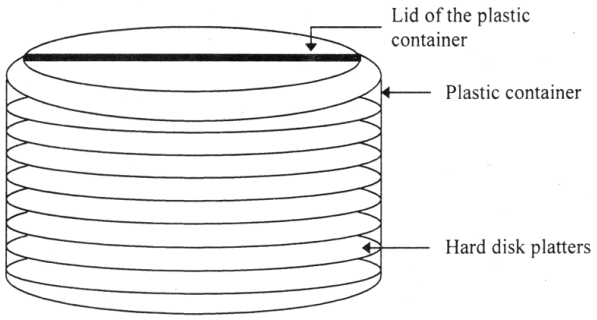


Fig. : A disk pack

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)

2.5.5 Floppy Disks

Q31. Define Floppy Disk.

Ans :

A floppy disk is a magnetic storage medium for computer systems. The floppy disk is composed of a thin, flexible magnetic disk sealed in a square plastic carrier. In order to read and write data from a floppy disk, a computer system must have a floppy disk drive (FDD). A floppy disk is also referred to simply as a floppy. Since the early days of personal computing, floppy disks were widely used to distribute software, transfer files, and create back-up copies of data. When hard drives were still very expensive, floppy disks were also used to store the operating system of a computer.

A number of different types of floppy disks have been developed. The size of the floppy got smaller, and the storage capacity increased. However, in the 1990s, other media, including hard disk drives, ZIP drives, optical drives, and USB flash drives, started to replace floppy disks as the primary storage medium.

2.5.6 Optical Disks

2.5.6.1 Compact Disks

Q32. What is Optical Disks? Explain different types of optical disks.

Ans :

With the advancement in technologies, such type of storage devices came in the market, which has more storage capacities and used optical or light technology, to store or retrieve the data. These kinds of storage devices are known as optical storage devices.

Optical storage devices are non-volatile i.e. they retain their contents if power supply is off. In such devices, data is recorded by making marks in a pattern that can be read back with the aid of light, usually a beam of laser light precisely focused on a spinning disk.

Types of Optical Disks

All optical disks are round platters. They come in different sizes and capacities. Commonly used types of optical disks are CD-ROM, WORD (CD-R), CD-RW and DVD disks. They are described below:

CD-ROM

CD-ROM stands for *Compact Disk-Read-Only Memory.* It is a spin-off of audio CD technology and works much like audio CDs used in music systems. In fact, if your computer has sound card and speakers, you can play audio CDs with your computer.

CD-ROM disk is a shiny, silver color metal disk usually of 5%-inch (12 cm) diameter. It is made of polycarbonate plastic and. thin layer of pure aluminum is applied to make the surface reflective. For some very good quality disks, gold layer is used, A thin layer of lacquer protects it. It has storage capacity of about 650 Megabytes or 700 Megabytes in newer ones. It is so called because of its large storage capacity on a compact-size disk and because it is a read-only storage medium. That is, these disks come pre-recorded and information stored on them cannot be altered.

WORM Disk / CD-Recordable (CD-R) Disks

WORM stands for write-once. read-many. WORM disks allow users to create their own CD-ROM disks by using a CD-recordable (CD-R) drive attached to a computer as a regular peripheral device. WORM disks look like standard CD-ROM disks, are purchased blank, and later encoded using a CD-R drive. The information recorded on a WORM disk by a CD-R drive can be read by any ordinary CD-ROM drive. As the name implies, data can be written only once on a WORM disk but can be read many times. That is, like a CD-ROM disk, once data has been etched on the surface of a WORM disk it becomes permanent and can be read but never altered. However, all the data to be recorded on a WORM disk can be written on its surface in multiple recording sessions.

CD Read/Write (CD-RW) Disk

A CD Read/Write (CD-RW) disk is very similar to a WORM disk with the exception that you can erase the previous content and write on it multiple times. Such disks use metallic alloy layer. Laser beam changes the chemical property during writing (or burn process) changing reflectivity at desired places. The land-pit difference on CD-RW is not significant and hence CD drives have to be compatible to read such disks. A CD-RW disk usually has a lifetime of 100 or more erase-write cycle. A disk written once can be erased by changing the chemical property again and then it can be written on to afresh. CD-RW drives have such erase capability. CD- RW disks are little expensive than CD-R disks but are a great cost saver because they can be reused many times due to their erase capability.

Digital Video (or Versatile) Disk (DVD)

DVD was designed primarily to store and distribute movies. However, it is fast becoming mainstream optical disk as prices are reducing and need for large capacity storage is increasing.

It is similar to CD-ROM in principle but is denser in recording data. It follows Eight-to-Fourteen Modulation Plus (EFMPlus) encoding as compared to Eight-to-Fourteen Modulation (EFM) encoding used by CD-ROM. There are two variants of DVD - single-layer disk and double-layer disk. Single-layer disk has storage capacity of 4.7GB, whereas, double-layer disk has storage capacity of 8.5GB.

Like CD-ROM, DVD also has many types - DVD-R/RW, DVD+R/RW, DVD-Video, and DVD-Audio. DVD- Video is now the most dominant movie storage format used. It allows storage of video in 4:3 or 16:9 aspect ratios in MPEG-2 video format using NTSC or PAL resolution. It may be of interest

to note that NTSC has resolution of 720x480 and PAL has resolution of 720x576. The audio is usually Dolby Digital (AC-3) or Digital Theater System (DTS) and can be either monaural or 5.1 Surround Sound.

Q33. What are the advantages and disadvantages of Optical Disks ?

Ans :

Advantages

1. Cost-per-bit of storage for optical disks is very low because of their low cost and high storage density. Additional cost benefit comes from the fact that some optical disks can be erased and reused many times.
2. Use of a single spiral track makes optical disks an ideal storage medium for reading large blocks of sequential data such as audio or video.
3. Optical disk drives do not have any mechanical read/write heads to rub against or crash into the disk surface. This makes optical disks more reliable storage medium than magnetic tapes or magnetic disks.
4. Optical disks have data storage life in excess of 30 years. This makes them better storage medium for data archiving as compared to magnetic tapes or magnetic disks.
5. Since data once stored on CD-ROM/WROM disks becomes permanent, the danger of stored data getting inadvertently erased/ overwritten is not there.
6. Due to their compact size and lightweight, optical disks are easy to handle, store, and port from one place to another.
7. Audio CDs can be played on a computer having a CD-ROM drive along with a sound card and speakers. This allows computer systems to be also used as music systems, whenever desired.
8. A computer having a DVD drive can be used to play DVDs allowing it to be used for watching videos such as movies.

Limitations

1. CD-ROM and WORM disks are read-only (permanent) storage medium. Data once recorded, cannot be erased. Hence, they cannot be reused.
2. Data access speed for optical disks is slower than magnetic disks.
3. Optical disks require more complicated drive mechanism than magnetic disks due to the need to have laser generating source and detection lens that require precision engineering and careful handling.
4. Since optical disk is a removable media, it is prone to scratches, dust, sticky prints (including fingerprints), etc. while handling. Hence, they need careful handling.
5. When used for off-line storage, they should be labeled properly for easy identification.

Q34. Explain the uses of Optical Disks ?

Ans :

Optical disks are used for following purposes:

1. For distributing large amounts of data at low cost. For example, a complete encyclopedia, dictionary, world atlas, dictionary of quotations, biographies of great people, information about all educational institutions of a particular type in a country, etc. are often distributed on CD-ROM disks.
2. For distribution of electronic version of conference proceedings, journals, magazines, books, product catalogs, etc.
3. For distribution of audio such as songs.
4. For distribution of new or upgraded versions of software products by software vendors.
5. For storage and distribution of wide variety of multimedia applications such as video games.
6. For archiving of data not used frequently but which may be used occasionally.

7. WORM disks are often used by end-user companies to make permanent storage of their own proprietary information. For example, many banks use them for making a permanent record of their daily transactions.
8. DVDs have become a popular medium for distribution of movies.

2.5.7 Zip Drive

Q35. What is Zip Drive?

Ans :

A Zip drive is a medium-capacity and portable magnetic disk storage system launched by Iomega in the mid-1990s. It was popular at the time of launch as cost per storage unit was lower than that of hard disks, and it could store a larger amount of data than a floppy disk. The Zip drive was capable of fast data transfer and was durable and reliable. The rise of other devices that later came to market, such as USB drives, were favored over the Zip drive and Zip disk, and these became obsolete soon afterward.

The Zip drive was available in 100- and 250-MB capacities. The initial versions of the drive could be connected to a computer by means of a parallel, SCSI or IDE port. The later versions had a USB interface and were thus simple to connect, being plug and play. The Zip drive was PC and Mac compatible and came with a manual and related software that provided ease-of-use features. The drive installed itself on a computer and would be assigned a new drive letter to distinguish itself from other drives. It could handle high-capacity Zip disks and had a large drive slot to fit the disks. The Zip drive also contained a retro-reflective spot for identifying the proper disk media in order to prevent damage to the disk and drive.

At the height of its popularity, the Zip drive was considered a larger version of the floppy drive and certain manufacturers included Zip drives internally in their devices. It was favored in the graphic arts vertical market and was also economical for home users at the time of launch for storing large data. Zip drives were reportedly prone to click-of-death failures, which potentially resulted in media and data loss.

2.5.8 Flash Drives

Q36. Explain the meaning of Flash Drive.

Ans :

Flash drive is a compact device of the size of a pen, comes in various shapes and stylish designs (such as pen shape, wallet shape etc.), and may have different added features (such as with a camera, with a built-in MP3/WMA/FM Radio play back for music on the go, etc.). It enables easy transport of data from one computer to another.

It is a plug-and-play device that simply plugs into a USB (Universal Serial Bus) port of a computer. The computer detects it automatically as removable drive. Now one can read, write, copy, delete, and move data from the computer's hard disk drive to the flash drive or from the flash drive to the hard disk drive. One can even run applications, view videos, or play MP3 files from it directly. Once done, it can be simply plugged out of the USB port of the computer and kept into the pocket for being carried anywhere. A flash drive does not require any battery, cable, or software, and is compatible with most PCs, desktop, and laptop computers with USB 2.0 port. All these features make it ideal external data storage for mobile people to carry or transfer data from one computer to another.

Fig. : A flash drive (pen drive)

As the name implies, it is based on flash memory storage technology discussed in earlier chapter. Recall that flash memory is non-volatile,

Electrically Erasable Programmable Read Only Memoiy (EEPROM) chip. It is a highly durable solid-state storage having data retention capability of more than 10 years.

Available storage capacities are 8MB, 16MB, 64MB, 128MB, 256MB, 512MB, 1GB, 2GB, 4GB, and 8GB. A pen drive of 16MB capacity has 5600 times more storage capacity than a 1.4 MB floppy disk.

Figure shows a flash drive. It has a main body and usually a port connector cover. The cover is removed or port connector is pushed out when the drive is to be plugged into the USB port of a computer. The main body usually has a write protect tab, a read/write LED (Light Emitting Diode) indicator, and a strap hole. Some manufacturers also provide software to be used with the drive.

2.6 PRIMARY VS SECONDARY STORAGE

Q37. What are the differences between Primary Vs Secondary Storage ?

Ans :

Primary Storage	Secondary Storage
It is directly accessed by CPU.	It is not directly accessed by CPU.
It has limited storage capacity.	It has very high storage capacity.
It has faster access time.	It has relatively slower access time.
It has high cost per bit.	It has relatively low cost per bit.
It stores data and programs that are required for processing by CPU.	It stores data and Instructions that are not currently being used by CPU but may be required later for processing.
Example: RAM, ROM, Cache memory and Virtual memory.	**Example:** Hard Disk, CDROM, DVD, Pen Drive.

2.7 DATA STORAGE AND RETRIEVAL METHODS

Q38. What is data storage ?

Ans : **(Dec.-19)**

Data storage is the collective methods and technologies that capture and retain digital information on electromagnetic, optical or silicon-based storage media. Storage is a key component of digital devices, as consumers and businesses have come to rely on it to preserve information ranging from personal photos to business-critical information.

Storage is frequently used to describe the devices and data connected to the computer through input/output (I/O) operations, including hard disks, flash devices, tape systems and other media types.

Importance

Underscoring the importance of storage is a steady climb in the generation of new data, which is attributable to big data and the profusion of internet of things (IoT) devices. Modern storage systems

require enhanced capabilities to allow enterprises to apply machine learning-enabled artificial intelligence (AI) to capture this data, analyze it and wring maximum value from it.

Larger application scripts and real-time database analytics have contributed to the advent of highly dense and scalable storage systems, including high-performance computing storage, converged infrastructure, composable storage systems, hyper-converged storage infrastructure, scale-out and scale-up network-attached storage (NAS) and object storage platforms.

This Techquickie video explains the evolution of computer storage.

By 2025, it is expected that 163 zettabytes (ZB) of new data will be generated, according to a report by IT analyst firm IDC. That estimate represents a potential tenfold increase from the 16 ZB produced through 2016.

How Data Storage Works

The term *storage* may refer both to a user's data generally and, more specifically, to the integrated hardware and software systems used to capture, manage and prioritize the data. This includes information in applications, databases, data warehouses, archiving, backup appliances and cloud storage.

Digital information is written to target storage media through the use of software commands. The smallest unit of measure in a computer memory is a bit, described with a binary value of 0 or 1, according to the level of electrical voltage contained in a single capacitor. Eight bits make up one byte.

Other capacity measurements to know are:

- kilobit (Kb)
- megabit (Mb)
- gigabit (Gb)
- terabit (Tb)
- petabit (Pb)
- exabit (Eb)

Larger measures include:

- kilobyte (KB) equal to 1,024 bytes
- megabyte (MB) equal to 1,024 KB
- gigabyte (GB) equal to 1,024 MB
- terabyte (TB) equal to 1,024 GB
- petabyte (PB) equal to 1,024 TB
- exabyte (EB) equal to 1,024 PB.

Q39. What do you understand by retrieval methods.

Ans : **(Dec.-19, Imp.)**

Recent improvements in computer technology and automated data collection make it easy to collect and store large amounts of data. It is impractical to maintain such data using either paper filing systems or custom software programs manipulating standard sequential files. Database systems have become the most viable means of maintaining and utilizing the large quantities of data collected by APT devices.

The storage and retrieval of data encompasses both hardware and software. With regard to the hardware, data have been stored on devices ranging in simplicity from paper to complex optical disks and flash memory cards. With regard to software, data storage has ranged from written information (for example, tables) filed in folders and stored in cabinets to electronic text files and spreadsheets for small data amounts to dedicated databases for large data amounts.

1. Hardware

The most familiar form of data storage and retrieval is paper; observations are recorded on paper and stored for later use and analysis. These data are most likely transferred to an electronic form before analyses are conducted. The main advantage of paper storage is ease of use, but such data are hard to work with. Paper storage is appropriate for very simple data sets that do not involve a large number of repetitive calculations.

Much of the data are collected in some electronic form on electronic storage media. Storage media range in simplicity from floppy disks for small databases to flash cards to hard drives and optical disks for larger databases.

The current floppy disk (89-mm micro floppy) operates on the principles of magnetic recording using magnetic heads for data storage and retrieval on a single rotating magnetic disk. Because of their limited capacity 1.44 megabytes MB and extremely low data transfer rale (0.06 MB/sec), floppy disks are useful only for storing small data files. However, they do offer universal compatibility and low cost.

Hard disk drives contain several spinning disks that are read from, and written to, using separate read and write heads that float above the disks with a separation in the order of 10 to 20 microns. These drives are sealed permanently to protect the disks and heads from dust particles. Over the past few years, the fixed hard disk drive technology has improved; drives with larger storage capacity are becoming less expensive. There are a number of other removable magnetic storage media devices with different sizes [for example, 40 MB Iomega Click! Drive, 100 MB and 250 MB Zip drives, and 1 gigabyte (GB) and 2 GB Jaz drives].

Flash memory cards are electronically programmable and non-reprogrammable solid-state data storage devices that use flash memory chips to store data. Entire sections of the microchip are erased (or flashed) at once. These cards lose power when they are disconnected, but the data are retained for long periods of time or until the microchip is rewritten; these are normally used in laptop PCs and digital cameras. Many types and configurations of these cards are available with memory ranging from 1 MB to 1 GB.

Compact disk read only memory (CD-ROM) technology was introduced as CD-digital/audio (CD-DA). CD-ROM features include standard design and physical structure of the disk, data format, and error correction code schemes. A CD-ROM is 12 cm in diameter with a 1.5-cm hole and is 1.2 mm thick. CD-ROMs can store up to 650 MB of data (74 minutes of play time for CD-DA); they are a highly reliable means of data storage with good data protection from damage, both inside and outside the CD-ROM drive.

An advancement in CD-ROM technology is the inexpensive CD-ROM/CD-RW combination drive for personal computers, which can easily copy data to recordable CDs (CD-R) or a rewriteable CDs (CD-RW) that look almost like a CD-ROM. These CDs are inexpensive and mobile writeable storage media.

The DVD (digital versatile disk) is an optical storage system that, like a CD, has read-only, recordable, and rewriteable versions. DVDs are likely to replace CDs in the future; current DVD drives are compatible with CD media. DVDs can store up to 17 GB of data, compared with the 650-MB capacity of CD-ROMs.

2. Software

Data that are recorded on paper and stored in file cabinets can be retrieved manually. Depending on the importance and amount of data collected, electronic storage in text files, spreadsheets, or dedicated databases may be warranted.

Electronic text (*.txt) files are simple ASCII files that can be read by most word processing, spreadsheet, and database software programs. They are platform independent and can be read on IBM compatible PCs, Apple PCs, and mainframes. A shortcoming of text files is that they cannot incorporate text attributes, such as bold and underlined characters. Rich text format (*.rtf) files can retain formatting and can be opened by major word processors in both IBM and Apple environments.

Data stored in text files can have data fields that are separated, or delimited, by a comma, a tab, or a space. Each row represents a data record. Such data-delimited text files can be read into a word processor, spreadsheet, database, or specialized statistical package for further manipulation and

analysis. Spreadsheet programs can be used to store and manipulate fairly large data sets, constrained only by available memory and PC processor speed.

A spreadsheet allows the user to organize information into both columns and rows. Each cell of the spreadsheet, defined as the unique intersection point of a column and a row, can contain a label, a value, or a formula. A label provides descriptive information, a value is a number, and a formula manipulates values and labels. Though spread- sheets have been used as databases for small amounts of data, they are generally difficult to verify and audit and do not provide good tools for managing data, whether in terms of consolidation or searching for specific details. When used as databases, spreadsheets arc unable to display one record (row) at a time and do not allow a multiple-report format. Relational links to other tables and data are also not supported.

Dedicated databases that arrange information in tables and records are best suited for large-scale data storage, manipulation, and retrieval. Traditional databases are organized as fields, records, and files. A field is a single piece of information; a record is a complete set of fields; and a file is a collection of records. A "database" or a database management system (DBMS) — consisting of a collection of programs that enable entering, selecting, and organizing data in a database — is used to access information from a database.

Short Question and Answers

1. What do you understand the word binary?

Ans :

1. Information is handled by computer's electronic/electrical components such as transistors, semiconductors, wires, etc., and all these can indicate only two states or conditions - ON (state 1) or OFF (state 0). Transistors are either conducting (state 1) or non-conducting (state 0), magnetic materials are either magnetized (state 1) in one or opposite direction or non-magnetized (state 0). a pulse or voltage is present (state 1) or absent (state 0) in wire. Information is represented within a computer by the presence or absence of these types of signals. Binary number system having only tw o digits (0 and 1) is most suitable for expressing the two possible states. Figure 5.1 illustrates the concept of binary components.
2. By using binary numbers, computer circuits only have to handle two binary digits rather than ten decimal digits. This greatly simplifies the internal circuit design of computers resulting in less expensive and more reliable circuits.
3. Finally, all possible operations in decimal number system are also possible in binary number system.

2. Non-Positional Number Systems

Ans :

In early days, human beings counted on fingers. When ten fingers were not adequate, stones, pebbles, or sticks were used to indicate values. This method of counting uses an additive approach or the non-positional number system. In this system, we have symbols such as I fdr 1, II for 2, III for 3, IIII for 4, IIIII for 5, etc. Each symbol represents the same value regardless of its position in the number and the symbols are simply added to find out the value of a particular number. Since it is very difficult to perform arithmetic with such a number system, positional number systems were developed as the centuries passed.

3. Positional Number Systems

Ans :

In a positional number system, there are only a few symbols called digits. These symbols represent different values, depending on the position they occupy in a number. The value of each digit in such a number is determined by three considerations:

1. The digit itself,
2. The position of the digit in the number, and
3. The base of the number system (where base is defined as the total number of digits available in the number system).

4. Decimal Number System

Ans :

Decimal number system is a base 10 number system having 10 digits from 0 to 9. This means that any numerical quantity can be represented using these 10 digits. Decimal number system is also a positional value system. This means that the value of digits will depend on its position. Let us take an example to understand this.

Say we have three numbers – 734, 971 and 207. The value of 7 in all three numbers is different-

- In 734, value of 7 is 7 hundreds or 700 or 7×100 or 7×10^2
- In 971, value of 7 is 7 tens or 70 or 7×10 or 7×10^1
- In 207, value 0f 7 is 7 units or 7 or 7×1 or 7×10^0

5. What is 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 primary storage ?

Ans :

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.

7. What is secondary storage ?

Ans :

The data and instructions in primary storage (RAM) are purely temporary in Mature 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.

8. What is random accesses memory ?

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.

9. 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.

10. What is programmable read only memory?

Ans :

- It is also the read only memory like ROM. The only difference between ROM and PROM is that the instructions in ROM are designed by the manufacturer of the computer where as in PROM, the instruction are programmed by the user himself according to his requirement.
- PROM is also known as one-time programmable non-volatile memory.
- In PROM, user can design the instructions only for once; he cannot change the instructions later whenever required.
- The major disadvantage of PROM is that a shock of electricity can easily cause fuses in ROM to burn out thereby corrupting the PROM.

11. What is erasable programmable read only memory ?

Ans :

- Although, PROM is not a flexible memory, as the instructions in it cannot be changed. EPROM is designed to overcome the drawback of PROM.
- In EPROM, the user can program the instructions himself according to his requirement and later on, he can also erase the instructions by using Ultra-Violet Rays (UV Rays) and reprogram the new instructions in it.
- While the contents are being written in EPROM, user can not read any information.
- EPROM chips are used for research and development operations because there are regular changes in requirement due to testing of various computer systems.)

12. What is electrically erasable programmable read only memory ?

Ans :

- It is also the read only memory and user can program/reprogram the instructions according to his requirement, but here the instructions will be reprogrammed through special electrical pulses.
- EEPROM such as Flash memory allow the entire ROM to be electrically erased then written to without taking them out of the computer.

- In EEPROM, user can electrically erase a portion of the contents of the ROM. This is very important in situations where minor changes to the ROM contents are needed.

13. What are the differences between RAM and ROM ?

Ans :

RAM	ROM
• Information stored and retrieved anytime.	• Information is permanently stored.
• Volatile storage.	• Non-volatile storage.
• It is read / write memory.	• It is read only memory.
• Information can be altered.	• Information can not be altered.
• It is possible to randomly select and store the information.	• It is not possible to randomly select and store the information.
• Execution speed depends upon the capacity of RAM.	• No such dependency.
• RAM allows the computer to read data quickly to run applications.	• ROM stores the program required to initially boot the computer.
• The two main types of RAM are static RAM and dynamic RAM.	• The types of ROM include PROM, EPROM and EEPROM.

14. Floppy Disk

Ans :

Floppy disk is one of the most popular data storage medium, used for permanent data storage and data transfer before the invention of compact disks. The floppy disk was introduced by IBM in 1972. Floppy disk basically consists of a round, flat piece of plastic, coated with a magnetic material.

The main features of a floppy disk are :

- The two principal sizes or dimensions of floppy disk are 3.5 inch and 5.25 inch.
- Floppy disks are portable i.e. we can easily carry this storage device from one place to another for data storage.
- Floppy disks are slower to access than hard disks and have less storage capacity.
- Data stores on a floppy disk in *tracks,* which is further divided into small segments, called *sectors.*
- The storage capacity of a 3.5-inch floppy disk is 1.44 MB and 5.25 inch floppy disk is 1.2 MB.
- Floppy disks are reusable i.e. we can write the new data on a floppy disk after erasing the previous one.
- Floppy disks allowed sequential as well as random access of data.

15. What is hard disks ? Explain different types of hard disks.

Ans :

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 of hard disks

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

(i) Zip / Bernoulli Disk

It consists of a single hard disk platter encased in a plastic cartridge. The disk is commonly of 3'/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

(ii) 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.

16. Define Floppy Disk.

Ans :

A floppy disk is a magnetic storage medium for computer systems. The floppy disk is composed of a thin, flexible magnetic disk sealed in a square plastic carrier. In order to read and write data from a floppy disk, a computer system must have a floppy disk drive (FDD).

A floppy disk is also referred to simply as a floppy. Since the early days of personal computing, floppy disks were widely used to distribute software, transfer files, and create back-up copies of data. When hard drives were still very expensive, floppy disks were also used to store the operating system of a computer.

A number of different types of floppy disks have been developed. The size of the floppy got smaller, and the storage capacity increased. However, in the 1990s, other media, including hard disk drives, ZIP drives, optical drives, and USB flash drives, started to replace floppy disks as the primary storage medium.

17. Explain the uses of Optical Disks.

Ans :

Optical disks are used for following purposes:

1. For distributing large amounts of data at low cost. For example, a complete encyclopedia, dictionary, world atlas, dictionary of quotations, biographies of great people, information about all educational institutions of a particular type in a country, etc. are often distributed on CD-ROM disks.
2. For distribution of electronic version of conference proceedings, journals, magazines, books, product catalogs, etc.
3. For distribution of audio such as songs.
4. For distribution of new or upgraded versions of software products by software vendors.
5. For storage and distribution of wide variety of multimedia applications such as video games.

6. For archiving of data not used frequently but which may be used occasionally.
7. WORM disks are often used by end-user companies to make permanent storage of their own proprietary information. For example, many banks use them for making a permanent record of their daily transactions.
8. DVDs have become a popular medium for distribution of movies.

18. What is Zip Drive ?

Ans :

A Zip drive is a medium-capacity and portable magnetic disk storage system launched by Iomega in the mid-1990s. It was popular at the time of launch as cost per storage unit was lower than that of hard disks, and it could store a larger amount of data than a floppy disk. The Zip drive was capable of fast data transfer and was durable and reliable. The rise of other devices that later came to market, such as USB drives, were favored over the Zip drive and Zip disk, and these became obsolete soon afterward.

The Zip drive was available in 100- and 250-MB capacities. The initial versions of the drive could be connected to a computer by means of a parallel, SCSI or IDE port. The later versions had a USB interface and were thus simple to connect, being plug and play. The Zip drive was PC and Mac compatible and came with a manual and related software that provided ease-of-use features.

The drive installed itself on a computer and would be assigned a new drive letter to distinguish itself from other drives. It could handle high-capacity Zip disks and had a large drive slot to fit the disks. The Zip drive also contained a retro-reflective spot for identifying the proper disk media in order to prevent damage to the disk and drive.

At the height of its popularity, the Zip drive was considered a larger version of the floppy drive and certain manufacturers included Zip drives internally in their devices. It was favored in the graphic arts vertical market and was also economical for home users at the time of launch for storing large data. Zip drives were reportedly prone to click-of-death failures, which potentially resulted in media and data loss.

19. What is data storage ?

Ans :

Data storage is the collective methods and technologies that capture and retain digital information on electromagnetic, optical or silicon-based storage media. Storage is a key component of digital devices, as consumers and businesses have come to rely on it to preserve information ranging from personal photos to business-critical information.

Storage is frequently used to describe the devices and data connected to the computer through input/output (I/O) operations, including hard disks, flash devices, tape systems and other media types.

Choose the Correct Answers

1. Computer word size is a multiple of [a]
   (a) 16 bits (b) 4 bits
   (c) 1024 bits (d) 10 bits
2. All of following are non-volatile memory except [d]
   (a) ROM (b) PROM
   (c) Flash memory (d) RAM
3. Computer memory is measured in terms of [b]
   (a) Bits (b) Bytes
   (c) Cells (d) Units
4. Which of the following are types of ROMs? [b]
   (a) SROM & DROM
   (b) PROM & EPROM
   (c) Only one type there is no further classification
   (d) PROM & EROM
5. A non-erasable disk that stores digitized audio information is _____ [a]
   (a) CD (b) CD-ROM
   (c) DVD-R (d) DVD-RW
6. RAM stands for [d]
   (a) Random origin money (b) Random only memory
   (c) Read only memory (d) Random access memory
7. Which statement is valid? [a]
   (a) 1KB = 1024 bytes (b) 1 MB = 2048 bytes
   (c) 1 MB = 10000 kilobytes (d) 1 KB = 100 bytes
8. Magnetic disks are the most popular medium for [c]
   (a) Direct access (b) Sequential access
   (c) Both (d) None of above
9. Select the smallest memory size. [c]
   (a) Terabyte (b) Gigabyte
   (c) Kilobyte (d) Megabyte

10. Which of the following is not a positional number system? [a]

(a) Roman Number System (b) Octal Number System

(c) Binary Number System (d) Hexadecimal Number System

11. The binary equivalent of the decimal number 10 is _____ [c]

(a) 0010 (b) 10

(c) 1010 (d) 010

12. Which of the following is not a binary number ? [c]

(a) 1111 (b) 101

(c) 11E (d) 000

13. Which of the following is the correct representation of a binary number? [d]

(a) $(124)_2$ (b) 1110

(c) $(110)^2$ (d) $(000)_2$

Fill in the blanks

1. RAM stores the data purly on _____ basis
2. ROM stands for _____.
3. Primary storage is also called _____ memory.
4. The technique to represent and work with numbers is called _____.
5. Smart card is an _____ device.
6. _____ is used to mainly recognize marks made by pencil or pen.
7. _____ can be used to scan images, posters, magazine pages etc.
8. The devices used to take the output from the computer are known as _____.
9. VDU is an _____ device.
10. In _____ Printer, there is no direct contact between the print and paper.

ANSWERS

1. Temporary
2. Read Only Memory
3. Internal
4. Number system
5. Input
6. Optical Mark Reader
7. Scanner
8. Output devices
9. Output
10. Non - impact

UNIT III

SOFTWARE

Software and its needs, Types of S/W. **System Software**: Operating System, Utility Programs Programming Language: Machine Language, Assembly Language, High LevelLanguage their advantages & disadvantages. **Application S/W** and its types: Word Processing, Spread Sheets Presentation, Graphics, DBMS s/w.

3.1 Software and its Needs

Q1. What is software? Explain the features of software.

Ans : **(Dec.-19 MGU, Imp.)**

Software is a generic term for organized collection of computer data and instructions. It is responsible for controlling, integrating, and managing the hardware components of a computer and to accomplish specific tasks. In other words, software tells the computer what to do and how to do it. For example, software instructs the hardware what to display on the user's screen, what kinds of input to take from the user, and what kinds of output to generate. Thus, software communicates with the hardware by organizing the control sequences, and the hardware carries out the instructions defined by the software.

A computer needs to be instructed to perform any task. These instructions are given in the form of computer programs, which are written in computer programming languages. A program controls the activity of the processor. The moment the hardware (processor, memory, etc.), acts as per the instructions of a program, the program is said to be in running or executing state.

A set of programs, which are specifically written to provide the user a precise functionality like solving a specific problem is termed as a software package. For example, word processing software package provides functionality to the computer so that it can be used to create text documents like letters and mailing lists. Similarly, an image processing software package assists a user in drawing and manipulating graphics.

Features of Software

1. Ease of use

The software systems and applications are becoming more and more easy to use. In fact, software developers and system analysts go to great lengths to ensure that the products they develop are user-friendlier than their competitor's products.

2. Graphical user interface (GUI)

GUI or graphical user interface has now become the default standard for most of the software applications. Gone are the days of the crude character based interfaces of UNIX and DOS application. Today's software applications and products provide the users with perceptive, graphical and easy-to-use interfaces. Now the users do not have to remember the cryptic system commands or shortcut keys that were a must in the character based era. Now almost any task can be accomplished by a mouse click.

3. Multi-platform capability

Today's software applications are not developed for just one platform. Most of the software applications supports multiple platforms-both hardware and software platforms. There are software applications that support hardware platforms ranging from mainframes to PCs and different software platforms like MVS, Solaris, AIX, UNIX, Windows and so on. For example IBM's DB2 Universal database is available for a variety or hardware and software platforms.

Another important feature of today's software application is that they support multiple languages and multiple currencies. Many vendors are providing their applications in many languages like English, Arabic, Japanese, and Chinese and so on.

4. Compatibility with other Software

Now the competition for each market segment in the software marketplace is rather fierce. We have many software vendors battling for the market share in the same segment. For example, Microsoft Word 2000 supports all previous versions of Work like Word 97, Word 6, Word and so on.

The two features – compatibility with earlier versions and compatibility with other products make it easier for the users, as they can choose the application they want and still use the old files they have created using other applications or using older versions of the same application.

5. Mail enabling

Mail enabled applications are designed to take advantage of on e-mail. These are the familiar word processors, spreadsheets, and other individual desktop applications that have email features built to them. There is another class of message-centered programs that are built specifically around e-mail functions.

6. Web enabling

With the ever-increasing popularity of internet and the amount of information that is available on the net, most software applications are now web-enabled. Web enabling helps the user in many different ways. Its use starts while the user is installing the application. During installation, most of the applications will automatically connect to the Internet and to the vendor's web site and will register their products (earlier one had to fill in a paper form and mail or fax it to the vendor).

3.2 TYPES OF SOFTWARE

3.2.1 System Software

Q2. Define system software.

Ans : **(Aug.-21, Dec.-19 MGU, Dec.-19 KU)**

System software is the software used for controlling the internal operations of the computer.

The main features of system software are:

- The main job of the system software is to act as an interface between the user and the computer. It makes the operation of a computer system more effective and efficient.
- It controls all the processing activities and make sure that the resources and the power of the computer are used in most efficient manner.
- System software checks the availability of different devices; scan input devices for input and sends output to output devices.
- System software converts the instructions from user understandable language to computer understandable language.

3.2.1.1 Operating System

Q3. What is operating system ?

Ans : **(Dec.-19 MGU, Dec.-19 KU, Imp.)**

The operating system is an important component of the computer system. It can be defined as a set of programs that control how the system works. It is the most important program that runs on a computer. It is considered the backbone of a computer, managing both software and hardware resources. All computers must have an operating system used for starting the computer and to run other programs. It provides an interface between the users and the hardware of a computer system.

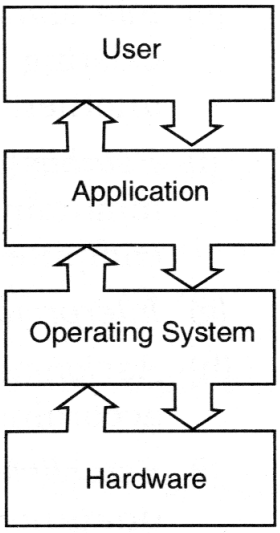


Fig. : Operating System

Operating systems perform basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk, and controlling peripheral devices such as disk drives and printers.

For large systems, the operating system has even greater responsibilities and powers. It is responsible for security, ensuring that unauthorized users do not access the system. The operating system is loaded automatically into the computer whenever we start the computer. More than one type of operating systems can also be installed on one computer but at one time only one operating system will be functional.

Once the operating system has started up, it manages all of the software and hardware on the computer. Most of the time, there are many different programs running at the same time, and they all need to access your computer's central processing unit (CPU), memory, and storage. The operating system coordinates all of this to make sure that each program gets what it needs. Without the operating system, the software wouldn't even be able to talk to the hardware, and the computer would be useless.

It also allows you to communicate with the computer without knowing how to speak the computer's language. The most popular operating systems are DOS, OS/2, UNIX, Windows 98, Windows XP, Windows Vista, Windows 7, Window 8 and Linux.

3.2.1.2 Utility Programs

Q4. What are utility programs ?

Ans : **(Dec.-19, Dec.-19 KU)**

Utility programs assist users in system maintenance tasks, such as disk formatting, data compression, data backup, and scanning a system for computer viruses. Some frequently used utility programs are:

1. Disk Formatting Utility

To use a new disk (hard disk, floppy disk, or optical disk) on a computer system, we need to format it according to the requirements of the computer's operating system. Disk formatting utility enables users to perform this task with great ease.

2. Data Compression Utility

This utility uses a compression algorithm to transform files into a fraction of their normal size, so that they occupy less storage space on disk, or can be transferred across a network in less time. It has an associated decompression algorithm used to convert a compressed file into its normal form and size when accessed by a user. It helps in significant saving of disk space - it can effectively double the capacity of a disk.

3. Data Backup Utility

Data stored in a computer system can be damaged or lost in several ways such as disk crash, virus, hardware malfunction, accidental deletion of files, or natural disasters like fire, earthquake, etc. Hence, we must always keep extra copies (called backup data) of important data. A backup utility enables creation of copy of data on some storage media, such as floppy disk, CD, pen drive, or magnetic tape. The storage media with backup data is often stored off-line away from computer system to prevent loss of critical data due to natural

disasters. When some data stored on-line is damaged or lost, it can be restored from backup media. It is not necessary that backup media is always kept off-line. In today's era of computer networks, some backup devices are kept on-line at a place away from main computer system and data backup on this device is done automatically by the computer system.

4. Antivirus Utility

A computer virus is a piece of code attached to a legitimate program that when executed, infects other programs in a system by replicating and attaching itself to them. In addition to this replicating effect, a virus normally does some other damage to the system, such as corrupting/erasing files. Therefore, due to its spreading nature, a virus can cause severe damage to a system.

3.2.1.3 Programming Language

Q5. What is Programming Language?

Ans : **(Aug.-21, Dec.-19 KU, Imp.)**

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.

3.2.1.3.1 Machine Language

Q6. What is Machine Language?

Ans : **(Aug.-21, Dec.-20, Dec.-19 MGU, Imp.)**

- 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.

Q7. What are the advantages and dis-advantages 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.

3.2.1.3.2 Assembly Language

Q8. What is Assembly Language?

Ans : **(Aug.-21, Dec.-20, Dec.-19 MGU, Imp.)**

- 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.

Q9. What are the advantages and disadvantages of assembly language ?

Ans :

Advantages of Assembly Language

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 of Assembly Language

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 difficulty.

3.2.1.3.3 High Level Language

Q10. What is High Level Language?

Ans : **(Dec.-20, Dec.-19 MGU, Imp.)**

- 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.

Q11. What are the advantages and disadvantages of High Level Language?

Ans :

Advantages of High-level Languages

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 of High-level Languages

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.

3.3 APPLICATION SOFTWARE

Q12. What is meant by Application Software?

Ans : **(Dec.-19, Imp.)**

Application software is the software that is designed to satisfy a particular need of a particular environment. These softwares are especially designed to solve the problems of one particular field i.e. application software is used in one application field only. We can not use application software in different fields to solve different problems. For example: Application software for financial management cannot be used for designing purposes. Similarly Microsoft word is used for documentation purpose only, we can't use it for any other purpose.

Such kinds of softwares that are particularly developed to work in one application area only are known as Application softwares.

The main features of application software are:

- Application software is designed by analyzing the environment and the need of the area of use.
- We cannot interchange the use of two-application softwares with each other.
- We cannot use application software for some other purposes except the permitted one.
- Programmers design application software by using high-level languages like C, C++, Visual Basic and Java etc.
- More interactive and easy to design.
- Easy to use and manipulate.
- The set of programs included in the application software packages are called the application programs and the programmers who develop the application software are called the application software programmers or application software developers.
- Some examples of application software are: *Ms-Word, Ms-Excel,* and *Ms-PowerPoint.*

Application software can be broadly classified into two categories:

(a) Pre-written Application Software

(b) Customized Application Software

(a) Pre-written Application Software

Pre-written application softwares are designed for common needs of various business organizations or applications.

These are developed by leading companies and sold as a product in the market.

- The cost of these softwares depends upon the functionality provided by the software, area of use and expected number of users.
- These softwares can be suitable for an individual or for a group of individuals. They provide help in controlling the general activities of organizations.

  For example: All organizations need software for word processing. Instead of developing software of their own, they can purchase a company's built-in software (pre-written software) like MS-WORD for this purpose.

(b) Customized Application Software

- Customized application software is designed for a specific application of a specific environment.
- The cost of such software depends upon the extent of work automated through the software.

  For example: An organization needs software to manage their account work. For that they will hire software engineers to create such software.

3.3.1 Types of Application Software

3.3.1.1 Word Processing

Q13. What is Word Processing? Explain the features of word processing.

Ans : **(Dec.-19, Dec.-19 KU, Imp.)**

The term word-processing describes use of hardware and software to create, edit, view, format, store, retrieve, and print documents (written material such as letters, reports, books, etc.). A word-processing package enables us to do all these on a computer system.

Features of Word Processor

A good Word Processor has number of advantages over conventional typewriter.

1. A Word Processor should print a relatively error-free document in the desired format.
2. A good Word Processor should give a good view of the document while the document is being typed so that the mistakes can easily be removed.
3. It should have a number of menus and commands that are user friendly and give the path for working with its environment.
4. There should be the provision to import and export the text data i.e. document.
5. A good Word Processor should have the spell and grammar checking facility so that text of the document is correct and grammatically error-free. It should have Thesaurus etc. that adds variety to the document by suggesting synonyms and also suggests their opposite meanings.
6. A good Word Processor should have different tools in toolbox for the user's help and which can be readily accessed using the mouse pointer.
7. It should provide the facility to save the document automatically after some minutes without using the Save command and give backup security and reliability if power goes off.
8. It should provide the facility to boldface, Italic or underline the selected text and also print the selected text in superscript and subscript style so that the performance of the document is enhanced.
9. A Word Processor should have the justification facility so that the text can be left justified, right justified, centered or fully justified. Justification means alignment of the text.
10. Word Processor should have the facility to set different page size (A4, A5 etc.), to set the margins (left, right, top, bottom) and also set the line spacing and character spacing.
11. Word Processor should provide the facility to define header and footer in a formatted document and also create footnotes and endnotes. It should have the facility to work with pictures, graphs and charts so that graphic environment can be created in a document.

Q14. What are the Advantages of Word Processing?

Ans :

The word processing is one of the major uses of a computer that can process words in letters, reports, and documents of all types with great speed and accuracy.

1. Word processing allows people to control written communications in new and powerful ways, manage and manipulate text quickly and efficiently, and increase written output many times over.

2. Word processing software produces error-free documents. Word processing software like MS Word marks out errors by underlining the word having error in red. If it is grammatical error, such error is marked in green. The user can correct the error. MS Word has facility to automatically correct error. MS Word has facility to automatically correct errors. It helps the user in producing error-free documents.

3. Word processing also permits you to change the format of a paragraph. With a single command, you can turn an uneven right margin into a beautiful, well-align, and professional document. You can even add a new sentence in the middle of your many-paged document by simply turning on the insert mode and then typing. Because a computer has an electronic brain, it can instantly shift forward all the text in its memory to make room for new words without changing its paragraph structure.

4. A word processor has other capabilities which can be carried out by just pressing a key. These include the following: moving paragraphs and blocks of text, creating boldface print, finding the next (or last) occurrence of any word or phrase, typing in capital letters, copying, deleting, and printing text.

5. Word Processor have the spell and grammar checking facility so that text of the document is correct and grammatically error-free. It should have Thesaurus etc. that adds variety to the document by suggesting synonyms and also suggests their opposite meanings.

6. Word processing also permits you to prepare a common letter addressed to one hundred, and even more different names and addresses. The most wonderful thing about this is that each letter looks like an original. In short, word processing enables you to produce personalized letters in mass. This is know as Mail Merge,

7. Word processing allows you to do things that would normally take a couple of day's work using an ordinary typewriter. For example, to reformat and entire document from double to single space, generate an index, print fifty or more individually-addressed copies of the same letter, and proofread an hundred-page document, all you need is a few minutes.

8. With word processing, you will be able to prepare reports and documents more easily and accurately. You can even work on the same sentence or paragraph over and over again without putting one on paper. Because it is easy to delete, insert, and correct words, you become more confident. Your ideas will also tend to flow more freely because you no longer have to concern your self with how the document would look like. In other words, you do the creating and let computer manage the words.

Q15. What are the Application of Word Processing?

Ans :

Word processors have various uses and applications in businesses, homes and educational environments.

1. Business

While there are many word processing features widely available, businesses most often utilize word processing features to create letterheads, merge mailings, generate labels, format presentations , meeting minutes

2. Marketing

Create marketing and advertising material, and generate and review resume templates.

3. Homes

Users in the home are likely to use word processors for writing letters, making labels, creating greeting cards and resumes, and personal planning and budgeting.

4. Education

Schools are more progressively using word processors in their curriculum. Educators generally utilize the application for basic text composition.

5. Research

Researchers are used word processors to write thesis and make the references to the documents.

6. Image Editing

Word's image editing features can often help you transform bad pictures into good ones and good ones into excellent ones. After importing an image or pasting one from the clipboard, you can resize the image, crop it and enhance your picture using a variety of formatting tools.

7. Desktop Publishing

People often use Word's extensive formatting features to create professional newsletters.

3.3.1.2 Spread Sheets Presentation

Q16. What is Spread Sheet ? Explain the uses of spread sheet.

Ans :

A spreadsheet is essentially a matrix of rows and columns. Consider a sheet of paper on which horizontal and vertical lines are drawn to yield a rectangular grid. The grid namely a cell, is the result of the intersection of a row with a column. Such a structure is called a Spreadsheet.

A spreadsheet package contains electronic equivalent of a pen, an eraser and large sheet of paper with vertical and horizontal lines to give rows and columns. The cursor position uniquely shown in dark mode indicates where the pen is currently pointing. We can enter text or numbers at any position on the worksheet. We can enter a formula in a cell where we want to perform a calculation and results are to be displayed. A powerful recalculation facility jumps into action each time we update the cell contents with new data.

MS-Excel is the most powerful spreadsheet package brought by Microsoft. The three main components of this package are

- Electronic spreadsheet
- Database management
- Generation of Charts.

Each workbook provides 3 worksheets with facility to increase the number of sheets. Each sheet provides 256 columns and 65536 rows to work with. Though the spreadsheet packages were originally designed for accountants, they have become popular with almost everyone working with figures. Sales executives, book-keepers, officers, students, research scholars, investors bankers etc, almost any one find some form of application for it.

1. A spreadsheet allows users to enter and calculate numerical data.
2. Using a spreadsheet greatly increases productivity for anyone who needs to manage receipts, create budgets, generate financial reports or even keep track of inventories.
3. A spreadsheet is a useful tool for sorting and analyzing data.
4. Complex calculations can be performed very quickly.
5. Professional looking graphs and charts can be created very quickly from a range of data which allows you to view the data pictorially.

6. Information on charts is updated automatically whenever related data on the worksheet changes.
7. Easy to make changes and corrections to data on the worksheet.
8. Calculation is always accurate, provided that data and formulae entered are correct.
9. Spreadsheet supports a variety of functions used to perform basic calculations based on parameters set by the user.
10. Spreadsheets can be integrated for use with other software programs. One example is a mail merge. A spreadsheet can be created with the names and addresses of various individuals, and a mail merge can be used to fill in text boxes into form letters.
11. Data in spreadsheets can be displayed in a graphic form. Spreadsheets allow the numerical data in the cells to be displayed as a graph or chart.

Q17. What are the application of spread sheets?

Ans :

- **Finance and Accounting :**This is the area of business with the biggest reliance and benefit from Excel spread sheets. Advanced formulas in Excel can turn manual processes that took weeks to complete in the 1980s into something that takes only a few minutes today.
- **Financial Analysis :**Excel can help to do financial analysis, to list customer and sales targets can help you manage your sales force and plan future marketing plans based on past results.
- **Summarize the sales :** Using a pivot table, users can quickly and easily summarize customer and sales data by category with a quick drag-and-drop.
- **Calculating employee wages and salaries :** Excel allows users to discover trends, summarize expenses and hours by pay period, month, or year, and better understand how your workforce is spread out by function or pay level.
- **Maintain employee data :**HR professionals can use Excel to take a giant spread sheet full of employee data and understand exactly where the costs are coming from and how to best plan and control them for the future.
- **Games :** When planning a team outing to a baseball game, you can use Excel to track the RSVP list and costs.
- **Customer Forecast :** Excel creates revenue growth models for new products based on new customer forecasts.
- **Budgeting :** When creating a budget for a small product, you can list expense categories in a spread sheet, update it monthly and create a chart to show how close the product is to budget across each category.
- **Create Lists :**You can create lists, from shopping lists to contact lists, on a spreadsheet. For example, if you entered store items to a spreadsheet along with their corresponding aisles, you could sort by aisle and print before your shopping trip. Your list would provide an aisle-by-aisle overview.

3.3.1.3 Graphics

Q18. What is Graphics Software ? List some features normally supported in graphic software.

Ans :

Graphics packages enable us to use a computer system to create, edit, view, store, retrieve and print designs, drawings, pictures, graphs and anything else that can be drawn in traditional manner.

Features

Today's graphics packages normally support the features described below.

1. Draw Designs

This feature enables users to draw graphics objects, such as lines, circles, rectangles, arcs, etc., to create diagrams and designs. Users need not worry about drawing exact shapes of objects such as straight lines or fully round circles. The system makes the lines, circles, arcs, etc. smooth and properly connected to each other automatically. The system al o allows users to move, copy, delete, rotate, tilt, flip horizontally/vertically, and increase/ decrease the size of objects. With all these features, users can draw complex designs with great ease.

In fact, computer-aided design (CAD) is an area based mainly on this feature of graphics software. Architects and engineers use CAD systems to create architectural drawings, product designs, landscaping plans, and many different types of engineering drawings. CAD systems enable designers to work much faster than they once worked in the era of manual drafting. Hence, with the help of CAD systems, designers can create in few hours, those designs that used to take several days.

2. Paint Drawings and Pictures

This feature enables users to create and modify drawings and pictures in image form. Unlike draw feature that uses vector graphics for composing graphic objects, paint feature uses raster graphics for composing graphic images. In vector graphics, a design is composed of patterns of lines, points, circles, arcs, and other geometric shapes (vectors) that can be represented by few geometric parameters.

For example, a line is represented by recording x and y coordinates of two points, and a circle is represented by recording x and y coordinates of centre and radius of the circle). On the other hand, in raster graphics, an image is composed of patterns of dots called pixels (picture elements.

That is, painting software creates an image by turning individual screen pixels on or off. Because the image is mapped on to the screen based on binary bits, this technique is called bit mapping and an image represented in this manner is called a bit-mapped image.

The number of bits needed to describe a pixel increases with monitor's resolution and number of colors that can be presented. Obviously, vector graphics requires much less storage space than raster graphics for the same drawing. However, raster graphics provides more flexibility and greater degree of creativity in drawing complex shapes and use of colors.

3. Present Graphs

This feature enables users to create graphs and charts from numerical data. The numerical data to be converted into a graph or chart may be imported from different software, such as a spreadsheet or a database. Among the most popular types of graphs and charts used for graphical representation of numerical data are line graphs, bar charts, and pie charts. Line graphs contain one or more lines connecting data points plotted on horizontal and vertical axes. Bar charts use one or more bars on horizontal and vertical axes to show values by the lengths of the bars.

Sometimes, a bar is divided into component parts, and the sum of all the parts equals the total length of the stacked bar. Pie charts use one or more circles divided into sectors to show the component parts of a whole. Presentation graphics software is useful

for analysts and decision makers, because it allows them to gain better understanding of the relationships, changes, and trends that are buried in their numeric data. This helps them in better decision making.

4. Drag-and-drop Objects

This feature enables users to create their overall designs and pictures much faster by allowing them to use ready-made graphic objects or images, supplied with software.

For example, drawing software comes with a set of ready-made shapes like line, rectangle, circle, etc. that a user can use in his/her design as per requirement. A user can select a desired object from a set of given objects, and drag it to the desired position on drawing area, and then drop it there to add it to overall design.

The drag feature also allows a user to change the size or shape of an object suitably to match with overall design. It also enables a user to glue multiple objects together, so that they stay connected and move together if one of them is moved on drawing area.

Similarly, painting software comes with a clip-art library' of stored images. A user can select a desired image from clip-art library, drag it to the desired position on drawing area, and then drop it there to add it to overall picture being created. A user can also change the size, color, texture, etc. of an image to match with overall picture. With this feature, users need not spend time in creating an image that is available in clip-art library.

5. Import Objects

This feature further enables users to create their overall designs and pictures much faster by allowing them to use not only the graphic objects or images supplied with software, but even those that are stored in files created by some other software or means.

For example, a photograph may be scanned, and the scanned image may be imported and included in an overall picture that a user is creating currently. Similarly, a graphics object or image received from someone through electronic mail can be imported in a drawing from the mail file. With this feature, users need not spend time in creating an image or object that can be obtained readily from somewhere else.

6. Screen Capture

This feature enables users to take a snapshot of a screen display and convert it into an image that can be stored in a file and later imported into a document. It is very useful while writing books or manuals that need to include screen images as illustrations. A screen is captured as a bit-mapped image. Once stored in a file, it can be imported into any document whenever required, and even manipulated with a paint program.

3.3.1.4 DBMS Software

Q19. What is Database Management System? Explain the objectives and components of DBMS.

Ans :

A DBMS is a set of software programs that controls the organization, storage, management, and retrieval of data in a database. A database is a repository for related collection of data. For example, an address book can be a database where the names, address and telephone numbers of friends and business contracts are stored. A company database might contain information about customers, vendors, employees, sales and inventory. Each piece of information can be added to a database and extracted later in a meaningful way. DBMS is the program (or collection of programs) that allows users (and other programs) to access and work with a database.

Database Management System is specially designed applications that interact with the user, other applications and Database (DB) itself to capture and analyze the data.

The DBMS helps create an environment in which end user have better access to more and better managed data than they did before the DBMS become the data management standard.

A database management system, therefore, is a combination of hardware and software that can be used to setup and monitor a database, and can manage the updating and retrieval of database that has been stored in it (figure).

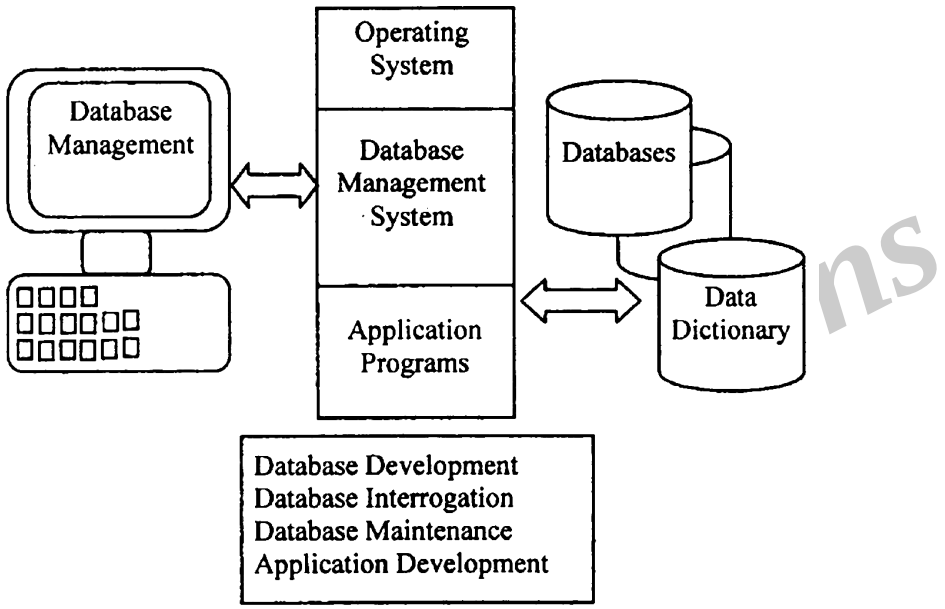


Fig. : DBMS

The DBMS of an organization will in some sense reflect the nature of activities in the organization, some familiarity with the basic concepts, principles and terms used in the field are important.

Objective of Database Management System

1. Shareability

An ability to share data resources is a fundamental objective of DBMS. This means different people and different processes using the same actual data at virtually the same time. The objective of shareability are as below:

(i) Serving different types of users with varying skill levels.

(ii) Handling different user views of the same stored data.

(iii) Combining interrelated data.

(iv) Setting standards.

(v) Controlling concurrent updates so as to maintain data integrity.

(vi) Coordinating restart and recovery operations across multiple users.

2. Availability

It means bringing the data of an organisation to the users of that data. The system which manages data resources should be easily accessible to the people within an organisation - making the data available when and where it is needed, and in the manner and form in which it is needed.

3. Evolvability

It refers to the ability of the DBMS to change in response to growing user needs and advancing technology.

Evolvability is the system characteristic that enhances future available of the resources. Evolvability covers expansion or contraction, both of which may occur as the system to fit the ever changing needs and desires of the using environment.

Evolvability implies the gradual unfolding, development and growth of a system to better meet the needs of the using environment - and it implies change of the system in response to changing needs and technology.

4. Integrity

Database integrity are used for:

(i) Protecting the existence of the database,

(ii) Maintaining the quality of the database, and

(iii) Ensuring the privacy of the database.

Components of DBMS

The major components of DBMS are given below:

1. DML Pre-compiler

It converts DML (Data Manipulation Language) statement embedded in an application program to normal procedure calls in the host language. The pre-compiler must interact with the query processor in order to generate the appropriate code.

2. DDL Interpreter

The DDL (Data Definition Language) interpreter converts the data definition statements into a set of tables. These tables contain information concerning the database and are in a form that can be used by other components of the DBMS.

3. File Manager

File manager manages the allocation of space on disk storage and the data structure used to represent information stored on disk. The file manager can be implemented using an interface to the existing file subsystem provided by the operating system of the host computer or it can include a file subsystem written especially for the DBMS.

4. Database Manager

A database manager is a program module, which provides the interface between the low level data stored in the database and the application programs and queries submitted to the system. It is responsible for interfacing with file system.

5. Query Processor

The query processor is used to interpret the online user's query and convert it into an efficient series of operations in a form capable of being sent to the data manager for execution.

6. Database Administrator (DBA)

Data administration is a high level function that is responsible for overall management of data resources in an organization including maintaining corporate wide data definitions and standards.

7. Data Dictionary

The data dictionary (or data repository) or system catalogue is an important part of the DBMS. It contains data about data (or metadata). It means that it contains the actual

database descriptions used by the DBMS. In most DBMSs, the data dictionary is active and integrated. It means that the DBMS checks the data dictionary every time the database is accessed.

8. Storage Manager

It is responsible for storing, retrieving and updating data in the database.

9. Buffer Manager

The area into which a block from the file is read is termed as a buffer. The management of buffers has the objective of maximizing the performance or the utilization of the secondary storage systems, while at the same time keeping the demand on CPU resources tolerably low. The use of two or more buffers for a file allows the transfer of data to be overlapped with the processing of data.

10. Database Users

One of the most important features of DBMS is that relatively inexperienced users, called end-users, are empowered to retrieve information from the database. The users form the most important component of database management system (DBMS).

Q20. What are the advantages of DBMS ?

Ans :

The database management system has a number of advantages as compared to traditional computer file-based processing approach. The DBA must keep in mind these benefits or capabilities during databases and monitoring the DBMS.

The Main advantages of DBMS are described below :

1. Controlling Data Redundancy

In non-database systems each application program has its own private files. In this case, the duplicated copies of the same data is created in many places. In DBMS, all data of an organization is integrated into a single database file. The data is recorded in only one place in the database and it is not duplicated.

2. Sharing of Data

In DBMS, data can be shared by authorized users of the organization. The database administrator manages the data and gives rights to users to access the data. Many users can be authorized to access the same piece of information simultaneously. The remote users can also share same data. Similarly, the data of same database can be shared between different application programs.

3. Data Consistency

By controlling the data redundancy, the data consistency is obtained. If a data item appears only once, any update to its value has to be performed only once and the updated value is immediately available to all users. If the DBMS has controlled redundancy, the database system enforces consistency.

4. Integration of Data

In Database management system, data in database is stored in tables. A single database contains multiple tables and relationships can be created between tables (or associated data entities). This makes easy to retrieve and update data.

5. Integration Constraints

Integrity constraints or consistency rules can be applied to database so that the correct data can be entered into database. The constraints may be applied to data item within a single record or the may be applied to relationships between records.

6. Data Security

Form is very important object of DBMS. You can create forms very easily and quickly in DBMS. Once a form is created, it can be used

many times and it can be modified very easily. The created forms are also saved along with database and behave like a software component. A form provides very easy way (user-friendly) to enter data into database, edit data and display data from database. The non-technical users can also perform various operations on database through forms without going into technical details of a Database.

7. Report Writers

Most of the DBMSs provide the report writer tools used to create reports. The users can create very easily and quickly. Once a report is created, it can be used may times and it can be modified very easily. The created reports are also saved along with database and behave like a software component.

8. Control Over Concurrency

In a computer file-based system, if two users are allowed to access data simultaneously, it is possible that they will interfere with each other. For example, if both users attempt to perform update operation on the same record, then one may overwrite the values recorded by the other. Most database management systems have sub-systems to control the concurrency so that transactions are always recorded with accuracy.

9. Backup and Recovery Procedures

In a computer file-based system, the user creates the backup of data regularly to protect the valuable data from damage due to failures to the computer system or application program. It is very time consuming method, if amount of data is large. Most of the DBMSs provide the 'backup and recovery' sub-systems that automatically create the backup of data and restore data if required.

10. Data Independence

The separation of data structure of database from the application program that uses the data is called data independence. In DBMS, you can easily change the structure of database without modifying the application program.

Q21. What are the disadvantages of Data Base Management ?

Ans :

The disadvantages of DBMS are given below.

1. High Cost

A significant disadvantage of DBMS is cost. In addition to the cost of purchasing or developing the software, the organisation also purchase or upgrade the hardware and so it becomes a costly system. Also additional cost occurs due to migration of data from one environment of DBMS to another environment.

2. Problems Associated with Centralization

Centralisation also means that data is accessible from a single source. As one know the centralised data can be accessed by each user, so there is no security of data from unauthorised access and data can be damaged or lost.

3. Complexity of Back-Up and Recovery

Back-up and recovery are fairly complex in DBMS environment. As in a DBMS, if one takes a back-up of the data then it may affect the multi-user database system which is in operation. Damaged database can be recovered from the back-up floppy, but iterate duplicacy in loading to the concurrent multi-user database system.

4. Confidentiality, Privacy and Security

When information is centralised and is made available to users from remote locations, the possibilities of abuse are often more than in

a conventional system. To reduce the chances of unauthorised users accessing sensitive information, it is necessary to take technical, administrative and, possibly, legal measures. Most databases store valuable information that must be protected against deliberate trespass and destruction.

5. **Data Quality**

Since the database is accessible to users remotely, adequate controls are needed to control users updating data and to control data quality. With increased number of users accessing data directly, there are enormous opportunities for users to damage the data. Unless there are suitable controls, the data quality may be compromised.

Q22. What are the Applications of DBMS ?

Ans :

DBMS are widely used in different areas because of their numerous advantages. Some of the most common database applications are listed below :

1. **Airlines and Railways :** Airlines and railways use online databases for reservation, and for displaying the schedule information.
2. **Banking :** Banks use databases for customer inquiry, accounts, loans, and other transactions.
3. **Education :** Schools and colleges use databases for course registration, result, and other information.
4. **Telecommunications :** Telecommunication departments use databases to store information about the communication network, telephone numbers, record of calls, for generating monthly bills, etc.
5. **Credit Card Transactions :** Databases are used for keeping track of purchases on credit cards in order to generate monthly statements.
6. **E-Commerce :** Integration of heterogeneous information sources (e.g., catalogues) for business activity such as online shopping, booking of holiday package, consulting a doctor, etc.
7. **Healthcare Information Systems and Electronic Patient Record :** Databases are used for maintaining the patient healthcare details.
8. **Digital Libraries and Digital Publishing :** Databases are used for management and delivery of large bodies of textual and multimedia data.
9. **Finance :** Databases are used for storing information such as sales, purchases of stocks and bonds or data useful for online trading.
10. **Sales :** Databases are used to store product, customer and transaction details.
11. **Human Resources :** Organisations use databases for storing information about their employees, salaries, benefits, taxes, and for generating salary cheques.

Short Question and Answers

1. What is software?

Ans :

Software is a generic term for organized collection of computer data and instructions. It is responsible for controlling, integrating, and managing the hardware components of a computer and to accomplish specific tasks. In other words, software tells the computer what to do and how to do it. For example, software instructs the hardware what to display on the user's screen, what kinds of input to take from the user, and what kinds of output to generate. Thus, software communicates with the hardware by organizing the control sequences, and the hardware carries out the instructions defined by the software.

A computer needs to be instructed to perform any task. These instructions are given in the form of computer programs, which are written in computer programming languages. A program controls the activity of the processor. The moment the hardware (processor, memory, etc.), acts as per the instructions of a program, the program is said to be in running or executing state.

A set of programs, which are specifically written to provide the user a precise functionality like solving a specific problem is termed as a software package. For example, word processing software package provides functionality to the computer so that it can be used to create text documents like letters and mailing lists. Similarly, an image processing software package assists a user in drawing and manipulating graphics.

2. Define system software.

Ans :

System software is the software used for controlling the internal operations of the computer.

The main features of system software are:

- The main job of the system software is to act as an interface between the user and the computer. It makes the operation of a computer system more effective and efficient.
- It controls all the processing activities and make sure that the resources and the power of the computer are used in most efficient manner.
- System software checks the availability of different devices; scan input devices for input and sends output to output devices.
- System software converts the instructions from user understandable language to computer understandable language.

3. Utility programs

Ans :

Utility programs assist users in system maintenance tasks, such as disk formatting, data compression, data backup, and scanning a system for computer viruses. Some frequently used utility programs are:

(i) Disk Formatting Utility

To use a new disk (hard disk, floppy disk, or optical disk) on a computer system, we need to format it according to the requirements of the computer's operating system. Disk formatting utility enables users to perform this task with great ease.

(ii) Data Compression Utility

This utility uses a compression algorithm to transform files into a fraction of their normal size, so that they occupy less storage space on disk, or can be transferred across a network in less time. It has an associated decompression algorithm used to convert a compressed file into its normal form and size when accessed by a user. It helps in significant saving of disk space - it can effectively double the capacity of a disk.

4. 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.

5. 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

(i) It is very difficult to program in machine language. The programmer has to know details of hardware to write program.

(ii) The programmer has to remember a lot of codes to write a program which results in program errors.

(iii) It is difficult to debug the program.

6. 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.

7. The main features of application software

Ans :

- Application software is designed by analyzing the environment and the need of the area of use.
- We cannot interchange the use of two-application softwares with each other.
- We cannot use application software for some other purposes except the permitted one.
- Programmers design application software by using high-level languages like C, C++, Visual Basic and Java etc.
- More interactive and easy to design.
- Easy to use and manipulate.
- The set of programs included in the application software packages are called the application programs and the programmers who develop the application software are called the application software programmers or application software developers.

8. What is Spread Sheet ?

Ans :

A spreadsheet is essentially a matrix of rows and columns. Consider a sheet of paper on which horizontal and vertical lines are drawn to yield a rectangular grid. The grid namely a cell, is the result of the intersection of a row with a column. Such a structure is called a Spreadsheet.

A spreadsheet package contains electronic equivalent of a pen, an eraser and large sheet of paper with vertical and horizontal lines to give rows and columns. The cursor position uniquely shown in dark mode indicates where the pen is currently pointing. We can enter text or numbers at any position on the worksheet. We can enter a formula in a cell where we want to perform a calculation and results are to be displayed. A powerful recalculation facility jumps into action each time we update the cell contents with new data.

MS-Excel is the most powerful spreadsheet package brought by Microsoft. The three main components of this package are

- Electronic spreadsheet
- Database management
- Generation of Charts.

9. What is Database Management System?

Ans :

A DBMS is a set of software programs that controls the organization, storage, management, and retrieval of data in a database. A database is a repository for related collection of data. For example, an address book can be a database where the names, address and telephone numbers of friends and business contracts are stored. A company database might contain information about customers, vendors, employees, sales and inventory. Each piece of information can be added to a database and extracted later in a meaningful way. DBMS is the program (or collection of programs) that allows users (and other programs) to access and work with a database.

Database Management System is specially designed applications that interact with the user, other applications and Database (DB) itself to capture and analyze the data.

10. Components of DBMS

Ans :

(i) DML Pre-compiler

It converts DML (Data Manipulation Language) statement embedded in an application program to normal procedure calls in the host language. The pre-compiler must interact with the query processor in order to generate the appropriate code.

(ii) DDL Interpreter

The DDL (Data Definition Language) interpreter converts the data definition statements into a set of tables. These tables contain information concerning the database and are in a form that can be used by other components of the DBMS.

(iii) File Manager

File manager manages the allocation of space on disk storage and the data structure used to represent information stored on disk. The file manager can be implemented using an interface to the existing file subsystem provided by the operating system of the host computer or it can include a file subsystem written especially for the DBMS.

(iv) Database Manager

A database manager is a program module, which provides the interface between the low level data stored in the database and the application programs and queries submitted to the system. It is responsible for interfacing with file system.

(v) Query Processor

The query processor is used to interpret the online user's query and convert it into an efficient series of operations in a form capable of being sent to the data manager for execution.

(vi) Database Administrator (DBA)

Data administration is a high level function that is responsible for overall management of data resources in an organization including maintaining corporate wide data definitions and standards.

11. Advantages of DBMS

Ans :

(i) Controlling Data Redundancy

In non-database systems each application program has its own private files. In this case, the duplicated copies of the same data is created in many places. In DBMS, all data of an organization is integrated into a single database file. The data is recorded in only one place in the database and it is not duplicated.

(ii) Sharing of Data

In DBMS, data can be shared by authorized users of the organization. The database administrator manages the data and gives rights to users to access the data. Many users can be authorized to access the same piece of information simultaneously. The remote users can also share same data. Similarly, the data of same database can be shared between different application programs.

(iii) Data Consistency

By controlling the data redundancy, the data consistency is obtained. If a data item appears only once, any update to its value has to be performed only once and the updated value is immediately available to all users. If the DBMS has controlled redundancy, the database system enforces consistency.

(iv) Integration of Data

In Database management system, data in database is stored in tables. A single database contains multiple tables and relationships can be created between tables (or associated data entities). This makes easy to retrieve and update data.

(v) Integration Constraints

Integrity constraints or consistency rules can be applied to database so that the correct data can be entered into database. The constraints may be applied to data item within a single record or the may be applied to relationships between records.

Choose the Correct Answer

1. Software is a set of : [c]
   (a) Instructions (b) Software
   (c) Programs (d) Bytes

3. The personal who deals with the computer and its management put together are called : [d]
   (a) Software (d) Hardware
   (c) Firmware (d) Humanware

4. Software is _____ component of the computer system. [a]
   (a) intangible (b) tangible
   (c) physical (d) virtual

6. Software can be purchased or obtained as : [b]
   (a) Shareware (b) Freeware
   (c) Liteware (d) All of these

7. Software that comes with some application software or with system software is called as : [a]
   (a) Utility software (b) Application software
   (c) System software (d) Language translator

9. Which of the following is a hardware component ? [d]
   (a) Program (b) Virus
   (c) Antivirus (d) Printer

10. Computer professionals working in a computer centre are called : [d]
    (a) Hardware (b) Software
    (c) Firmwarw (d) Humanware

7. A DBMS provides users with the conceptual representation of : [b]
   (a) Register (b) Data
   (c) Logical view (d) Physical view

8. The overall description of a database is called _____. [d]
   (a) Data definition (b) Data manipulation
   (c) Data integrity (d) Database schema

9. Column header is referring as : [c]
   (a) Table (b) Relation
   (c) Attributes (d) Domain

Fill in the blanks

1. _____ is a generic term for organized collection of computer data and instructions.
2. GUI stands for _____.
3. First generation computers relied on _____ language.
4. _____ is designed by analyzing the environment and the need of the area of use.
5. The term _____ describes use of hardware and software to create, edit, view, format, store, retrieve, and print documents.
6. A _____ is essentially a matrix of rows and columns.
7. _____ enable us to use a computer system to create, edit, view, store, retrieve and print designs, drawings, pictures, graphs.
8. DBMS stands for _____.
9. DBA stands for _____.
10. Collection of raw facts is called _____.

ANSWERS

1. Software
2. Graphical Uses Interface
3. machine
4. Application software
5. word-processing
6. spreadsheet
7. Graphics packages
8. Database Management System
9. Database Administrator
10. Data

UNIT IV

OPERATING SYSTEM :

Functions, Measuring System Performance, Assemblers, Compilers and Interpreters. Batch Processing, Multiprogramming, Multi Tasking, Multiprocessing, Time Sharing, DOS, Windows, Unix/Linux.

4.1 OPERATING SYSTEM

Q1. What is Operating System ?

Ans : **(Aug.-21, Dec.-19, Dec.-19 MGU, Imp.)**

The operating system is an important component of the computer system. It can be defined as a set of programs that control how the system works. It is the most important program that runs on a computer. It is considered the backbone of a computer, managing both software and hardware resources. All computers must have an operating system used for starting the computer and to run other programs. It provides an interface between the users and the hardware of a computer system.

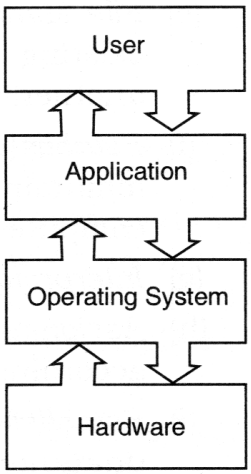


Fig. : (Operating System)

Operating systems perform basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk, and controlling peripheral devices such as disk drives and printers.

For large systems, the operating system has even greater responsibilities and powers. It is responsible for security, ensuring that unauthorized users do not access the system. The operating system is loaded automatically into the computer whenever we start the computer. More than one type of operating systems can also be installed on one computer but at one time only one operating system will be functional.

Once the operating system has started up, it manages all of the software and hardware on the computer. Most of the time, there are many different programs running at the same time, and they all need to access your computer's central processing unit (CPU), memory, and storage. The operating system coordinates all of this to make sure that each program gets what it needs. Without the operating system, the software wouldn't even be able to talk to the hardware, and the computer would be useless.

It also allows you to communicate with the computer without knowing how to speak the computer's language. The most popular operating systems are DOS, OS/2, UNIX, Windows 98, Windows XP, Windows Vista, Windows 7, Window 8 and Linux.

Q2. What are the objectives of Operating System ?

Ans :

1. Make a computer system easier to use

An operating system hides details of hardware resources from programmers and other users and provides them with a convenient interface for using a computer system. It acts as an intermediary between the hardware and its users, providing a high-level interface to low-level hardware resources, and making it easier for programmers and other users to use those resources.

It Shows the logical architecture of a computer system. As shown, hardware resources are surrounded by operating system layer that, in turn, is surrounded by a layer of other system software (such as compilers, editors, utilities, etc.) and a set of application programs (such as commercial data processing applications, scientific and engineering applications, entertainment and educational applications, etc.). Finally, end users view the computer system in terms of the user interfaces of the application programs.

2. Manage the resources of a computer system

An operating system manages all the resources of a computer system. This involves performing such tasks as keeping track of who is using what resources, granting resource requests, accounting for resource usage, and mediating conflicting requests from different programs and users. Efficient and fair sharing of system resources among users and / or programs is a key goal of all operating systems.

4.1.1 Functions of Operating System

Q3. What are the functions of Operating System ?

Ans : **(Aug.-21, Dec.-19 MGU, Imp.)**

Most operating systems perform the functions given below. A separate module of operating system software performs each of these functions:

1. Process Management

Process management module takes care of creation and deletion of processes, scheduling of system resources to different processes requesting them, and providing mechanisms for synchronization and communication among processes.

2. Memory Management

Memory management module takes care of allocation and de-allocation of memory space to programs in need of this resource.

3. File Management

File management module takes care of file-related activities such as organization, storage, retrieval, naming, sharing, and protection of files.

4. Security

Security module protects the resources and information of a computer system against destruction and unauthorized access.

5. Command Interpretation

Command interpretation module takes care of interpreting user commands, and directing system resources to process the commands. With this mode of interaction with a system, users are not much concerned about hardware details of the system.

4.2 MEASURING SYSTEM PERFORMANCE

Q4. What parameters are used normally to measure the performance of a computer system?

Ans :

1. Throughput

Through put is the amount of work that a system is able to do per unit time. It is measured as the number of jobs (processes) completed by the system per unit time.

For example, if a system is able to complete *n* processes in *t* seconds, its throughput is n/t processes per second during that interval. Throughput is measured normally in processes/hour. Note that the throughput of a system does not depend on its jobs processing efficiency only, but also on the nature of jobs processed. For long processes, throughput of a system may be one process/hour; whereas for short processes, it may be 100 processes/hour for the same system.

2. Turnaround time

From the point of view of an individual user, an important criterion is how long it takes a system to complete a job submitted by him/her. Turnaround time is the interval between the time of submission of a job to the system for processing to the time of completion of the job.

Although, higher throughput is desirable from the point of view of overall system performance, individual users are more interested in better turnaround time for their jobs.

3. Response time

Turnaround time is not a suitable measure for interactive systems because in such a system a process can produce some output early during its execution and can continue executing while previous results are being output to the user. Hence, another measure used in case of interactive systems is response time. It is the interval between the time of submission of a job to the system for processing to the time of the system producing the first response for the job.

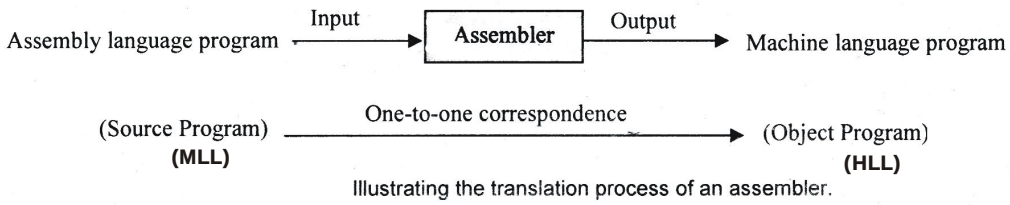
4.3 Assemblers, Compilers and Interpreters

Q5. What is an Assembler ?

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

Computer can directly execute only machine language programs that use numbers for representing instructions and storage locations. Hence, an assembly language program must be converted (translated) into its equivalent machine language program before it can be executed on the computer. This translation is done with the help of a translator program m called assembler. Assembler is system software supplied by computer manufacturers. It translates an assembly language program into its equivalent machine language program. It is so called because in addition to translating, it also "assembles" the machine language program in main memory of the computer, and makes it ready for execution.

The process of translating an assembly language program into its equivalent machine language program by using an assembler. As the figure shows, input to the assembler is the assembly language program (often referred to as source program), and its output is the machine language program (often referred to as object program). Since the assembler translates each assembly language instruction into an equivalent machine language instruction, there is a one-to-one correspondence between the assembly language instructions of a source program and the machine language instructions of its equivalent object program. Note that during the process of translation of a source program into its equivalent object program by the assembler, the source program is not under execution. It is only converted into a form that can be executed by the computer.



Illustrating the translation process of an assembler.

Notice that in case of an assembly language program, the computer has to run the assembler (program) first to translate the original assembly language program (source program) into its equivalent machine language program (object program), and then execute the object program to get the result. This means that the computer has to spend more time in getting the desired result from an assembly language program as compared to a machine language program.

However, assembly language programming saves so much time and effort of a programmer that the extra time and effort spent by the computer is worth it. This conversion time is one-time and very small in case of stored-program computers where once the object code is obtained; it can be executed as many times as desired.

Q6. What is a Compiler ? Why it is required ?

Ans :

A computer can execute only machine language programs directly. Hence, a high-level language program must be converted (translated) into its equivalent machine language program before it can be executed on a computer. This translation is done with the help of a translator program called compiler.

Hence, a compiler is a translator program (much more sophisticated than an assembler is) that translates a high-level language program into its equivalent machine language program. A compiler is so called because it compiles a set of machine language instructions for every program instruction of a high-level language.

The process of translating a high-level language program into its equivalent machine language program using a compiler. As the figure shows, input to the compiler is the high-level language program (often referred to as source program), and its output is the machine language program (often referred to as object program). Since high-level language instructions are macro instructions, the compiler translates each high-level language instruction into a set of machine language instructions rather than a single machine language instruction. Hence, there is a one-to-many correspondence between the high-level language instructions of a source program and the machine language instructions of its equivalent object program. Note that during the process of translation of a source program into its equivalent object program by the compiler, the source program is not under execution. It is only converted into a form that can be executed by the computer.

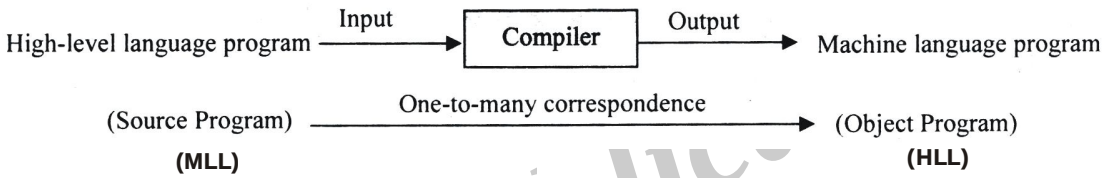


Fig. : Illustrating the translation process of a compiler.

A compiler can translate only those source programs that have been written in the language for which the compiler is meant.

Q7. Define Interpreters

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

Interpreter is another type of translator used to translate a high-level language program into its equivalent machine language program. It takes one statement of the high-level language program, translates it into machine language instructions, and then executes the resulting machine language instructions immediately. That is, in case of an interpreter, the translation, and execution processes alternate for each statement encountered in the high level language program. This differs from a compiler that merely translates the entire source program into an object program, and is not involved in its execution. The input to an interpreter is a source program, but unlike a compiler, its output is the result of program execution instead of an object program.

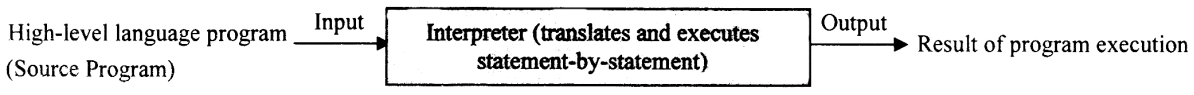


Fig. : Illustrating the role of an interpreter.

After compilation of a source program, the resulting object program is saved permanently for future use, and is used every time the program is to be executed. Hence, repeated compilation (translation of the source code) is not necessary for repeated execution of a program. However, in case of an interpreter,

since no object program is saved for future use, repeated interpretation (translation plus execution) of a program is necessary for its repeated execution. Since an interpreter translates and executes a high-level language program statement-by-statement, a program statement must be reinterpreted (translated and executed) every time it is encountered during program execution. For example, during the execution of a program, instructions in a loop are reinterpreted every time the loop is executed.

As compared to compilers, interpreters are easier to write because they are less complex programs than compilers. They also require less memory space for execution than compilers require.

The main advantage of interpreters over compilers is that a syntax error in a program statement is detected and Brought to the attention of the programmer as soon as the program statement is interpreted. This allows the programmer to make corrections during interactive program development. Therefore, interpreters make it easier and faster to correct programs.

Q8. What are the differences between compiler and interpreter ?

Ans :

S.No.	Complier	Interpreter
i.	Complier is a kind of language translator which translates the program written in a high- level language into machine language into machine language and vice - versa in a single step.	Interpreter is a kind of language translator, which translates the program written in a high-level language into machine language and vice - versa line - by - line, while the program is running.
ii.	The execution of program is faster in compiler than interpreter as in compiler the entire code is executed in a single go.	The execution of program is slower in interpreter than compiler as in interpreter the code is executed line by line.
iii.	Compiler generates an error report after the translation of entire code.	In case of interpreter, once an error is encountered it is notified and no further code is scanned.
iv.	C, C++ are compiled languages.	Visual Basic is an interpreted language.
v.	Memory requirement is more.	Memory requirement is less.
vi.	Program need not be compiled every time.	Every time a higher - level program is converted into lower - level program.

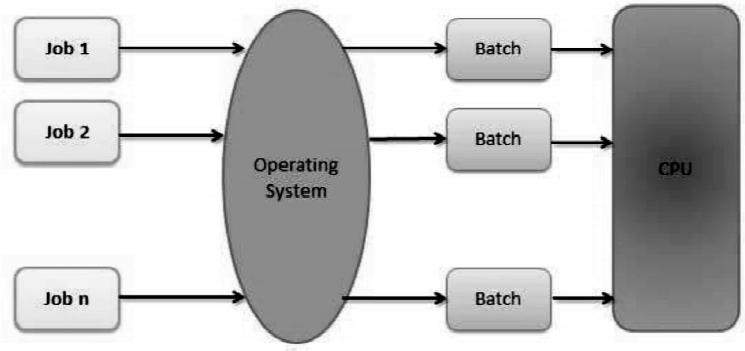
4.4 BATCH PROCESSING

Q9. What do you understand by batch processing ? Explain advantages and disadvantages of batch processing ?

Ans : **(Dec.-19, Imp.)**

Batch processing is a technique in which an Operating System collects the programs and data together in a batch before processing starts. An operating system does the following activities related to batch processing.

- The OS defines a job which has predefined sequence of commands, programs and data as a single unit.
- The OS keeps a number a jobs in memory and executes them without any manual information.
- Jobs are processed in the order of submission, i.e., first come first served fashion.
- When a job completes its execution, its memory is released and the output for the job gets copied into an output spool for later printing or processing.



Advantagest :

- It allows sharing of computer resources among many users and programs,
- It shifts the time of job processing to when the computing resources are less busy,
- It avoids idling the computing resources with minute-by-minute human interaction and supervision,
- By keeping high overall rate of utilization, it better amortizes the cost of a computer, especially an expensive one.

Disadvantages :

- Difficult to debug program.
- A job could enter an infinite loop.
- Due to lack of protection scheme, one batch job can affect pending jobs.

Common Batch Processing Usage

- **Printing** – A popular computerized batch processing procedure is printing. This normally involves the operator selecting the documents they need printed and indicating to the batch printing software when, where they should be output and priority of the print job. Then the job is sent to the print queue from where printing daemon sends them to the printer.
- **Databases** – Batch processing is also used for efficient bulk database updates and automated transaction processing, as contrasted to interactive online transaction processing (OLTP) applications.
- **Converting** – Batch processing is also used for converting a number of computer files from one format to another. This is to make files portable and versatile especially for proprietary and legacy files where viewers are not easy to come by.

4.5 Types of Operating System

Q10. Explain various types of operating systems.

Ans : **(Dec.-19, Dec.-19 MGU, Dec.-19 KU, Imp.)**

Various operating systems have evolved depending on the requirement and the cost bearing capacity of the users.

Following list depicts different types of operating systems:

1. Single user Operating system
2. Multi-user Operating system
3. Single tasking Operating system
4. Multi-tasking Operating system
5. Multi-programming Operating system
6. Single processing Operating system
7. Multi-processing Operating system
8. Multi-threading Operating system
9. Time sharing Operating system
10. Network Operating system
11. Real time Operating system
12. Distributed Operating system
13. Online Operating system
14. Batch processing Operating system

A brief description of these operating systems is as follows:

1. Single user Operating system

A single user operating system is a type of operating system that is developed and intended for use on a computer that will only have a single user at any given time, i.e. only one person can use the machine at a time and operating system is available to the single user at a time.

2. Multi-user Operating system

- A multi-user operating system is a type of operating system that allows multiple users on different computers or terminals to access a single system with one operating system on it.
- It allows two or more users to run programs at the same time. Some operating systems permit hundreds or even thousands of concurrent users.
- Such operating system is made for machines which are more commonly called sharable machines, i.e. data from one machine can be shared by other users at other machines.

- This operating system is more complex in nature, bigger in size and more costly as compared to single user operating system.
- Some multi-user operating systems are: Windows-2000, Windows-NT and Windows 2003.

3. Single tasking Operating system

- Single tasking operating systems are those operating systems that can process one application at one time.
- The user can only work on one application at a time; i.e. user can't start another application till the processing of one application has been finished by the operating system.
- An example of single tasking operating system is MSDOS (Microsoft Disk Operating System).

4. Multi-tasking Operating system

- A multi-tasking operating system is a type of operating system that is capable of running more than one application at a time. For example, at some time you might be downloading some thing from internet, as well as you are writing mail to your friend and listening music also.
- Multi-user operating systems also have the property of multitasking. It improves the overall efficiency of the computer.
- Today, most desktop, laptop, and notebook (mini laptop) operating systems function with some type of multitasking operating system. Even equipment such as Automatic Teller Machines or ATMs still make use of some type of multitasking system, using a series of programs to check balances and execute the requests made by users.
- Some multitasking operating systems are: Windows-2000, Windows-XP, Windows-Vista and Windows-NT.

5. Multi-programming Operating system

- Multi-programming refers to execution of two or more different and independent programs by the same computer.
- In this two or more program resides in main memory (RAM) and are executed concurrently. This is done by switching the CPU from one program to another almost instantaneously.
- Since there is only one processor, there can be no true simultaneous execution of different programs. Instead, the operating system executes part of one program, then part of another, and so on. To the user it appears that all programs are executing at the same time.
- Some multi-programming operating systems are: Windows-2000, Windows-XP, Windows-Vista and Windows-NT.

6. Single processing Operating system / Uni-processor Operating system

- Single processing operating systems are designed to work with one processor / CPU.
- Desktop computers and laptops are generally uni-processor systems.

- These systems can manage the processing needs of a home or a small organization, but they are not suitable for high level designing and complex calculations.
- Some single processing operating systems are: Windows 98, Windows-ME etc.

7. Multi-processing Operating system

- A multi-processing operating system allows a program to run on more than one central processing unit (CPU) at a time.
- If one of the CPU breaks down, the other CPU will automatically takes over its job. This is also called parallel processing.
- By allowing parallel processing of segments of program, it improves performance of computer systems.
- Some multiprocessing operating systems are: Windows-2000, UNIX and Linux.

8. Multi-threading Operating system

- A multi-threading operating system allows different parts of a single program (threads) to run concurrently.
- These threads will be alternately active, on standby, suspended or destroyed, according to the priority assigned to them or may be run simultaneously.
- Some multithreading operating systems are: Windows-2000, UNIX and Linux.

9. Time sharing Operating system

- Time sharing is a technique of allocation of computer resources in a time dependent fashion to several programs simultaneously.
- It helps to provide a large number of users direct access to the main computer.
- In timesharing, the CPU is divided among different users on a scheduled basis. Therefore, each user is given a brief share of the CPU time unlike multi-programming, where CPU is allocated to programs on priority basis.
- This very brief share of CPU time is called the time slice or time slot or quantum, which may vary from 10 milliseconds to 20 milliseconds. Each program gets predetermined “time slice”.
- At end of time slice, current program is set aside and a new one starts. By rapidly shuffling programs, illusion of several programs executing simultaneously is created.
- The timesharing operating system keeps only a few programs in the main memory and rest are stored in the disk storage. The program remains in hard disk until it is not active and when CPU time is allocated to it the program is brought to the main memory.

- This operation of transferring programs from disk storage to main memory and back is known as swapping.
- Some time sharing operating systems are: Windows-2000, Windows 2003, UNIX and Linux.

10. Network Operating system

- Networking operating system (NOS) is the software that runs on a computer, which acts as a server.
- NOS provide the capabilities required for network operations. It enables the server to manage data, users, groups, security, applications, and other networking functions.
- NOS are based on a client/server architecture in which a server enables multiple clients to share data and resources.
- It allows remote users to connect to a network.
- It monitors the status and functionality of network elements.
- The most popular network operating systems are Microsoft Windows Server 2003, Microsoft Windows Server 2008, UNIX, Linux and Novell NetWare.

11. Real Time Operating system

- A Real Time operating system is an operating system that has been developed for real-time applications.
- It responds to input instantly.
- Real time operating systems are designed to handle events as they occur.
- Real-time operating systems are commonly found and used in Robotics.
- General-purpose operating systems, such as DOS and UNIX, are not real-time because they can take a few seconds, or even minutes, to react. "Lynx" is an example of a real time operating system.

12. Distributed Operating system

- The development of networked computers that can be linked and communicate with each other, gave rise to distributed computing.
- A distributed operating system manages a group of independent computers and makes them appear to be a single computer.
- Distributed computations are carried out on more than one computer.
- A distributed system may have more total computing power than a mainframe.

- It allows many users access to a common data base.
- It makes human-to-human communication easier. For example, by E- mail.
- It splits the workload over the available machines in the most cost effective manner.

13. Online processing Operating system

- In online processing operating system, the processing is performed under the direct control of the CPU while at the same time the user remains in communication with the computer.
- Time sharing is an example of online processing. As there is direct contact with the CPU, so access and retrieval of record are quick and direct.
- The systems which employ online processing need high capacity memory, so that user data, operating system elements and programs can be store and accessed quickly. Moreover, as simultaneous access is there so proper security provisions are necessary to prevent any unauthorized access.

14. Batch processing Operating system

- In earlier computers, the users didn't interact directly with the system, instead, a user prepared a job, which consisted of program, data, and some control information about the nature of the job and submit it to the computer operator.
- The operating system of such a computer had the function to transfer the control from one job to another.
- Batch processing operating systems are ideal in situations where:
  - There are large amounts of data to be processed.
  - Similar data needs to be processed
  - Similar processing is involved when executing the data.
- Batch processing is also known as serial, sequential, off line, or stacked job processing. It is the most appropriate method of processing for many types of applications such as payroll or preparation of customer statements where it is not necessary to update information (records) on daily basis.

4.5.1 Multi Programming

Q11. Define Multi Programming. Explain how multi programming ensures effective utilization of Main Memory and CPU ?

Ans :

In both manual loading and batch processing, jobs are loaded into a system and processed one at a time. Once loaded, a job remains in main memory until its execution is over, and next job is loaded only after the completion of the current job. It shows that in such a situation, the currently loaded job that is being executed is the sole occupant of user's area of main memory (operating system resides in a separate part of main memory) and has CPU exclusively available for itself. Is an illustration of uniprogramming system model in which only one job is processed at a time and all system resources are available exclusively for the job until its completion.

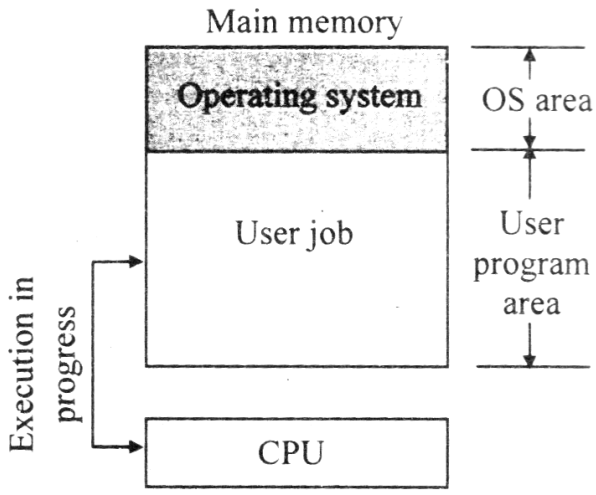


Fig. Uniprogramming system model. Only one job is processed at a time and all system resources are available exclusively for the job until its completion.

A job does not need CPU for entire duration of its processing because in addition to computing (for which CPU is needed), it often needs to perform I/O operations (such as reading/writing of data from/to tape/disk, waiting for data input from keyboard/mouse, and printing of results) during the course of its processing. In fact, depending on CPU utilization during the course of processing, jobs are broadly classified into two types:

1. CPU-bound jobs

These jobs mostly perform computations with little I/O operations. Hence, their CPU utilization is very high. Programs used for scientific and engineering computations usually fall in this category of jobs.

2. I/O-bound jobs

These jobs mostly perform I/O operations with little computation. Hence, their CPU utilization is very low. Programs used for commercial data processing applications usually fall in this category of jobs.

In a uniprogramming system, CPU is idle whenever the job being currently processed performs I/O operations. CPU idle time may not be significant for CPU-bound jobs, but it may be of the order of 80-90% for I/O-bound jobs. Moreover, since I/O devices are slower than CPU by 20 to 100 times, CPU idle time is significant even for CPU-bound jobs. The concept of multiprogramming was introduced to minimize the idle time of CPU. It is based on the idea of organizing multiple jobs in a system so that its CPU always has something to execute. How this is done is explained below.

Multiprogramming is interleaved execution of two or more different and independent programs by a computer has already introduced the notion of two programs (operating system and user program) resident simultaneously in main memory of a computer. This concept is carried a step further in multiprogramming by enabling two or more user programs to reside simultaneously in main memory and

carrying out their interleaved execution. With multiple user programs residing simultaneously in the user program area of main memory, whenever a user program that was executing (using CPU) goes to perform I/O operations, CPU is allocated to another user program in main memory that is ready to use CPU, instead of allowing CPU to remain idle. CPU switches from one program to another almost instantaneously. Hence, in multiprogramming, several user programs share CPU time to keep it busy.

Note that multiprogramming does not mean execution of instructions from several programs simultaneously. Rather, it means that multiple programs are available to CPU (stored in main memory) and a portion of one is executed, then a portion of another, and so on. As a CPU can execute only one instruction at a time, only one of the programs residing in main memory uses the CPU for executing its instructions at any instance of time. Simultaneous execution of more than one program with a single CPU is impossible. In some multiprogramming systems, only a fixed number of jobs can be processed concurrently (multiprogramming with fixed tasks - MFT), while in others the number of jobs can vary (multiprogramming with variable tasks - MVT).

Shows a typical scenario of jobs in a multiprogramming system. At the time instance shown, there are three user jobs (A, B and C) residing in memory out of which job A is performing I/O operation (writing to disk), job B is executing (utilizing CPU time), and job C is waiting for CPU to become free. Actually, as shown in Figure , in case of multiprogramming, all jobs residing in main memory are in one of the following three states:

1. Running (it is using CPU)
2. Blocked (it is performing I/O operations)
3. Ready (it is waiting for CPU to be assigned to it)

In jobs A, B, and C are in blocked, running, and ready states, respectively. As soon as job B relinquishes CPU (its execution is over or it needs to perform some I/O operation), the CPU is given to job C (because it is in ready state) and it starts executing. Meanwhile, if job A completes output operation, its state converts from blocked to ready. Hence, in multiprogramming, CPU is never idle as long as there is always some job to execute. Note that although many jobs may be in ready and blocked states, only one job can be running at any instant, because only one CPU is present.

The area occupied by each job residing simultaneously in main memory is known as a memory partition. The actual number of partitions, and hence jobs, allowed in main memory at any given time depends on operating system. Moreover, jobs awaiting entry into main memory are queued on a fast secondary storage device such as agnetic disk. A job from this queue is loaded into main memory whenever a memory partition becomes free (the job cupying that partition completes its execution).

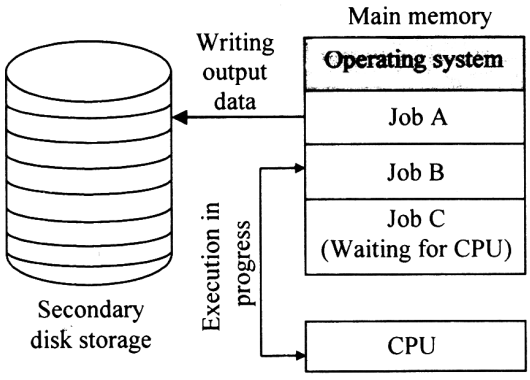


Fig. A typical scenario of jobs in a multiprogramming system

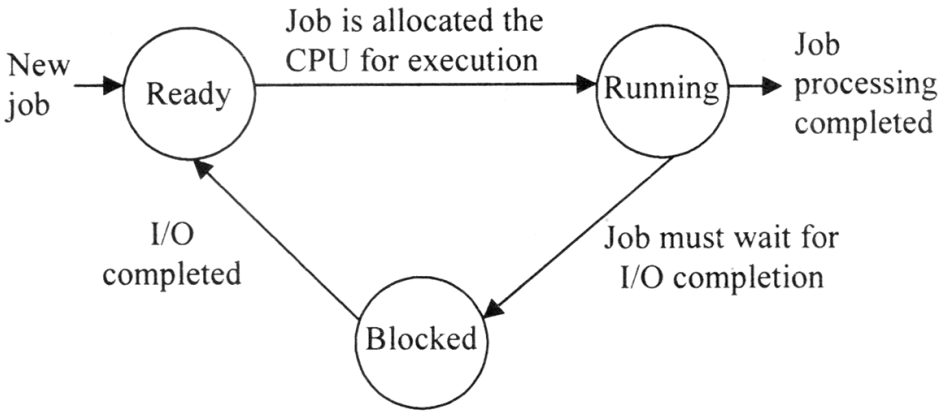


Fig. Three different states of jobs in main memory in a multiprogramming system

Q12. List some hardware and software requirements for a multi programming system to work satisfactor.

Ans :

Multiprogramming systems have better throughput than uniprogramming systems because CPU idle time is reduced drastically. However, they are more sophisticated because they require following additional hardware and software features:

1. Large memory

Multiprogramming requires large main memory to accommodate a good number of user programs along with operating system.

2. Memory protection

Multiprogramming requires a memory protection mechanism to prevent a job (in one memory partition) from changing another job's program/data (in another memory partition). A combination of hardware and software protection mechanism is used for this. It prevents one job from addressing beyond the limits of its own allocated memory area.

3. Job status preservation

In multiprogramming, when a running job is blocked for I/O processing, CPU is taken away from it and given to another job that is ready for execution. The blocked job resumes its execution sometime later. However, this requires preserving the job's complete status information when CPU is taken away from it and restoring this information back before CPU is given to it again. To enable this, operating system maintains a process control block (PCB) for each loaded process. shows a typical process control block. With this arrangement, before taking away CPU from a running process, its status is preserved in its PCB. The status is restored back before the process resumes execution when CPU is given to it again later. Hence, the process can continue execution without any problem.

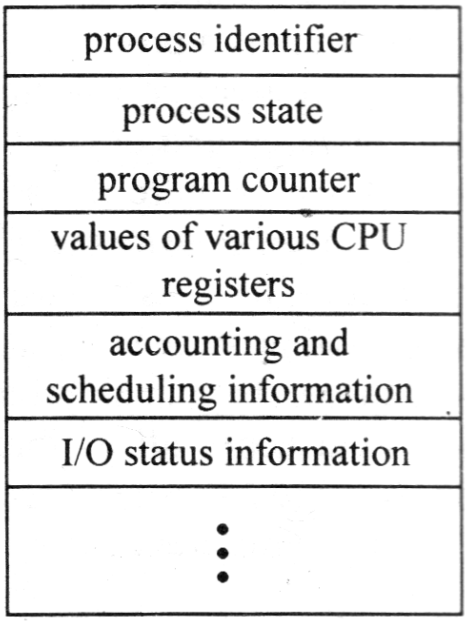


Fig. A typical process control block (PCB).

4. Proper job mix

A proper mix of I/O-bound and CPU-bound jobs is required to overlap the operations of CPU and I/O devices effectively. If all loaded jobs need I/O at the same time, CPU will again be idle. Hence, jobs resident simultaneously in main memory should contain a.good mix of CPU-bound and I/O-bound jobs so that at least one job is always ready to utilize CPU.

5. CPU scheduling

In a multiprogramming system, often often there are multiple jobs in ready state (waiting for CPU to be allocated). Hence, when CPU becomes free, operating system must decide which of these ready should be allocated to CPU for execution. Part of the operating system that takes this decision is called CPU scheduler, and the algorithm it uses for this is called CPU scheduling algorithm.

Q13. What are the advantages and disadvantages of multi-programming operating system ?

Ans :

Advantages:

- It increases the overall performance of the system.
- It increases the overall productivity of the system.

Disadvantages:

- It requires a lot of memory to execute several programs simultaneously.
- Special mechanism is required to prevent interference among processes.

4.5.2 Multi Tasking

Q14. What is Multi - Tasking Operating System ?

Ans : **(Aug.-21, Imp.)**

Tehnically speaking, multitasking is same as multiprogramming. The term multiprogramming for multi-user systems (systems that are used simultaneously by many users such as mainframe and server class systems), and multitasking for single-user systems (systems that are used by only one user at a time such as a personal computer or a notebook computer). Note that even in a single-user system, it is not necessary that the system processes only one job at a time. In fact, a user of a single-user system often has multiple tasks being processed by the system.

For example, while editing a file in foreground, a sorting job can be given in background. Similarly, while compilation of a program is in progress in background, user may be reading his/her electronic mails in foreground. In this manner, a user may work concurrently on many tasks. In such a situation, status of each of the tasks is viewed on computer's screen normally by partitioning the screen into multiple windows. Progress of different tasks is viewed on different windows in a multitasking system.

Q15. What are the advantages and disadvantages of multitaksing operating system ?

Ans :

Advantages:

- It increases CPU utilization.
- It decreases total read time needed to execute a job.
- It increases overall throughput of a computer.

Disadvantages:

- It is relatively more complicated.
- It requires CPU scheduling.
- Proper memory management is required.
- It requires tracking of all kinds of jobs running concurrently.

4.5.3 Multi Processing

Q16. What is multi - processing ? What are the advantages and disadvantages of multi processing ?

Ans : **(Aug.-21, Imp.)**

Multiprocessing systems have two or more CPUs, which have the ability to execute two or more jobs simultaneously. Instructions from several and independent programs are carried out by different CPUs at the same time. Multiprocessing systems can be designed in limitless number of ways. In some systems several small CPUs are interlinked to perform the major processing.

If one of the CPUs fail, another takes over and carries on wit the processing. In some others a network is formed by interconnecting the CPUs and small CPUs, called front-end processors, are used for I/O operations, scheduling and controlling of jobs, etc. In yet other system, each CPU performs only specific type of applications.

Multiprogramming is similar to time sharing environment in which different applications share a single CPU. In time sharing, like multiprogramming, the CPU is not dedicated to a single user. The CPU switched between users so fast that the users do not feel that the CPU is switching between users. The multiple users can run multiple applications on a single CPU computer simultaneously. Multiprocessing systems have several CPUs.

Advantages

1. High reliability of the system is ensured by the provision of automatic takeover of complete work by other CPUs in case of breakdown of one of the CPUs.
2. Parallel processing improves systems efficiency by increasing throughput and lowering turnaround time of the system.
3. It also results in more efficient use of hardware resources other than the CPU.

Disadvantages

1. Large memory is required for multiprocessing as it requires many programs and data to reside in memory at any time.
2. The system needs a highly sophisticated operating system and highly skilled computer professionals to design it.
3. The multiprocessing systems are very expensive. It requires not only high initial outlay but also high operation and maintenance expenses are to be incurred.

Q17. How is Multi processing different from Multi programing ?

Ans :

Multiprocessing is the simultaneous execution of two or more processes by a computer system having more than one CPU. Comparatively, multiprogramming is the interleaved execution of two or more processes by a single CPU system. Hence, while multiprogramming involves execution of a portion of one program, then a portion of another, etc., in brief consecutive periods, multiprocessing involves simultaneous execution of several program segments of the same or different programs.

4.5.4 Time Sharing

Q18. Define Time Sharing ? What are the requirements of Time Sharing System ?

Ans :

Time - sharing is a mechanism to provide simultaneous interactive use of a computer by many users in such a way that each one feels that he/she is the sole user of the system. It uses multiprogramming with a special CPU scheduling algorithm to achieve this.

A time - sharing system has many (even hundred of) user terminals connected to the same computer simultaneously.

Using these terminals, multiple users can work on the system simultaneously. Multiprogramming feature allows multiple user programs to reside simultaneously in main memory, and special CPU scheduling algorithm allocates a short period of CPU time one-by-one to each user process (from the first one to the last one, and then again beginning from the first one). The short period during which a user process gets to use CPU is known as time slice, time slot, or quantum, and is typically of the order of 10 to 100 milliseconds. Hence, when CPU is allocated to a user process, it uses the CPU until the allotted time slice expires (system's clock sends an interrupt signal to CPU after every time slice), or it needs to perform some I/O operation, or it completes its execution during this period. Notice that CPU is taken away from a running process when the allotted time slice expires.

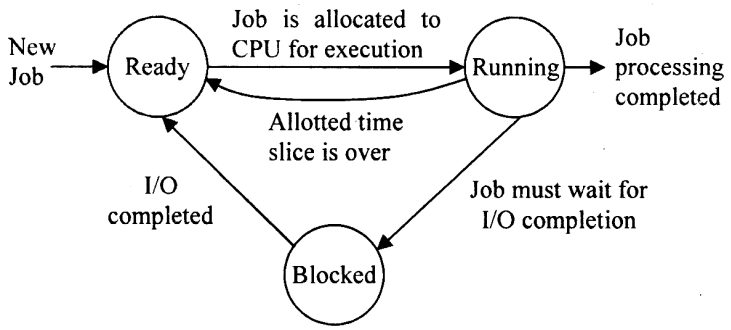


Figure : Process state diagram for a time-sharing system.

Now let us see how the CPU scheduling algorithm, mentioned above, gives an impression to each user that he/she is the sole user of the system. Let the time slice be 10 milliseconds and the processing speed of the system's CPU be 500 million instructions per second. Hence, the system executes $500 \times 10^6 \times 10^{-3} \times 10 = 5 \times 10^6 = 5$ million instructions in 10 milliseconds. This is large enough for substantial progress of a single user process. Let there be 100 user terminals and 100 simultaneous users using the system. If 10 milliseconds is allocated to each user process one-by-one, a user will get CPU's attention once in every 100 x 10 milliseconds = 1 second. As human reaction time is of the order of a few seconds, a user will not notice any delay in execution of his/her commands and will normally feel that he/she is the sole user of the system, whereas actually a single computer is shared among many users.

Requirements of Time -sharing Systems

Time-sharing systems require following additional hardware and software :

1. A number of terminals connected to a system simultaneously, so that multiple users can use the system simultaneously in interactive mode.
2. Relatively large memory to support multiprogramming.
3. Memory protection mechanism to prevent a job's instructions and data from other jobs in a multiprogramming environment.
4. Job status preservation mechanism to preserve a job's status information when CPU is taken away from it, and restoring this information back, before CPU is given to it again.

5. A special CPU scheduling algorithm that allocates CPU for a short period one-by-one to each user process in a circular fashion.

6. An alarm clock mechanism to send an interrupt signal to CPU after every time slice.)

Q19. What are the advantages of time sharing systems ?

Ans :

Advantages of Time-sharing Systems

Although time-sharing systems are complex to design, they provide the following advantages to their users:

1. Reduces CPU idle time

A user's thinking and typing speed is much slower than a computer's processing speed. Hence, during interactive usage of a system, while a user is engaged in thinking or typing his/her input, a time-sharing system services many other users. Hence, time-sharing systems help in reducing CPU idle time and, in turn, provide increased system throughput.

2. Provides advantages of quick response time

The special CPU scheduling algorithm used in time-sharing systems ensures quick response time to all users. This feature helps in improving programmers' efficiency by making interactive programming and debugging much simpler and quicker. Multiple programmers can work simultaneously for writing, testing, and debugging their programs, or for trying out various approaches to a problem solving.

3. Offers good computing facility to small users

Small users can gain direct access to more sophisticated hardware and software than they could other wise justify or afford. In time-sharing systems, they merely pay a fee for resources used and are relieved of hard ware, software, and personnel problems associated with acquiring and maintaining their own installation.

4.6 DISK OPERATING SYSTEM

Q20. What is meant by Disk Operating System ?

Ans :

DOS (Disk Operating System) was the first widely-installed operating system for personal computers. (Earlier, the same name had been used for an IBM operating system for a line of business computers.) The first personal computer version of DOS, called PC-DOS, was developed for IBM by Bill Gates and his new Microsoft Corporation. He retained the rights to market a Microsoft version, called MS-DOS.

PC-DOS and MS-DOS are almost identical and most users have referred to either of them as just "DOS." DOS was (and still is) a non-graphical line-oriented command- or menu-driven operating system, with a relatively simple interface but not overly "friendly" user interface. Its prompt to enter a command looks like this:C:>The first Microsoft Windows operating system was really an application that ran on top of the MS-DOS operating system.

The DOS has several commands, each for a particular task and these are stored in DOS directory on the disk. The commands are of two types :

(a) Internal Commands

These are in built commands of MS-DOS i.e. these are stored in Command interpreter file (COMMAND.COM). These commands reside in the memory as long as the machine is at he system prompt (C:\>) level. To use these commands no extra /external file is required. E.g. DATE, TIME, DIR, VER etc.

(b) External commands

These are separate program (.com) files that reside in DOS directory and when executed behave like commands. An external command has predefined syntax. for e.g. HELP, DOSKEY, BACKUP, RESTORE, FORMAT etc.

Q21. Explain the features of disk operating system.

Ans :

Following are some of the important features of DOS :

- As MS-DOS is a single user operating system and works on text - based commands issued by the user. It directly interprets the commands typed on DOS-prompt.
- DOS provides easy commands to perform various file operations, like- file creation, file copy, file movements and file deletion.
- It enables the user, to create directories and sub - directories for managing the files efficiently.
- It has a SCANDISK utility that helps to detect, diagnose and repair disk errors.
- It provides DATE and TIME commands to modify the system's date and time as per user requirements.
- DOS allows users to retrieve a deleted file, using UNDELETE command.
- DOSKEY command of MS-DOS, recalls the previously typed commands that can be edited. This way, time required to retype commands is saved.
- The DIR command of DOS helps to show a list of all files, directories or sub-directories present in the system or a particular directory.
- The system's settings can be changed by making appropriate changes in CONFIG.SYS file.
- DOS enables users to retrieve data from a formatted disk by using UNFORMAT command.
- By using pipe symbol (|), user can execute more than one command simultaneously. Thus it reduces the command's typing time.
- DOS provides DISKCOPY command to copy the complete contents of a disk into some another disk.
- DOS allows users to find a particular text/string from a specific file by using FIND command.
- Microsoft Defragmenter, a powerful utility of DOS can optimize hard disk's storage space by combining small unused areas between files to form a big unused area, which can be further used for storage purpose.

Q22. Explain the various internal and external commands of disk operating system ?

Ans : **(Dec.-19 KU, Imp.)**

Internal Commands

1. **CLS:** this command is used to clean the screen.
2. **DIR:** this command allows the user to see all files and sub-directory in the current directory. DIR Command lists file information in five columns; (first) column gives primary name of the file (second) column gives extension of the file (third) column gives the file size - number of bytes used; (fourth) column gives the last updated date; (fifth) column gives the last updated time.

   Dir/p - page by page display of file name and directory names;

   Dir/w - width-wise display;

   Dir/s - displays all sub directory and files in the sub-directory of current directory.
3. **Copy con** this command copies whatever typed on keyboard to the file; the file can be closed by giving the command A2 or F6 key: eg: Copy con test .....A2.
4. **Date** it displays two system date and allows the user to change it if desired ; it is displayed in the form of mm - dd - yy; eg:c:\> date - enter.
5. **Time** it displays the system type and enables the user to change it; eg: C:\> Time - enter.
6. **md(mkdir)** it creates a new directory in sub directory in the current directory; eg: C:\> md <New directory name>
7. **rd(rmdir)** this command is used to remove a directory from the disk; it can't remove a directory which contains sub directory or files, ie, the child should be removed from the parent; similarly this command can't remove the current directory and root directory. Syntax: c:\> RD<Dir name>.
8. **Type** it displays the content of saved file; eg: C:\> Type> file name.
9. **Ren** this command changes the name of existing file or directory: Syntax: C:\> ren <old name> new name>
10. **Delete** delete a file from current directory; Syntax: C;\> del<file name>
11. **Ver** it displays the version of DOS currently being used in the system; Syntax: C:> ver
12. **Copy** it copies the given file or files from the source directory to the largest directory; Syntax:C:\> copy<source file name> <target file name>.
13. **Prompt** allows the user to set a new DOS prompt instead of usual C:\> or A:\>; eg C:\> prompt pcc; Prompt$p$g - this allows you to reset default prompt; Prompt $d (current date); Prompt $t (current time);

External Command

1. **Attrib** this command is used for protecting the files from accidental changes or modification. It can also be used for making a hidden file, archive files, read only files; Syntax: Attrib +R/-R/+H/-H/+A/-A <file name> +FR protects the file by making it read only, -R removes the read only protection; eg: Attrib + r <file name >

2. **Scandisk/ Chkdisk** this command checks the status of the disk; it shows a graphical display, information about the user file.

3. **Tree** this command graphically displays the path of each directory and sub directory in given drive; Syntax: C:\> tree<

4. **More** it displays one screen of data at a time and is used with another command when one screen is full; if you press any key on the next screen is displayed: Syntax C:\> type abc.doc| more.

5. **Edit** the command loads the MSDOS editor, where we can edit files, create new files, open existing files; Syntax: C:\> edit < file name>

6. **Label** a label is a name given to a disk which refers to collection of filers and directories on disk; Syntax: C:\>label A.

7. **Sort** this command is used for sorting data and displaying the result on the screen: Syntax:C:\>dir/ sort/r (reverse order)

8. **Format;** this command prepares a disk by arranging random magnetic impulses in to a series of track and sectors so that it is addressable by a DOS version; Syntax : C:\> format A:/s

9. **Sys** this command transfers MSDOS System files to specified areas to make the disk boo table; Syntax: C:\>Sys A:<

10 **Pipes** (|) it connects two files ie the standard output of one filter command becomes standard input of another filter; eg Dir/Sort/ more ||

11. **Batchfiles** all batch files on DOS must have the file extn on bat to execute the batch file, the user has just type the file name and press enter key, in addition to usual DOS command.

12. **Echo** this command can be used to display a message on the screen

13. **Pause** when this command is obeyed, the system waits for the user to press a key by displaying a line "strike a key when ready"

4.7 MICRO SOFT WINDOWS

Q23. What is Microsoft Windows ? What are the features of Microsoft Windows ?

Ans :

Microsoft Windows is a series of software operating systems and graphical user interfaces produced by Microsoft. Microsoft first introduced an operating environment named *Windows* in November 1985 as an add-on to MS-DOS in response to the growing interest in graphical user interfaces (GUIs).

Microsoft Windows came to dominate the world's personal computer market, overtaking Mac OS, which had been introduced previously. At the 2004 IDC Directions conference, it was stated that Windows had approximately 90% of the client operating system market. The most recent client version of Windows is Windows Vista; the most recent server version is Windows Server 2008.

Windows 95, 98, 98SE and ME

Windows 95 was released in **1995**, featuring a new user interface, supported long file names, could automatically detect and configure installed hardware (plug and play), natively ran 32-bit applications, and featured several technological improvements that increased its stability over Windows 3.1. Windows 95 uses preemptive multitasking and runs each 32-bit application in a separate address space. This makes it harder for a single buggy application to crash the whole system.

There were several releases of Windows 95; the first in 1995, with Service Pack 1 following in December which included Internet Explorer 2.0. Subsequent versions were only available with the purchase of a new computer and were called OEM Service Releases. OSR1 was equivalent to Windows 95 with SP1. OSR2 (also called Windows 95 B) included support for FAT32 and UDMA and shipped with Internet Explorer 3. OSR 2.1 included basic support for USB and OSR 2.5 (also called Windows 95C) shipped with Internet Explorer 4.0.

Microsoft's next release was **Windows 98** in **1998**. The 98 was the fastest Windows Operating System, with a shutdown time of about 4 seconds! Windows 98 was very popular due to its new interface and programs. Also the boot-screen of Windows 98 was very popular, and most people liked it, including its sounds.

Microsoft released a second-version of Windows 98 in **1999**, named as **Windows 98 Second Edition** (usually shorten to **Windows 98SE**). It had a even better experience. With improving data and fixed things such as problems.

In **2000**, Microsoft released **Windows ME** (Millennium Edition), which used the same core as Windows 98 but adopted some aspects of Windows 2000 and removed the "boot in DOS mode" option. It also added a new feature called System Restore, allowing the user to set the computer's settings back to an earlier date. ME is also the last DOS-based Windows release which does not include Microsoft Product Activation.

Windows XP

Windows XP is a line of operating systems produced by Microsoft for use on personal computers, including home and business desktops, notebook computers, and media centers. The name "XP" is short for "experience".

The most common editions of the operating system are Windows XP Home Edition, which is targeted at home users, and Windows XP Professional, which offers additional features such as support for Windows Server domains and two physical processors, and is targeted at power users, business and enterprise clients.

Windows XP introduced several new features to the Windows line, including:

- Faster start-up and hibernation sequences
- The ability to discard a newer device driver in favor of the previous one (known as *driver rollback*), should a driver upgrade not produce desirable results
- A new, arguably more user-friendly interface, including the framework for developing themes for the desktop environment
- *Fast user switching*, which allows a user to save the current state and open applications of their desktop and allow another user to log on without losing that information

- The *ClearType* font rendering mechanism, which is designed to improve text readability on Liquid Crystal Display (LCD) and similar monitors
- *Remote Desktop* functionality, which allows users to connect to a computer running Windows XP Pro from across a network or the Internet and access their applications, files, printers, and devices
- Support for most DSL modems and wireless network connections, as well as networking over FireWire, and Bluetooth.

  Windows XP analyzes the performance impact of visual effects and uses this to determine whether to enable them, so as to prevent the new functionality from consuming excessive additional processing overhead.

Q24. Explain the features of windows.

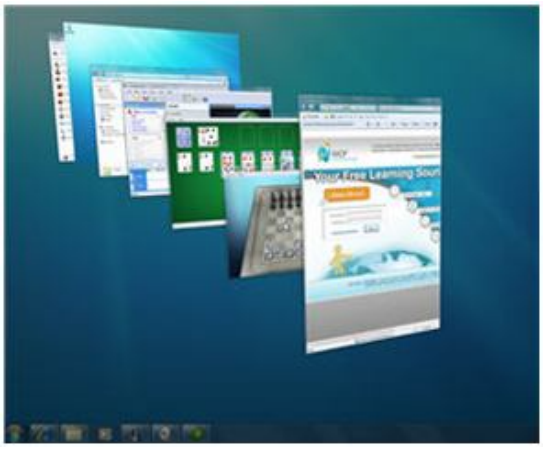
Ans :

1. Windows can run application that offer high quality output.
2. With Windows you can communicate and exchange data between programs without transferring or copying files.
3. It is an easy-to-use, consistent GUI for virtually all programs.
4. It is capable of multitasking of Graphics programs and characters-based programs (DOS) can be run concurrently.
5. Program Manager can be used to switch easily between multiple programs.
6. Because file and disk-management are ample and readily available, you don't have to close and open programs or use DOS commands to do standard file and disk maintenance chores.
7. Many programs are included with Windows, such as word processor and a drawing program.
8. The most distinctive feature of windows is consistent user interface. A program's user interface is how you interact with it while working. In the earlier years of MS-DOS, users had to learn a different method to interact with every program, is having less to learn with a new program.

Q25. Explain the elements of windows ?

Ans :

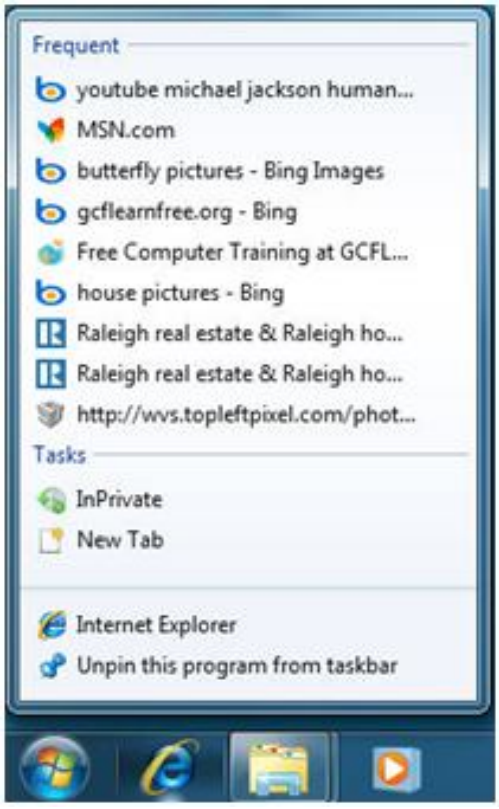
(i) Aero



Aero is an interface that makes your visual interactions with the desktop fun and easy.

- **Aero Peek** makes your open windows transparent so you can see your desktop. It also allows you to peek at items in your taskbar for a thumbnail preview.
- **Aero Snap** is a quick way to resize your windows to make them easier to read, organize, and compare.
- **Aero Flip** allows you to preview all open windows from a central window or 3D view that you can flip through.
- **Aero Shake** allows you to take your mouse and shake only the open window you want to focus on, and the rest will disappear.

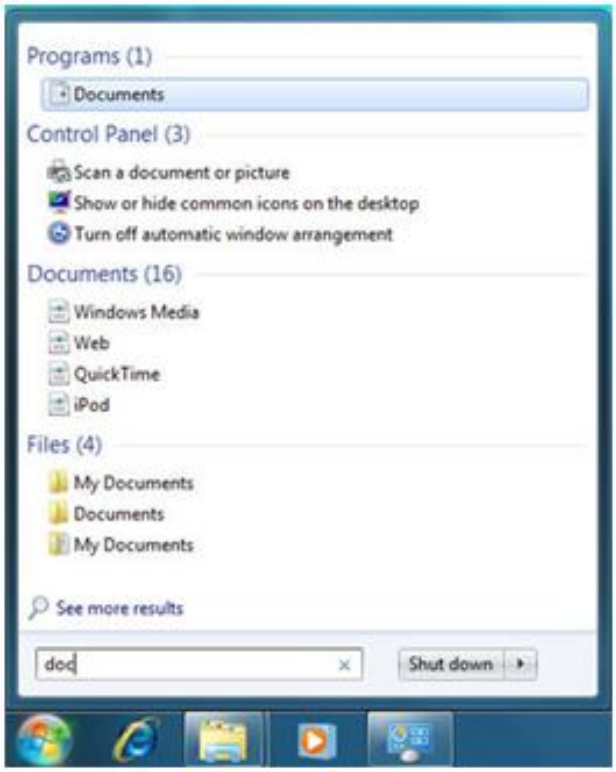
(ii) Taskbar



The **taskbar** is now more convenient to use, with larger views and easier access.

- **Jump Lists** allow you to right-click an icon in the taskbar and immediately access items like music, videos, or webpages you use on a regular basis.
- **Pin** allows you to place programs on the taskbar and rearrange the order of the icons.
- **Action Center** allows you to control the alerts and pop-ups you receive regarding maintenance and security.

(iii) Search



As soon as you start typing in the **Search bar** of the Start Menu, you will instantly see a list of relevant options grouped by categories with highlighted keywords and text. This allows you to easily scan for the documents, music, pictures, and emails you are looking for.

(iv) Libraries

Libraries allow you to organize your files in one place so they are easy to search and access.

Windows 7 has four default Libraries for documents, music, pictures, and videos; however, you can customize and create you own Libraries based on your needs.

(v) Gadgets

You can select or download **gadgets** such as a slide show, calendar, or weather update to add to your desktop. The live updates of some gadgets like weather, stocks, and feed headlines are quite convenient.

Q26. Explain about startbutton in windows.

Ans :

The Start button is where a lot of the action takes place in Windows 7. The Start button can be found in the bottom left of your screen, and looks like this :

By default, the Windows Start button is found at the bottom left part of the desktop screen. However, the Start button can be placed at the top left or top right part of the screen by moving the Windows Taskbar.

Clicking the Start button opens the Start Menu that gives you access all the programs installed on the computer and other Windows features.

Below is a visual example of the Start button and its location on Windows 7.

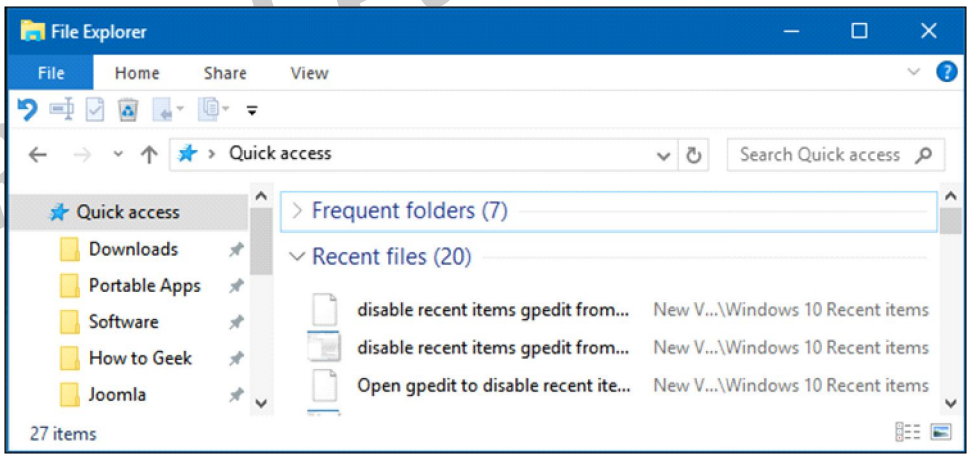
Click the Start button once with your left mouse button and you'll see a menu appear :

The Start menu is split into two different areas.

1. The white area on the left is for software programmes that you have installed on your computer. But these are the programmes you have recently used.

   If an entry has a black arrow it means that documents can be opened by clicking the shortcut.

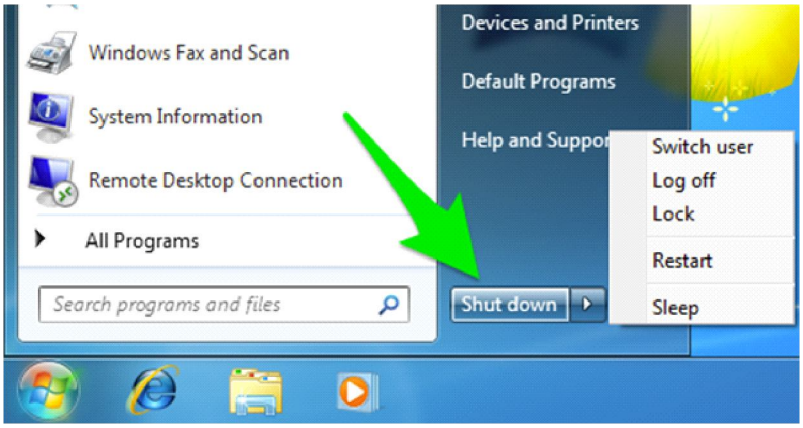
   For example, here's what happens when we click our Microsoft Word entry above:



We have four recently opened documents that we can click on. These will then open in Word.

Notice the small pin icon to the right of the Recent list. Clicking the icon will pin that document to the Word shortcut menu. This is useful if you open one particular document all the time.

2. The other area is the darker strip on the right. These are shortcuts for locations on your computer. We'll explore these options in later sections, especially the Control Panel and Computer options. But one more thing to notice in the dark area on the right of the Start menu is the Shut down button. Clicking this will obviously shut down your computer, but click the arrow to the right of the Shutdown button to see the following options :



As you can see, there are five options on the menu.

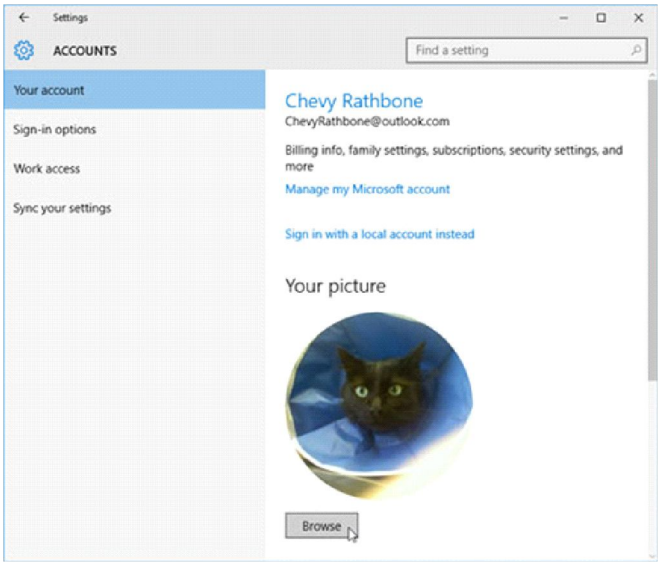
- The first is useful if you share your computer with others, and have set up multiple accounts. Click Switch user to see other account names. A user can then enter login details without the need to shutdown the computer and start again.
- The Log Off option logs you out of your account. Again, the computer doesn't shut down. Instead, you'll see a screen where you or others can log back in again.
- The Lock option prevents others from using the computer until you enter your password again.

  The final two options are Restart and Sleep.
- The Restart is self-explanatory.
- But the Sleep option is useful if you're not going to be using the computer for a while. It powers down the hardware, saving you energy.

Start Menu Picture

If you look at the top of your Start menu you'll see a picture, which is a flower in the images above.

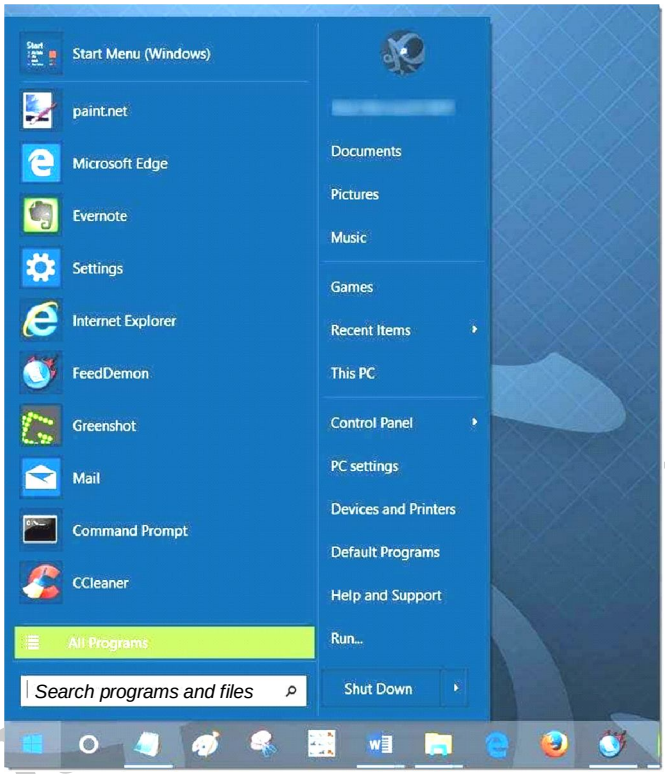
You can change this. Click the picture with your left mouse button and a new screen will open. This one :



- Click the link for Change you picture. You'll then see others images you can use:
- Select a picture from the ones available, or click the Browse for more pictures link. When you're happy with your selection, click the Change Picture button at the bottom.

Searching from the Start menu

At the bottom of the left-hand area of the Start menu is a Search area :



- If you have forgotten where you stored or downloaded a particular file, simply type its name (or just part of its name) in the search box. You should then see search options appear:
- If the file you're looking for is not there, then click where it says "See more results".

Q27. What is the use of Control Panel ?

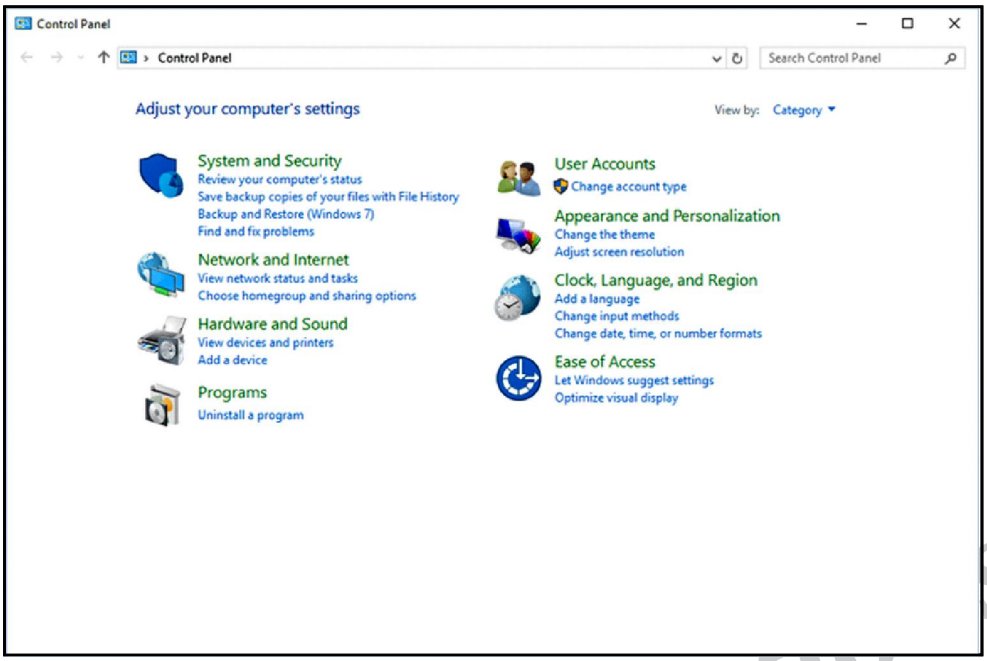
Ans :

The Control Panel is a section of Microsoft Windows that enables a user to change various computer hardware and software features. Settings for the mouse, display, sound, network, and keyboard represent just a few examples of what may be modified in the Control Panel. Below are some examples of how the Control Panel appeared in Windows.

To open the Control Panel,

- click the Start button on the taskbar
- then click Control Panel on the Start menu.

Windows 7 gives you three different views for looking at your computer's Control Panel: To switch views, click the View By drop-down button in the upper-right corner of the Control Panel and then choose one of the views from the button's drop-down menu.



(a) Category View

By default, the Control Panel is displayed in Category view, which is separated into eight categories, ranging from System and Security to Ease of Access.

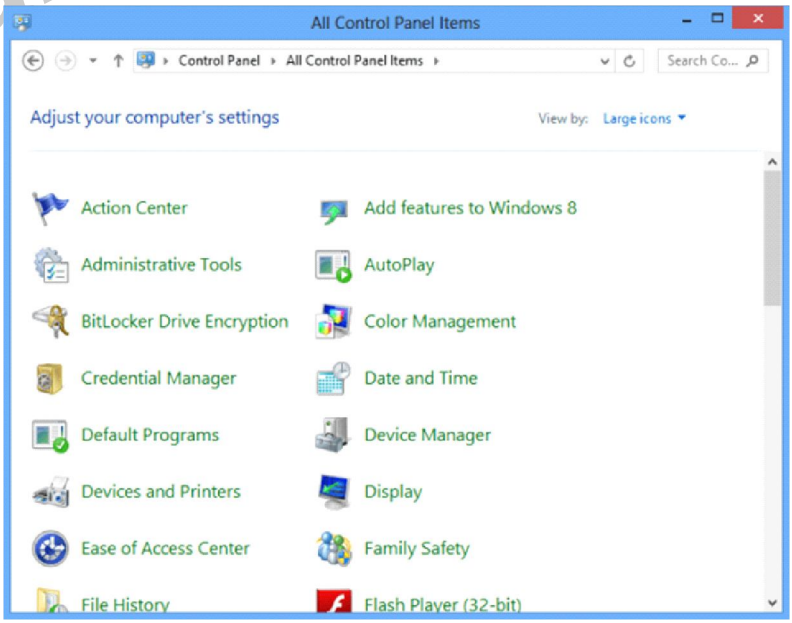
To open a window with the Control Panel options for any one of these categories, simply click the category's hyperlink.

The following table gives you a description of all the Control Panel categories, including the various programs you can find by clicking each category's hyperlink.

Click This Category Link . . .	. . . To Display These Groups of Links
System and Security	Action Center, Windows Firewall, System, Windows Update, Power Options, Backup and Restore, BitLocker Drive Encryption, and Administrative Tools
User Accounts	User Accounts, Windows Cardspace, Credential Manager, and Mail (32-bit)
Network and Internet	Network and Sharing Center, Homegroup, and Internet Options
Appearance and Personalization	Personalization, Display, Desktop Gadgets, Taskbar and Start Menu, Ease of Access Center, Folder Options, and Fonts
Hardware and Sound	Devices and Printers, AutoPlay, Sound, Power Options, Display, and Windows Mobility Center
Clock, Language, and Region	Date and Time, and Region and Language
Programs	Programs and Features, Default Programs, and Desktop Gadgets
Ease of Access	Ease of Access Center and Speech Recognition

(b) Icon Views

The Control Panel's other two views are Large Icons view and Small Icons view. When the Control Panel is in one of the icon views, Windows displays an alphabetical listing of the more than 50 Control Panel programs on your system, ranging from Action Center to Windows Update. To view (and possibly change) the settings for a particular Control Panel option in one of the icon view modes, you need to double-click the Control Panel program icon.



4.8 UNIX / LINUX

Q28. Define Unix Operating System ?

Ans :

UNIX is a multi-user, time-sharing operating system. Although it can be used on a wide variety of computers, ranging from notebook computers to super computers, it is prevalent especially on RISC workstations such as those from Sun Mircosystems, Hewlett-Packard, IBM, and Silicon Graphics.

UNIX was developed in the early 1970s at Bell Laboratories by Ken Thompson and Dennis Ritchie for a PDP-11 computer. It was the first operating system to be written in a high-level language, C. Normal practice until then was to use assembly language'for writing operating systems due to which operating systems were system dependent. That is, they were usable only on a system for which they were developed. However, since UNIX was written in C language, moving it to a new machine, known as porting it, was much easier. This was an important reason for its popularity and availability on a wide variety of systems.

Q29. Define Linux Operating System.

Ans :

Linux is an open-source operating system enhanced and backed by thousands of programmers worldwide. It is a multi-tasking, multiprocessing operating system designed originally for use on personal computers. The name "Linux" is derived from its inventor Linus Torvalds. Torvalds was a student at the University of Helsinki, Finland in early 1990s when he wrote the first version of an UNIX-like kernel as a toy project. He later posted the code on the Internet and asked programmers across the world to help him build it into a working system.

The result was Linux. Torvalds holds the copyright but permits free distribution of source code. That is, he oversees development of kernel and owns its trademark. When someone submits a change or a feature, Torvalds and his core team of kernel developers review the merit of adding it to kernel source code.

Q30. Explain the features of LINUX Operating System.

Ans :

Following are some of the important features of LINUX Operating System:

- LINUX is fast, free and easy to use.
- LINUX supports multi-tasking i.e. several programs running at the same time.
- LINUX is a multi-user operating system means multiple users can access system resources like memory, hard disk, application programs at the same time.
- Additional provisions like multi-processing and graphical capabilities are well integrated into LINUX.
- LINUX is free from distribution restrictions and its source code is available freely for downloads or making changes to create a new version for self-usage or further distribution.
- LINUX provides a special interpreter program (shell), which can be used to execute commands of the operating system. It can be used to perform various types of operations.
- LINUX provides user security using authentication features like password protection, controlled access to specific files and encryption of data.
- Today, almost all LINUX distributions have Live CD/USB feature by which user can run or try the operating system even without installing it on the system.
- LINUX is used worldwide and hence available in multiple languages.
- LINUX has its own software repository from where users can download and install thousands of applications just by issuing a command in Linux Terminal or Shell.

Short Question and Answers

1. What is Operating System ?

Ans :

The operating system is an important component of the computer system. It can be defined as a set of programs that control how the system works. It is the most important program that runs on a computer. It is considered the backbone of a computer, managing both software and hardware resources. All computers must have an operating system used for starting the computer and to run other programs. It provides an interface between the users and the hardware of a computer system.

2. What is an Assembler ?

Ans :

Computer can directly execute only machine language programs that use numbers for representing instructions and storage locations. Hence, an assembly language program must be converted (translated) into its equivalent machine language program before it can be executed on the computer. This translation is done with the help of a translator program m called assembler. Assembler is system software supplied by computer manufacturers. It translates an assembly language program into its equivalent machine language program. It is so called because in addition to translating, it also "assembles" the machine language program in main memory of the computer, and makes it ready for execution.

3. What is a Compiler ?

Ans :

A computer can execute only machine language programs directly. Hence, a high-level language program must be converted (translated) into its equivalent machine language program before it can be executed on a computer. This translation is done with the help of a translator program called compiler. Hence, a compiler is a translator program (much more sophisticated than an assembler is) that translates a high-level language program into its equivalent machine language program. A compiler is so called because it compiles a set of machine language instructions for every program instruction of a high-level language.

The process of translating a high-level language program into its equivalent machine language program using a compiler. As the figure shows, input to the compiler is the high-level language program (often referred to as source program), and its output is the machine language program (often referred to as object program). Since high-level language instructions are macro instructions, the compiler translates each high-level language instruction into a set of machine language instructions rather than a single machine language instruction. Hence, there is a one-to-many correspondence between the high-level language instructions of a source program and the machine language instructions of its equivalent object program. Note that during the process of translation of a source program into its equivalent object program by the compiler, the source program is not under execution. It is only converted into a form that can be executed by the computer.

4. Define Multi Programming.

Ans :

In both manual loading and batch processing, jobs are loaded into a system and processed one at a time. Once loaded, a job remains in main memory until its execution is over, and next job is loaded only after the completion of the current job. It shows that in such a situation, the currently loaded job that is being executed is the sole occupant of user's area of main memory (operating system resides in a separate part of main memory) and has CPU exclusively available for itself. Is an illustration of uniprogramming system model in which only one job is processed at a time and all system resources are available exclusively for the job until its completion.

5. Advantages and disadvantages of multi-programming operating system ?

Ans :

Advantages:

- It increases the overall performance of the system.
- It increases the overall productivity of the system.

Disadvantages:

- It requires a lot of memory to execute several programs simultaneously.
- Special mechanism is required to prevent interference among processes.

6. Advantages and disadvantages of multitaksing operating system ?

Ans :

Advantages:

- It increases CPU utilization.
- It decreases total read time needed to execute a job.
- It increases overall throughput of a computer.

Disadvantages:

- It is relatively more complicated.
- It requires CPU scheduling.
- Proper memory management is required.
- It requires tracking of all kinds of jobs running concurrently.

7. Define Time Sharing ?

Ans :

Time - sharing is a mechanism to provide simultaneous interactive use of a computer by many users in such a way that each one feels that he/she is the sole user of the system. It uses multiprogramming with a special CPU scheduling algorithm to achieve this.

A time - sharing system has many (even hundred of) user terminals connected to the same computer simultaneously.

Using these terminals, multiple users can work on the system simultaneously. Multiprogramming feature allows multiple user programs to reside simultaneously in main memory, and special CPU scheduling algorithm allocates a short period of CPU time one-by-one to each user process (from the first one to the last one, and then again beginning from the first one). The short period during which a user process gets to use CPU is known as time slice, time slot, or quantum, and is typically of the order of 10 to 100 milliseconds. Hence, when CPU is allocated to a user process, it uses the CPU until the allotted time slice expires (system's clock sends an interrupt signal to CPU after every time slice), or it needs to perform some I/O operation, or it completes its execution during this period. Notice that CPU is taken away from a running process when the allotted time slice expires.

8. Disk Operating System ?

Ans :

DOS (Disk Operating System) was the first widely-installed operating system for personal computers. (Earlier, the same name had been used for an IBM operating system for a line of business computers.) The first personal computer version of DOS, called PC-DOS, was developed for IBM by Bill Gates and his new Microsoft Corporation. He retained the rights to market a Microsoft version, called MS-DOS.

PC-DOS and MS-DOS are almost identical and most users have referred to either of them as just "DOS." DOS was (and still is) a non-graphical line-oriented command- or menu-driven operating system, with a relatively simple interface but not overly "friendly" user interface. Its prompt to enter a command looks like this:C: > The first Microsoft Windows operating system was really an application that ran on top of the MS-DOS operating system.

9. What is Microsoft Windows ?

Ans :

Microsoft Windows is a series of software operating systems and graphical user interfaces produced by Microsoft. Microsoft first introduced an operating environment named *Windows* in November 1985 as an add-on to MS-DOS in response to the growing interest in graphical user interfaces (GUIs).

Microsoft Windows came to dominate the world's personal computer market, overtaking Mac OS, which had been introduced previously. At the 2004 IDC Directions conference, it was stated that Windows had approximately 90% of the client operating system market. The most recent client version of Windows is Windows Vista; the most recent server version is Windows Server 2008.

Windows 95, 98, 98SE and ME

Windows 95 was released in **1995**, featuring a new user interface, supported long file names, could automatically detect and configure installed hardware (plug and play), natively ran 32-bit applications, and featured several technological improvements that increased its stability over Windows 3.1. Windows 95 uses preemptive multitasking and runs each 32-bit application in a separate address space. This makes it harder for a single buggy application to crash the whole system.

10. Unix Operating System ?

Ans :

UNIX is a multi-user, time-sharing operating system. Although it can be used on a wide variety of computers, ranging from notebook computers to super computers, it is prevalent especially on RISC workstations such as those from Sun Mircosystems, Hewlett-Packard, IBM, and Silicon Graphics.

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11. Linux Operating System.

Ans :

Linux is an open-source operating system enhanced and backed by thousands of programmers worldwide. It is a multi-tasking, multiprocessing operating system designed originally for use on personal computers. The name "Linux" is derived from its inventor Linus Torvalds. Torvalds was a student at the University of Helsinki, Finland in early 1990s when he wrote the first version of an UNIX-like kernel as a toy project. He later posted the code on the Internet and asked programmers across the world to help him build it into a working system.

The result was Linux. Torvalds holds the copyright but permits free distribution of source code. That is, he oversees development of kernel and owns its trademark. When someone submits a change or a feature, Torvalds and his core team of kernel developers review the merit of adding it to kernel source code.

Choose the Correct Answers

1. Which of the following is a category of System software ? [a]
   (a) Operating system (b) Programming language
   (c) Utility program (d) All of the above
2. Which of the following is an Operating System ? [d]
   (a) MS-DOS (b) UNIX
   (c) Windows NT (d) All of the above
3. Which of the following is not an Operating System ? [c]
   (a) Windows 98 (b) Windows NT
   (c) Turbo C (d) Linux
4. Which is not the function of Operating System ? [d]
   (a) Process management (b) Memory management
   (c) Acting as interface (d) Supplying input
5. Which of the following is a text-based Operating System ? [d]
   (a) Windows XP (b) Windows NT
   (c) Linux (d) MS-DOS
6. Which of the following can execute multiple processes simultaneously ? [c]
   (a) Real Time Operating System
   (b) Multiprocessing Operating System
   (c) Multitasking Operating System
   (d) Multi-user Operating System
7. Which of the following operating system can support multiple CPUs ? [b]
   (a) Real Time Operating System
   (b) Multiprocessing Operating System
   (c) Multitasking Operating System
   (d) Multi-user Operating System
8. The operating system serves as a link between user and _____ . [c]
   (a) Memory (b) Devices
   (c) Hardware (d) Software
9. Which of the following is not managed by O/S ? [d]
   (a) Memory Usage (b) I/O Management
   (c) Network Communications (d) Syntax checks
10. FAT stands for : [c]
   (a) File Allocation Terminal (b) File Allocation Test
   (c) File Allocation Table (d) File Access Table

Fill in the blanks

1. The _____ is loaded automatically into the computer whenever we start the computer.
2. _____ module protects the resources and information of a computer system against destruction and unauthorized access.
3. _____ is another type of translator used to translate a high-level language program into its equivalent machine language program.
4. In a uniprogramming system, _____ is idle whenever the job being currently processed performs I/O operations.
5. _____ have two or more CPUs, which have the ability to execute two or more jobs simultaneously.
6. A _____ system has many (even hundred of) user terminals connected to the same computer simultaneously.
7. DOS stands for _____
8. DOS allows users to retrieve a deleted file, using _____ command.
9. _____ is a line of operating systems produced by Microsoft for use on personal computers, including home and business desktops, notebook computers, and media centers.
10. The name “Linux” is derived from its inventor _____ .

ANSWERS

1. Operating system
2. Security
3. Interpreter
4. CPU
5. Multiprocessing systems
6. Time - sharing
7. Disk Operating System
8. UNDELETE
9. Windows XP
10. Linus Torvalds

UNIT V

DATA COMMUNICATION:

Data, Communication, Basic Networking Devices, Communication Process, Data Transmission speed, Communication Types(modes), Data Transmission Medias, Modem and its working, characteristics, Typesof Networks, LAN Topologies, Computer Protocols, Concepts relating to networking.

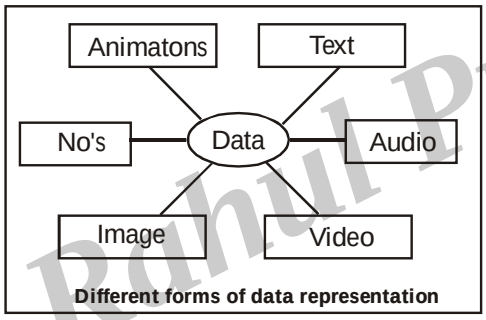
5.1 DATA COMMUNICATION

5.1.1. Data

Q1. Define Data.

Ans :

The word "data" is plural for "datum." When data are processed, organized, structured or presented in a given context so as to make them useful, they are called Information.



Different forms of data representation

Data is the name given to basic facts and entities such as names and numbers. The main examples of data are weights, prices, costs, numbers of items sold, employee names, product names, addresses, tax codes, registration marks etc. Data is the raw material that can be processed by any computing machine.

5.1.2 Communications

Q2. Define communication.

Ans :

The word "communication" (which comes from the Latin word "communicare" meaning to make common) is used in common talk, usually, to mean speaking or writing or sending a message to another person. Communication is really much more than that. It involves ensuring that your message has reached the target audience, (that is, the persons to whom it is sent) and that the receiver understands and responds as you want them to. It also involves ensuring that you yourself take care to receive, understand, interpret, and respond to messages that are sent to you.

Communication is an important aspect of behaviour; human communication is affected by all factors that influence human behaviour.

Definitions of Communication

There are many definitions of Communication given by many theorists; some of these definitions are quoted here.

- Communication is a process of passing information and understanding from one person to another.

— Keith Davis

- Communication is any behaviour that results in an exchange of meaning.

- The American Management Association

- Communication may be broadly defined as the process of meaningful interaction among human beings. More specifically, it is the process by which meanings are perceived and understandings are reached among human beings.

— D.E. McFarland

- Communication is the process by which information is passed between individuals and/or organizations by means of previously agreed symbols.

— Peter Little

A wider and more comprehensive definition is given by National Joint Committee for the Communicative Needs of Persons with Severe Disabilities :

- Any act by which one person gives to or receives from another person information about that person's needs, desires, perceptions, knowledge, or affective states. Communication may be intentional or unintentional, may involve conventional or unconventional signals, may take linguistic or non- linguistic forms, and may occur through spoken or other modes.

— Julia Scherba de Valenzuela, Ph.D.

These definitions show that communication involves exchange of thoughts between two parties. Communication is the transmission of information and meaning from one individual or group to another. The crucial element is meaning.

Q3. Explain the characteristics of communicaion.

Ans :

i) Communication is unintentional as well as intentional

We do not always succeed in conveying exactly what we want to; the target receiver may receive less or more, or even something other than what we intended to convey. In fact, communication does not happen exactly as the sender wishes. It often fails.

Communication takes place even when we do not plan it and when we are not conscious of it; we may communicate something that we had not intended to communicate. Our non-verbal behaviour, which is always present, conveys something about us.

ii) Communication is a dynamic process

A process is an ongoing activity. Communication is a process and is always changing, always in motion; it grows and develops. Even if the same two persons exchange the same ideas again, the communication will not be exactly the same as it was the first time, because the two persons have grown and developed and changed since then. Every time we engage in an act of communication, we bring to it all our previous experiences, feelings, thoughts, attitudes which have been formed by other communication events.

ii) Communication is systemic

Every component of the process is affected by every other component. The source, the environment, the goal, the medium, the nature of the message, the receiver, the feedback, all affect one another. If the audience is inattentive or uninterested, the source is not able to communicate effectively. If a wrong medium is chosen, the message may fail to have the intended result; if the sender's goal is not clear, the message will be confused. Disturbance at any stage in the communication process affects the entire process.

iv) Communication is both interaction and transaction

The two participants, the source and the receiver, exchange ideas and information and influence each other during the process of communication. They also come to a shared and common meaning as a result of the communication. They share as well as exchange thoughts and meanings.

Q4. What is data communication ? Explain the characteristics of data communication.

Ans : **(Dec.-19)**

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 of Data Communication

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.

5.2 Basic Networking Devices

Q5. Explain various basic networking devices.

Ans :

1. Repeater

A repeater operates at the physical layer. Its job is to regenerate the signal over the same network before the signal becomes too weak or corrupted so as to extend the length to which the signal can be transmitted over the same network. An important point to be noted about repeaters is that they do not amplify the signal. When the signal becomes weak, they copy the signal bit by bit and regenerate it at the original strength. It is a 2 port device.

2. Hub

A hub is basically a multiport repeater. A hub connects multiple wires coming from different branches, for example, the connector in star topology which connects different stations. Hubs cannot filter data, so data packets are sent to all connected devices. In other words, collision domain of all hosts connected through Hub remains one. Also, they do not have intelligence to find out best path for data packets which leads to inefficiencies and wastage.

Types of Hub

i) **Active Hub :** These are the hubs which have their own power supply and can clean , boost and relay the signal along the network. It serves both as a repeater as well as wiring center. These are used to extend maximum distance between nodes.

ii) **Passive Hub :** These are the hubs which collect wiring from nodes and power supply from active hub. These hubs relay signals onto the network without cleaning and boosting them and can't be used to extend distance between nodes.

3. Bridge

A bridge operates at data link layer. A bridge is a repeater, with add on functionality of filtering content by reading the MAC addresses of source and destination. It is also used for interconnecting two LANs working on the same protocol. It has a single input and single output port, thus making it a 2 port device.

Types of Bridges

(i) Transparent Bridges : These are the bridge in which the stations are completely unaware of the bridge's existence i.e. whether or not a bridge is added or deleted from the network , reconfiguration of the stations is unnecessary. These bridges makes use of two processes i.e. bridge forwarding and bridge learning.

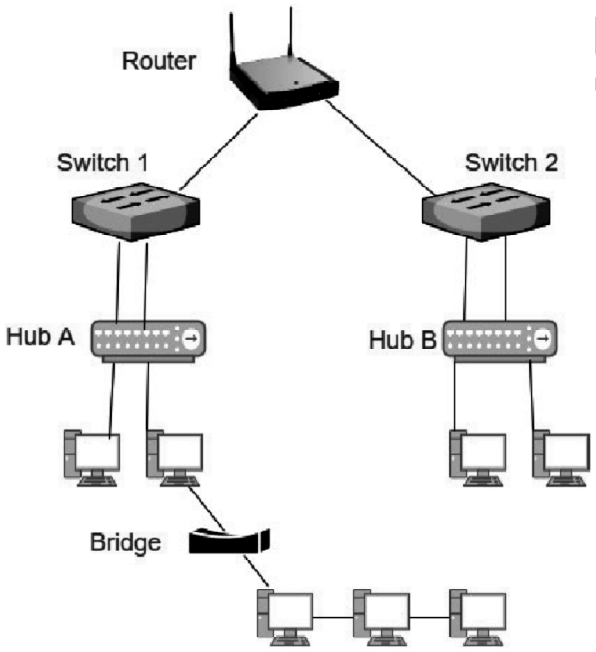
(ii) Source Routing Bridges : In these bridges, routing operation is performed by source station and the frame specifies which route to follow. The hot can discover frame by sending a specical frame called discovery frame, which spreads through the entire network using all possible paths to destination.

4. Switch

A switch is a multi port bridge with a buffer and a design that can boost its efficiency (large number of ports imply less traffic) and performance. Switch is data link layer device. Switch can perform error checking before forwarding data, that makes it very efficient as it does not forward packets that have errors and forward good packets selectively to correct port only. In other words, switch divides collision domain of hosts, but broadcast domain remains same.

5. Routers

A router is a device like a switch that routes data packets based on their IP addresses. Router is mainly a Network Layer device. Routers normally connect LANs and WANs together and have a dynamically updating routing table based on which they make decisions on routing the data packets. Router divide broadcast domains of hosts connected through it.



6. Gateway

A gateway, as the name suggests, is a passage to connect two networks together that may work upon different networking models. They basically works as the messenger agents that take data from one system, interpret it, and transfer it to another system. Gateways are also called protocol converters and can operate at any network layer. Gateways are generally more complex than switch or router.

7. Brouter

It is also known as bridging router is a device which combines features of both bridge and router. It can work either at data link layer or at network layer. Working as router, it is capable of routing packets across networks and working as bridge, it is capable of filtering local area network traffic.

5.3 COMMUNICATIONS PROCESS

Q6. Explain the process of communication.

Ans :

Communications is a continuous process which mainly involves three elements viz. sender, message, and receiver. The elements involved in the communication process are explained below in detail:

1. Sender

The sender or the communicator generates the message and conveys it to the receiver. He is the source and the one who starts the communication

2. Message

It is the idea, information, view, fact, feeling, etc. that is generated by the sender and is then intended to be communicated further.

3. Encoding

The message generated by the sender is encoded symbolically such as in the form of words, pictures, gestures, etc. before it is being conveyed.

4. Media

It is the manner in which the encoded message is transmitted. The message may be transmitted orally or in writing. The medium of communication includes telephone, internet, post, fax, e-mail, etc. The choice of medium is decided by the sender.

5. Decoding

It is the process of converting the symbols encoded by the sender. After decoding the message is received by the receiver.

6. Receiver

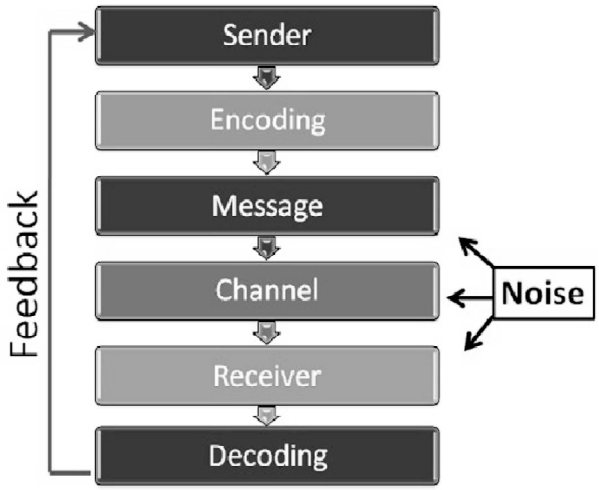
He is the person who is last in the chain and for whom the message was sent by the sender. Once the receiver receives the message and understands it in proper perspective and acts according to the message, only then the purpose of communication is successful.

7. Feedback

Once the receiver confirms to the sender that he has received the message and understood it, the process of communication is complete.

8. Noise

It refers to any obstruction that is caused by the sender, message or receiver during the process of communication. For example, bad telephone connection, faulty encoding, faulty decoding, inattentive receiver, poor understanding of message due to prejudice or inappropriate gestures, etc.



Q7. Explain the Importance of Communication.

Ans :

1. The Basis of Co-ordination

The manager explains to the employees the organizational goals, modes of their achievement and also the interpersonal relationships amongst them. This provides coordination between various employees and also departments. Thus, communications act as a basis for coordination in the organization.

2. Fluent Working

A manager coordinates the human and physical elements of an organization to run it smoothly and efficiently. This coordination is not possible without proper communication.

3. The Basis of Decision Making

Proper communication provides information to the manager that is useful for decision making. No decisions could be taken in the absence of information. Thus, communication is the basis for taking the right decisions.

4. Increases Managerial Efficiency

The manager conveys the targets and issues instructions and allocates jobs to the subordinates. All of these aspects involve communication. Thus, communication is essential for the quick and effective performance of the managers and the entire organization.

5. Increases Cooperation and Organizational Peace

The two-way communication process promotes co-operation and mutual understanding amongst the workers and also between them and the management. This leads to less friction and thus leads to industrial peace in the factory and efficient operations.

6. Boosts Morale of the Employees

Good communication helps the workers to adjust to the physical and social aspect of work. It also improves good human relations in the industry. An efficient system of communication enables the management to motivate, influence and satisfy the subordinates which in turn boosts their morale and keeps them motivated.

5.4 Types of Communication

Q8. Explain different types of communication.

Ans : **(Aug.-21, Dec.-19 KU, Imp.)**

1. Verbal Communication

Verbal communication can also be called as Oral communication. In very simple terms, any communication that happens orally between people is known as verbal communication. The objective of such communications is to ensure that people understand whatever you want to convey. Because of its very nature, verbal communications is more quick and precise then email communication.

In the era of messaging via Whatsapp or using email, people still prefer personal meetings or phone calls (or face to face skype calls) because they are effective and much more convenient in conveying the message.

Nowadays, Verbal communication is an important aspect and is looked as a key strength in an individual.

A manager or an executive needs to have good verbal communication skills. A manager has to handle a team of people and he needs to be skilled to convince the team of people in acting like he wants them to. Executives meet many customers who are each different in terms of their understanding and talking skills. Thus, Executives to need excellent verbal communication skills.

The higher up an organization you go, the better should be the verbal skills that you have. This is because you need to ensure that your speech is precise and to the point and does not leave any scope for any misunderstanding.

2. Non-verbal / Interpersonal communication

Non-verbal communication occurs mainly through visual symbols and auditory symbols. Visual symbols are those which are seen and auditory symbols are those which are heard. Our other senses like smell, taste and touch also take in meanings and can be used for non-verbal communication. For example, the fragrance in a room, the feel of the plush covering on furniture, the taste and aroma of the coffee served in the visitors' room of an office, make significant impressions.

3. Written Communications

There are many many ways that written communications can be used. The number of ways is ever increasing with the penetration of smartphones and the internet. One of the most common forms of written communications used till date is Email. But slowly, written type of communications is becoming more informal with Whatsapp and other online messaging apps being used regularly.

All different forms of written communication can be formal or informal. If today, we visit a court of law, you will find that even Whatsapp messages are considered to be legal in nature. In fact, there have been so many cases of celebrities brought under the scanner because of wrong written communications on their social media account.

4. Formal & Informal

There are two types of communication when considering the formality of the communication. One is the formal and official type of communication which can be emails, letterheads, memos, reports and other such kinds of written material. These are considered as documentary evidence and certain formality is associated with them. You cannot submit such formal documents and later deny them.

Informal communication is one where there is nothing official about the communication that is happening. It can be known as Grapevine communication. There is no specific channel of informal communication because there is Social media, Whatsapp, SMS which are all vehicles of

informal communication which can be used by people.

(a) Advantages of formal communication : When you want to finalize policy and want to decide a course to adopt, then formal communication is more effective

Formal communication can help in establishing procedures and ensuring that the steps are followed.

Any promises or any official plans need to be formally documented so that they can be referred to later.

(b) Advantages of informal communication : Informal communication helps the "Open door policy" and makes people more confident and forthcoming with their ideas and creativity.

Informal communication does not incite fear into peoples mind

Informal talks encourage people to share their problems.

The problem with formal communication is that it is not personal and a distance is maintained if you use only formal communications. Whereas on the other hand, informal conversations can get out of hand and there can be negative grapevine generated.

5. Visual Communication

One of the industries which most prominently uses Visual communication is the medical industry. New medicines which come into the market have to be shown to doctors and the advantages have to be explained. At such times, the medical representatives carry informative pamphlets which are shown to the doctors and dropped with the doctors.

These informative pamphlets have all the information about the medicine so that doctors can feel confident in suggesting the medicine to their patients. Similarly, many different industries are using visual communication to help interaction with their customers so that they can communicate their ideas better. Explainer videos as a concept is rising and is becoming as one of the best types of communication observed on websites.

5.5 Data Transmission Speed

Q9. Explain the term bandwidth.

Ans :

Bandwidth refers to data transfer rate of a communication system (amount of data that it can transfer per unit of time). It is analogous to a road's width. Wider a road, the more traffic it can handle in a given time. Similarly, higher the bandwidth of a communication system, the more data it can transfer in a given time.

Bandwidth is measured in bits per second (bps) (also called baud). Generally, baud is identical to bits per second (bps). Hence, a rate of 300 baud means 300 bps. However, technically, baud refers to number of signal (state) changes per second. Hence, using more sophisticated coding techniques 1 baud can represent 2 or even 3 bps. However, for most communication systems, 1 baud represents one signal change per second, and is equivalent to 1 bps.

Based on data transmission speeds, three basic categories of communication channels (paths) are:

1. Narrowband

Narrowband or sub-voice grade channels have speed in the range of 45 to 300 baud. They are used to handle low data volumes, and are adequate for low-speed devices. They are used mainly for telegraph lines and low speed terminals.

2. Voice band

Voice band channels have speed up to 9600 baud. They are so called because their major application is in ordinary telephone voice communication. They are used also for data transmission from slow I/O devices to CPU or vice versa.

3. Broadband

Broadband channels are used for transmission of large volumes of data at high

speed. They have speed of 1 million baud or more. Broadband facility is used for high-speed computer-to- computer communication or for data transmission to several different devices simultaneously.

Cost of data transmission service increases with speed. Hence, a thorough analysis of business needs and associated costs is necessary to make a proper choice of communication channel for an application.

5.6 Data Transmission Medias

Q10. 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.

Q11. What is a wire pair ? In what situations they are suitable for use in data transmission.

Ans : **(Dec.-19, Imp.)**

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)

Q12. What is a coaxial cable ? Write its practical uses.

Ans : **(Dec.-19)**

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.

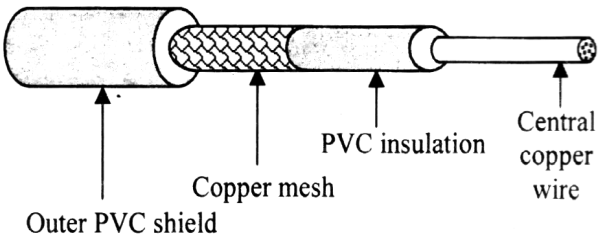


Fig : A coaxial cable

Q13. 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.

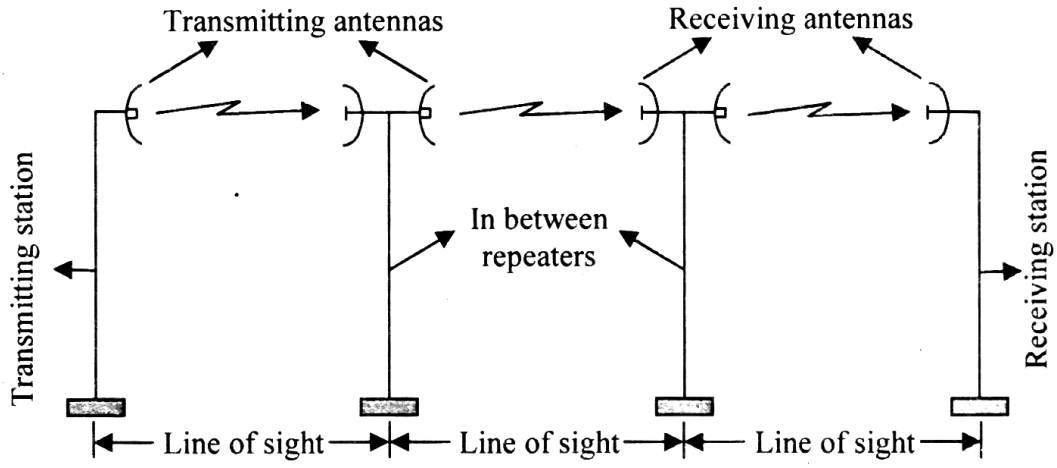


Fig : A microwave communication system

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 therm.

Q14. 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.

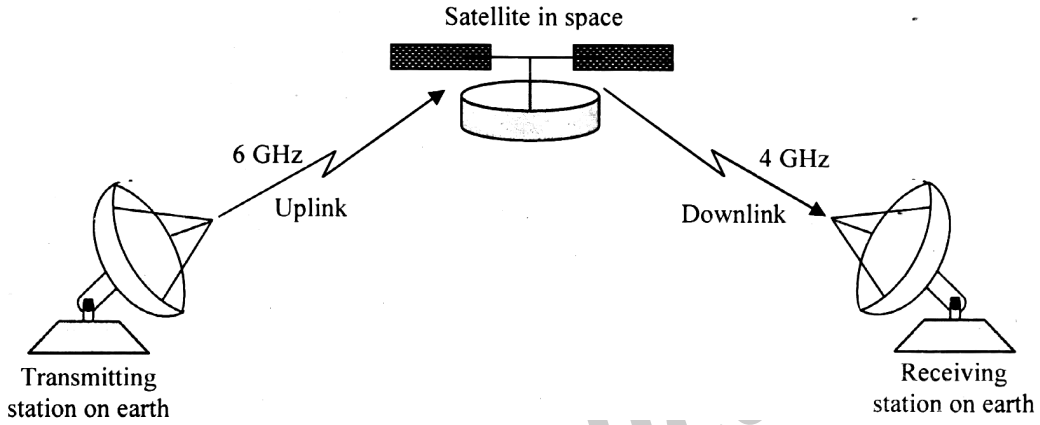


Fig : A satellite communication system

Satellite communication systems have following 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.
5. 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:

1. Initial cost of placing a satellite into its orbit is very high.
2. 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.
3. 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.
4. 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.

Q15. What is optical fiber ? How it is for data communication ? What are its advantages.

Ans :

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.

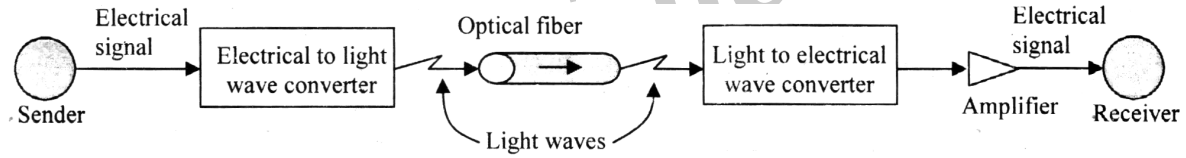


Fig : Optical fiber communication system

Optical fibers have following 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.

Optical fibers, however, suffer from following disadvantages:

1. Optical fibers, being fragile, cannot turn at sharp comers. 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.

5.7 MODEM AND ITS WORKING

Q16. What is modem ? Explain the working mechanism of modem.

Ans :

A special device called modem (modulator/demodulator) is used to carry out the process of modulation and 'demodulation (conversion of digital data to analog form and vice-versa). Hence, when an analog facility is used for data communication between two digital devices (say two computers interconnected by a telephone line), two modems are required, one near each device. As Figure below shows digital signal generated at sender computer's end is converted to analog form by modulator of the modem placed near it.

The analog signal is transmitted through telephone line and is converted to digital form by demodulator of the modem placed near receiver computer. The receiver computer processes the data, and then the modem near it modulates the processed data to analog form.

The analog data is returned via telephone line to the sender computer end, where analog signals are demodulated to digital form first by the modem there, and then the digital data is passed on to the sender computer. Hence, modem is an essential piece of hardware for any application in which two digital devices (say two computers) want to communicate over an analog transmission channel (Say a telephone line).

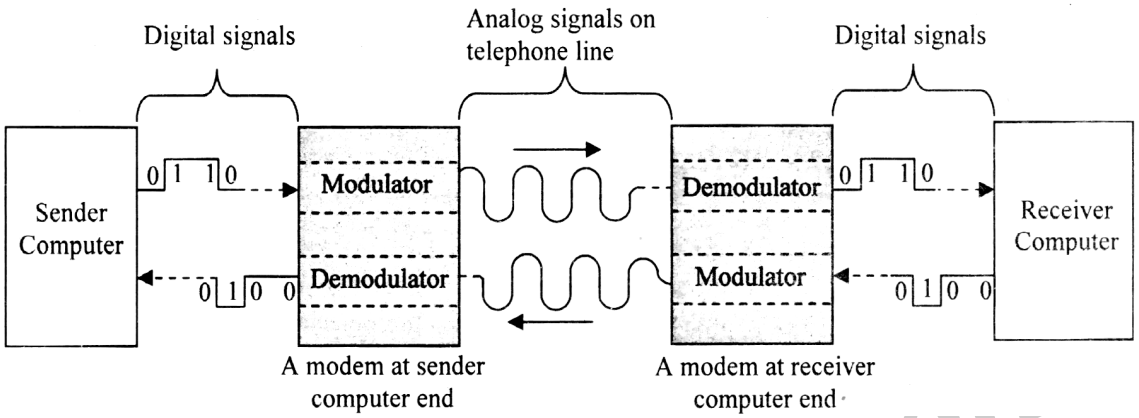


Fig : Illustrating the use of modems in data communications

5.7.1 Characteristics

Q17. Describe some common factors that one should consider while selecting a modem.

Ans :

1. Transmission speed

Higher the modem's transmission speed, the better it is because it can communicate faster. Transmission speeds of earlier modems were 300, 1200, or 2400 bps. Modems available now can operate at 9600, 14400, or 28800 bps.

2. Internal versus external

Modems are of two kinds, internal and external. An internal modem is an optional add-on circuit board that plugs into one of computer's expansion slots. It gets its power from computer's expansion bus. It is manufactured and supplied by computer manufacturers. An external modem, on the other hand, is a separate box containing circuitry and logic to modulate data signal. It has its own power supply, on/off switch, and front-panel LCDs to indicate its status. For this reason. external modems are slightly more expensive. An external modem is connected to a computer via serial port.

3. Facsimile facility

Some modems, known as FAX modems, are capable of emulating a FAX machine in addition to performing functions of a regular modem. A computer equipped with a FAX modern can send/ receive text and images as a FAX to/from a remote FAX machine, or another computer equipped with a FAX modem. FAX modems can be of external or internal type.

5.8 NETWORKS

5.8.1 Concepts Relating to Networking

Q18. Define networks.

Ans : **(Dec.-20, Dec.-19 KU, Imp.)**

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 of Network

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 micro computers 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.

Network Services

1. Network services are the thing that a network can do. The major networking services are
2. File Services: This includes file transfer, storage, data migration, file update, synchronization and achieving.
3. Printing Services: This service produces shared access to valuable printing devices.
4. Message Services: This service facilitates email, voice mails and coordinate object oriented applications.
5. Application Services: This services allows to centralize high profile applications to increase performance and scalability
6. Database Services: This involves coordination of distributed data and replication.

Q19. What are the applications of networks?

Ans :

Telecommunication has added new efficiencies in the work place. They also help business to achieve competitive advantage.

1. Electronic Mail

Electronic mail or e-mail, as it is popularly known, is a method of sending and receiving messages (mail) electronically over a computer network.

E-mail is a system allows a person or a group to electronically communicate to others through Internet. A typed message is transmitted through the use of telephone line and high speed modem the message is send in the digital form which is a machine readable language and it is stored in the mail boxes of the receiver. Message can be retrieved by the concept of the receipt; users can edit, sort, classify and forward the message.

2. Video Conferencing

It enables direct face-to-face communication across networks. A video conferencing system has two or more parties in different locations, which have the ability to communicate using a combination of video, audio, and data. A videoconference can be person to person (referred to as 'point-to- point') or can involve more than two people (referred to as 'multipoint') and the video conferencing terminals are often referred to as 'endpoints'.

The following five elements are common to all video conferencing endpoints:

i) **Camera :** The camera captures live images to send across the network.

ii) **Visual Display :** It displays the images of the people taking part in the videoconference.

iii) **Audio System :** It includes both microphones to capture audio from the endpoint and loudspeakers to play back the audio received from other endpoints across the network connection.

iv) **Compression :** Videos are very bandwidth-intensive and they take a long time to load. Therefore, video systems include technologies, for conferencing allowing transmission across a network connection in near-real time.

v) **User Interface and Control System:** The user interface allows the users to control interactions, such as placing calls, storing and locating numbers, and adjust environment settings such as volume. The control system handles the underlying communication that takes place between endpoints.

3. Electronic Data Interchange (EDI)

Refers to the structured transmission of data between organizations by electronic means. It is used to transfer electronic documents from one computer system to another (i.e.,) from one trading partner to another trading partner.

The advantages of EDI include :

i) **Paperless :** EDI save company money by providing an alternative to, or replacing information flows that require a great deal of human interaction and materials such as paper documents, meetings, faxes, etc.

ii) **Reduced Data Handling Costs :** Even when paper documents are maintained in parallel with EDI exchange, e.g. printed shipping manifests, electronic exchange and the use of data from that exchange reduces the handling costs of sorting, distributing, organizing, and searching paper documents.

iii) **No Manual Manipulation of Data :** EDI and similar technologies allow a company to take advantage of the benefits of storing and manipulating data electronically without the cost of manual entry.

iv) **Error Less :** EDI reduces errors, such as shipping and billing errors, because EDI eliminates the need to rekey documents on the destination side.

v) **Speed :** One very important advantage of EDI over paper documents is the speed in which the trading partner receives and incorporates the information into their system thus greatly reducing cycle times.

4. Electronic Funds Transfer (EFT)

Refers to the computer-based systems used to perform financial transactions electronically. Electronic Funds Transfer (EFT) provides for electronic payments and collections. EFT is safe, secure, efficient, and less expensive than paper check payments and collections.

5. Facsimile (Fax)

It is a word from Latin facsimile, "make like. Fax is a copy or reproduction of an old book, manuscript, map, art print or other item of historical value that is as true to the original source as possible using, normally, some form of photographic technique. It differs from other forms of reproduction by attempting to replicate the source as accurately as possible in terms of scale, color, condition, and other material qualities.

6. Telecommuting

It is a work arrangement in which employees enjoy flexibility in working location and hours. In other words, the daily commute to a central place of work is replaced by telecommunication links.

7. Distance Learning

It is the process of creating an educational experience of equal qualitative value for the learner to best suit their needs outside the classroom. Rather than attending courses in person, teachers and students may communicate at times of their own choosing by exchanging printed or electronic media, or through technology that allows them to communicate in real time and through other online ways.

8. Telematics

It is integrated use of telecommunications and informatics. More specifically it is the science of sending, receiving and storing information via telecommunication devices.

Q20. What are the advantages of networks ?

Ans :

The main advantages of networking are:

(i) Hardware Resource Sharing

Network enables sharing of expensive resources such as processor, storage space and peripherals like modern, fax, and laser printer.

(ii) Sharing of Databases

The network permits concurrent access to the same data file by many users in the network. Thus, user in the sales department, production department, inventory department etc., share corporate databases.

(iii) Sharing of Software

Any user in a network can load and use the software installed on any of the computer of file server in the network.

(iv) Communication between users

The Network users can communicate between them. E-mail facility can also be used for communication.

(v) Decentralized Data Processing

In a network, the data processing can be decentralized by enabling local offices to capture and store data, and generate information to meet most of their requirements a local level itself.

(vi) Security of Data

In a networked environment the data is backed up with duplicate storage. Adequate security measures are also put in place to product the data.

Q21. What are the disadvantages of networks.

Ans :

The main Dis & Advantages of Networks are:

(i) Crashes

The biggest disadvantage is on a server-based network. When the server crashes, work gets disrupted as all network resources and its benefits are lost. Unless proper precautions are taken to ensure regular backups, the crash may result in the loss of days' and even months' of critical data and time.

(ii) Data Security

As all the data resources are all pooled together, it is possible for unauthorized personnel to access classified information if network security is weak or poorly implemented.

(iii) Privacy

A network may also mean loss of privacy as anyone, especially your boss, with the right network privileges may be in a position to read your private e-mail.

5.8.2 Types of Networks

Q22. What are the different types of computer networks.

Ans :

Computer networks can be divided in following categories :

1. LAN (Local Area Networking)
2. WAN (Wide Area Networks)
3. MAN (Metropolitan Area Networks)
4. CAN (Campus Area Networks)

Q23. What is local area network (LAN). Explain advantages and disadvantages of local area network.

Ans : **(Dec.-20, Dec.-19 MGU, Imp.)**

Local Area Networks (LANs) are most often described as privately owned networks that offer reliable high speed communication channels

optimized for connecting information processing equipment in a limited geographical area, namely, an office building, complex of buildings, or campus.

A LAN is a form of local (limited-distance), shared packet network for computer communications. LANs interconnect computers and peripherals over a, common medium in order that users might share access to host computers, databases, files, applications, and peripherals.

The main users of LANs include business organizations, research and development groups in science and engineering, industry, educational institution.

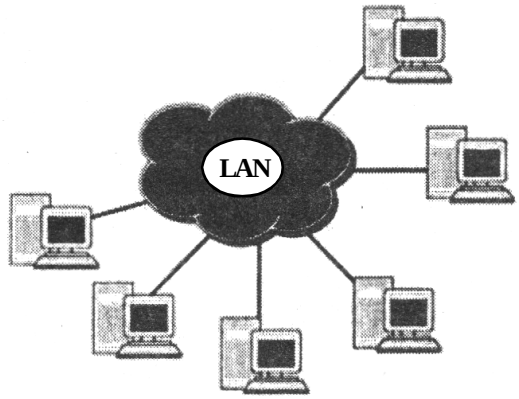


Figure : LAN Architecture

Advantage of LAN

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.

Disadvantage of LAN

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.

Q24. What is Metropolitan Area Network (MAN). Explain advantages and disadvantages of Metropolitan area network.

Ans : **(Dec.-20, Dec.-19 MGU, Imp.)**

MAN is ideal for many kinds of network users because it is a medium-size network. MANs are used to build networks with high data connection speeds for cities and towns.

A MAN is a relatively new class of network, it serves a role similar to an ISP (Internet Service Provider), but for corporate users with large LANs.

The network size falls intermediate between LANs and WANs. A MAN typically covers an area of between 5 and 50 km diameter.

Many MANs cover an area the size of a city, although in some cases MANs may be as small as a group of buildings or as large as the entire city.

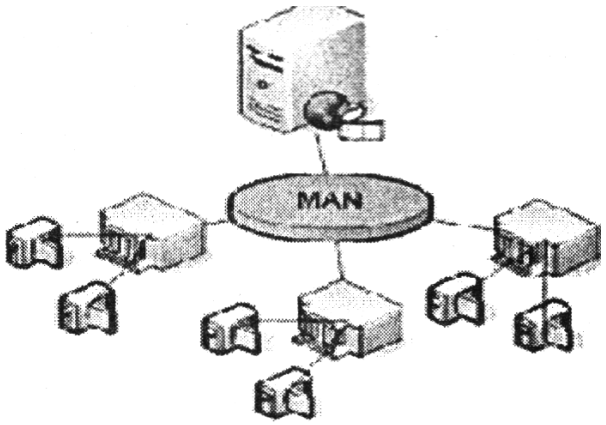


Fig : Metropolitan Area Network

A MAN is optimized for a larger geographical area than a LAN, ranging from several blocks of buildings to entire cities.

Advantages of MAN

1. The biggest advantage of MANs is the bandwidth (potential speed) of the connecting links. This means that resources (such as databases and files) shared on the network can be accessed extremely quickly.
2. Accommodates large number of clients.
3. Moderate error rates

Disadvantages of MAN

1. Large space requirements
2. Slower data access
3. More expensive equipment.

Q25. What is Wide Area Network (WAN). Explain advantages and disadvantages of Wide area network.

Ans : **(Dec.-20, Dec.-19 MGU, Imp.)**

A WAN is a data communications network that covers a relatively broad geographic area and that often uses transmission facilities provided by common carriers, such as telephone companies.

WANs are interconnection of any number of LANs and MANs. They connect networks across cities, states and countries. The internet can be thought of as the largest WAN.

WAN technologies generally function at the lower three layers of the OSI reference model: the physical layer, the data link layer, and the network layer.

Advantages of WAN

1. WANs enable people to communicate with one another very quickly over large distance.
2. Can grow without bound
3. Multiple uses

Disadvantages of WAN

1. Large space requirements at different locations
2. Setting up a network can be an expensive and complicated experience. The bigger the network the more expensive it is.
3. Highest error rates
4. Encryption of secure data such as financial transactions is necessary because it is even easier to intercept data.
5. Once set up, maintaining a network is a full-time job which requires network supervisors and technicians to be employed.

Q26. What is Campus Area Network (CAN).

Ans :

Campus Area Networks are usually a connection of many small LAN networks which are often used on university campuses and office buildings. Campus Area Networks allow for easy file sharing between different departments as all the files are usually shared on the server machines of each LAN network. This type of network offers a lot of simplicity in the transfer and downloading of files.

Q27. What are the difference between LAN, MAN and WAN.

Basis	LAN	MAN	WAN
Coverages	Diameter of not more than a few kilometers.	Diameter covers a town or a city	Span entire countries
Data Rate	A total data rate of atleast 10 to 100 Mbps	A total data rate is variable.	Data rate more than 1Mbps (Megabits per second)
Ownership	Complete ownership by a single organization.	Complete ownership is collectively held by few (3-4) organizations.	Owned by multiple organization.
Error Rate	Very low error rates.	Low error rate.	Comparatively higher error rate
Topology	Symmetrical topology, ring, bus.	Topology of bus or star.	Several topologies star, ring, mesh.
Standard	It uses IEEE 802 standard	It uses IEEE 802 standard	It uses ITU standard.

5.9 LAN TOPOLOGIES

Q27. What do you understand by 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. They are described below. Choice of a topology for a computer network depends on a combination of factors such as :

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

Q28. Explain different types of topologies.

Ans : **(Aug.-21, Dec.-19, Dec.-19 KU, Imp.)**

i) Bus Topology

- Bus topology comprises of stations or terminals that are connected to a single communication line. This single communication line is referred to as a bus.

- Information frames originating from a station are broadcast away from the station in both directions on the bus.
- Each station on the bus interrogates the information frame destination address field for its own address. If the destination field does not match the stations address, the station discards the information frame back on to the bus. If the destination address matches the station address, it accepts the information frame and processes the frame.

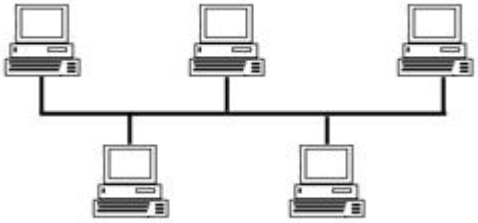


Fig : Bus Topology

Characteristics of Bus Topology

- 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.

ii) Ring Topology

- In Ring topology, all the stations are arranged in a logical ring and each computer has direct point to point link with two computers surrounding it.
- Each node in a ring acts as a repeater. It accepts the data from the neighboring node and checks whether the data is sent for it or not. If the data is sent for some other node, it passes the data packet to the next node on the ring.

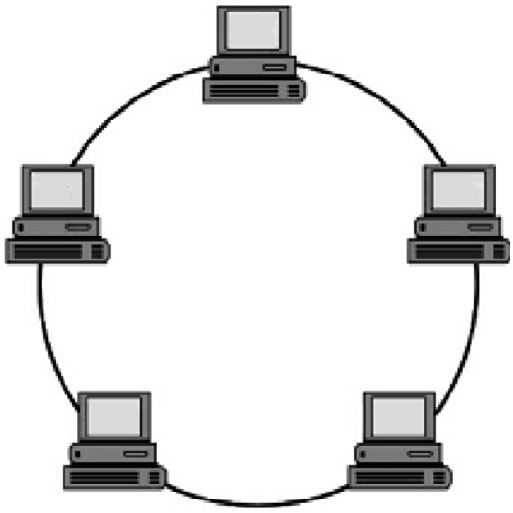


Fig :Ring Topology

Characteristics of Ring Topology

- It is used in high performance networks where large bandwidth is required.
- Transmission is unidirectional.
- There is no termination point, as there is no end to the ring.
- The data is transferred in a sequential manner i.e. bit by bit around the ring.
- Signal is passed along the ring in one direction from one station to another station until it reaches destination.

iii) Star Topology

- Star topology is the most common type of network topology that is used in homes and offices.
- In star topology, there is a central connection point called the hub. Each computer on a star network communicates with a central hub that resends the message either to all the computers in a broadcast star network or only to the destination computer in a switched star network.
- Star networks are relatively easy to install and manage, but bottlenecks can occur because all data must pass through the hub.
- In a star network, the best advantage is when there is a failure in cable then only one computer might get affected and not the entire network.

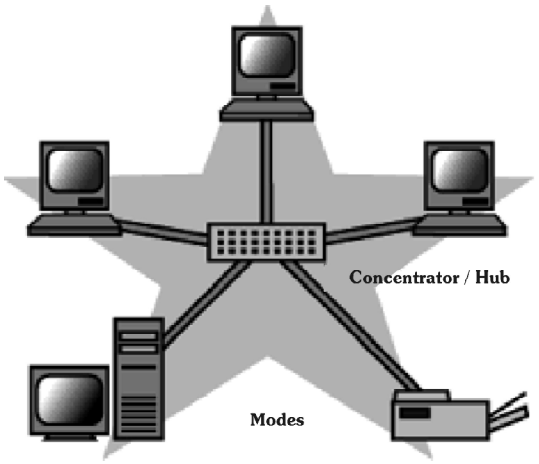


Fig. Star topology

- In a star network, the entire network is dependant on the hub so if the entire network is not working then there could be a problem with the hub.

Characteristics of Star Topology

- 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.

iv) Tree Topology

- Tree topology is basically an extension of star topology.
- It is suitable for networks having hierarchical flow of data. This means the data travels level by level.
- In the tree topology, computers are connected like an inverted tree.

The server or the host computer is connected at the top. Data can flow from top to bottom and bottom to top in level by level manner.

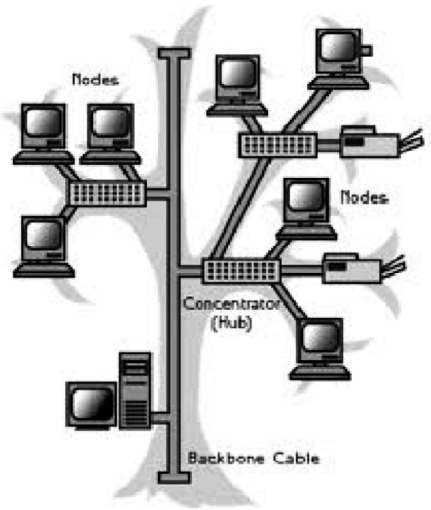


Fig : Tree topology

Characteristics of Tree Topology

- 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.

v) 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.

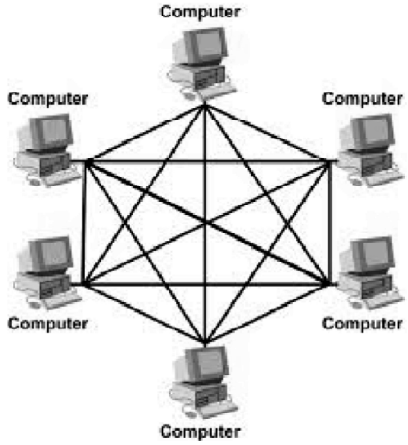


Fig : Mesh topology

vi) Hybrid Topology

- A combination of different topologies makes a Hybrid topology or Hybrid network.
- Different topologies have their own benefits and drawbacks so hybrid network provides a means to take the benefit of these topologies collectively.

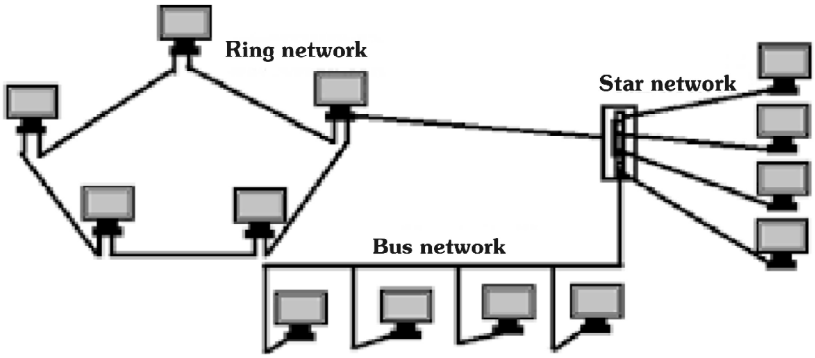


Fig : Hybrid topology

- The two most common hybrids found today are Star-bus and Star-ring topology.
- When two hubs of different topologies are joined so that the devices attached to them can communicate is called Star-bus network.
- When two or more star topologies are linked together using a specialized hub called MAU (Multi-utilization Access Unit), it is known as Star-ring topology.

Characteristics of Hybrid Topology

- The combination of topologies is done according to the requirements of the organization.
- Connecting two similar topologies cannot be termed as Hybrid topology.

5.10 COMPUTER PROTOCOLS

Q29. Define Protocols ? Explain different types of computer protocols.

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

It is a digital language through which we communicate with others on the Internet.

Protocol is a set of mutually accepted and implemented rules at both ends of the communications channel for the proper exchange of information. By adopting these rules, two devices can communicate with each other and can interchange information. We can't even think of using the Internet without Protocols. Each protocol is defined in different terms and different use with unique name. Message travel from sender to receiver via a medium (The medium is the physical path over which a message travels) using a protocol.

'Protocols' are developed by industry wide organizations. All data of protocols are stored in binary information. Protocol language is a mixture of bits, characters, integers, etc.

Each of it has its own access method of exchanging data over a computer network, such as LAN, Internet, Intranet, etc.

Protocols types

1. **TCP:** Transmission Control Protocol, used for the reliable transmission of data over a network.
2. **HTTP:** Hypertext Transfer Protocol, used for transmitting and displaying information in the form of web pages on browsers.
3. **FTP:** File Transfer Protocol, used for file transfer (uploading and downloading) over the Internet.
4. **POP:** The most common protocol for receiving mail is Post Office Protocol (POP). It is now in version 3 so it is called POP3. Email clients such as Outlook Express require an address for a POP3 server before they can read mail. The SMTP and POP3 servers may or may not be the same address
5. **SMTP:** Simple Mail Transfer Protocol, used for email

   Both SMTP and POP3 use TCP for managing the transmission and delivery of mail across the Internet.
6. **Ethernet:** Used for data transmission over a LAN.
7. **Wi-Fi:** One of the wireless protocols.
8. **IP:** Internet Protocol is the primary network protocol used on the Internet, developed in the 1970s. On the Internet and many other networks, IP is often used together with the Transport Control Protocol (TCP) and referred to interchangeably as
9. **TCP/IP:** IP supports unique addressing for computers on a network. Most networks use the Internet Protocol version 4 (IPv4) standards that features IP addresses four bytes (32 bits) in length. The newer Internet Protocol version 6 (IPv6) standard features addresses 16 bytes (128 bits) in length.

The concept of Network

The generic term network refers to a group of entities (i.e. objects, people, etc.) That are connected to one another. A network, therefore, allows material or immaterial elements to be circulated among all of these entities, based on well-defined rules. A network, as far as this article is concerned, is a group of computers and peripheral devices connected to one another. Note that the smallest possible network is two computers connected together. Networking refers to the implementation of tools and tasks for linking computers so that they can share resources over the network. This article will introduce you to this concept and explain to you the different types of networks that exist.

Q30. Explain the functions of protocols.

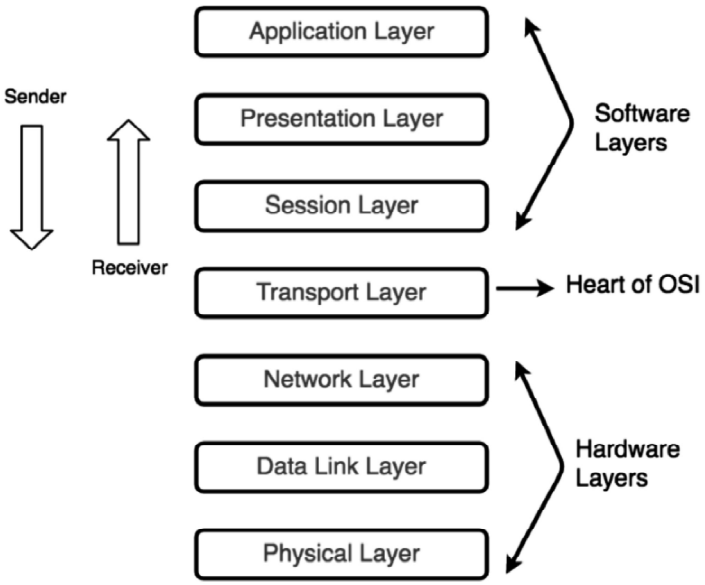
Ans :

- Establish connection.
- Negotiation of various connection characteristics.
- Start and end a message.
- Format a message.
- Perform message error correction.
- Detect unexpected loss of the connection.
- Termination of the session and connection.

Q31. Explain briefly about OSI Model.

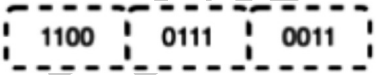
Ans :

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.



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 topolgy.

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)

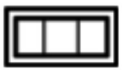
The data link layer is responsible for the node to node delivery of the message. The main function of this layer is to make sure data transfer is error free from one node to another, over the physical layer. When a packet arrives in a network, it is the responsibility of DLL to transmit it to the Host 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.

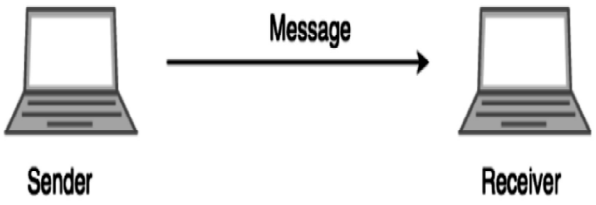
ii) **Synchronization :** This layer allows a process to add checkpoints which are considered as synchronization points into the data. These synchronization point help to identify the error so that the data is re-synchronized properly, and ends of the messages are not cut prematurely and data loss is 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.

Q32. Explain briefly about TCPI / IP Model.

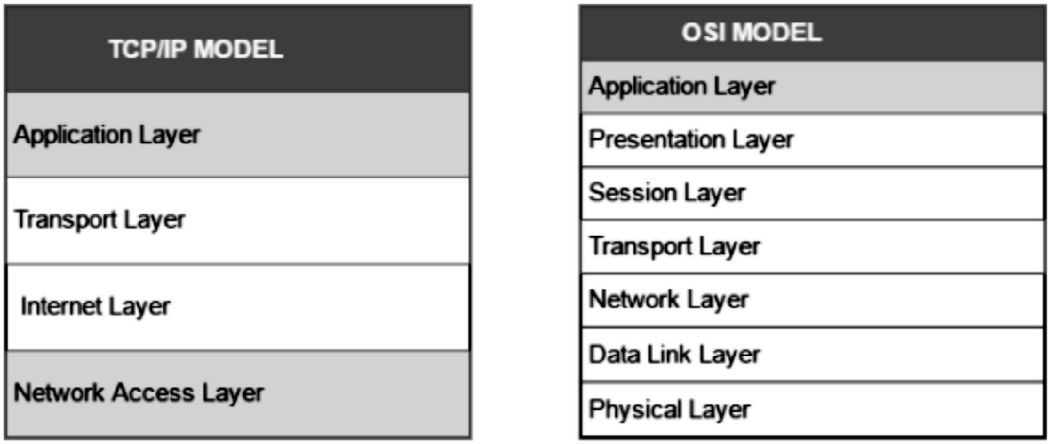
Ans :

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

The diagrammatic comparison of the TCP/IP and OSI model is as follows :



Difference between TCP/IP and OSI Model:

TCP/ IP	OSI
1. TCP refers to Transmission Control Protocol.	1. OSI refers to Open Systems Interconnection.
2. TCP/IP has 4 layers.	2. OSI has 7 layers.
3. TCP/IP is more reliable	3. OSI is less reliable
4. TCP/IP does not have very strict boundaries.	4. OSI has strict boundaries
5. TCP/IP follow a horizontal approach.	5. OSI follows a vertical approach.
6. TCP/IP uses both session and presentation layer in the application layer itself.	6. OSI uses different session and presentation layers.
7. TCP/IP developed protocols then model.	7. OSI developed model then protocol.

The first layer is the Process layer on the behalf of the sender and Network Access layer on the behalf of the receiver. During this article, we will be talking on the behalf of the receiver.

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.

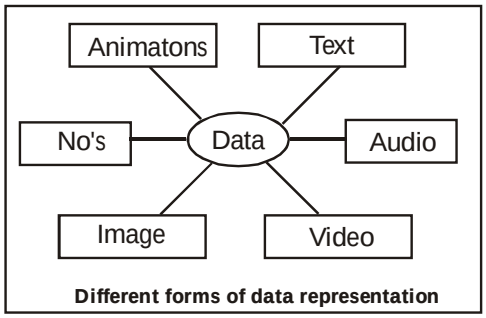
iii) **NTP :** NTP stands for Network Time Protocol. It is used to synchronize the clocks on our computer to one standard time source. It is very useful in situations like bank transactions. Assume the following situation without the presence of NTP. Suppose you carry out a transaction, where your computer 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.

Short Question and Answers

1. Define Data.

Ans :

The word "data" is plural for "datum." When data are processed, organized, structured or presented in a given context so as to make them useful, they are called Information.



Different forms of data representation

Data is the name given to basic facts and entities such as names and numbers. The main examples of data are weights, prices, costs, numbers of items sold, employee names, product names, addresses, tax codes, registration marks etc. Data is the raw material that can be processed by any computing machine.

2. Define communicaion.

Ans :

The word "communication" (which comes from the Latin word "communicare" meaning to make common) is used in common talk, usually, to mean speaking or writing or sending a message to another person. Communication is really much more than that. It involves ensuring that your message has reached the target audience, (that is, the persons to whom it is sent) and that the receiver understands and responds as you want them to. It also involves ensuring that you yourself take care to receive, understand, interpret, and respond to messages that are sent to you.

Communication is an important aspect of behaviour; human communication is affected by all factors that influence human behaviour.

Definitions of Communication

There are many definitions of Communication given by many theorists; some of these definitions are quoted here.

- Communication is a process of passing information and understanding from one person to another.

— Keith Davis

- Communication is any behaviour that results in an exchange of meaning.

— The American Management Association

- Communication may be broadly defined as the process of meaningful interaction among human beings. More specifically, it is the process by which meanings are perceived and understandings are reached among human beings.

— D.E. McFarland

- Communication is the process by which information is passed between individuals and/or organizations by means of previously agreed symbols.

— Peter Little

3. Characteristics of Data Communication.

Ans :

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.

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4. Hub

Ans :

A hub is basically a multiport repeater. A hub connects multiple wires coming from different branches, for example, the connector in star topology which connects different stations. Hubs cannot filter data, so data packets are sent to all connected devices. In other words, collision domain of all hosts connected through Hub remains one. Also, they do not have intelligence to find out best path for data packets which leads to inefficiencies and wastage.

Types of Hub

(i) Active Hub

These are the hubs which have their own power supply and can clean , boost and relay the signal along the network. It serves both as a repeater as well as wiring center. These are used to extend maximum distance between nodes.

(ii) Passive Hub

These are the hubs which collect wiring from nodes and power supply from active hub. These hubs relay signals onto the network without cleaning and boosting them and can't be used to extend distance between nodes.

---

5. Bridge.

Ans :

A bridge operates at data link layer. A bridge is a repeater, with add on functionality of filtering content by reading the MAC addresses of source and destination. It is also used for interconnecting two LANs working on the same protocol. It has a single input and single output port, thus making it a 2 port device.

Types of Bridges

(i) Transparent Bridges

These are the bridge in which the stations are completely unaware of the bridge's existence i.e. whether or not a bridge is added or deleted from the network , reconfiguration of the stations is unnecessary. These bridges makes use of two processes i.e. bridge forwarding and bridge learning.

(ii) Source Routing Bridges

In these bridges, routing operation is performed by source station and the frame ———specifies which route to follow. The hot can discover frame by sending a specical frame called discovery frame, which spreads through the entire network using all possible paths to destination.

---

6. Verbal Communication.

Ans :

Verbal communication can also be called as Oral communication. In very simple terms, any communication that happens orally between people is known as verbal communication. The objective of such communications is to ensure that people understand whatever you want to convey. Because of its very nature, verbal communications is more quick and precise then email communication.

In the era of messaging via Whatsapp or using email, people still prefer personal meetings or phone calls (or face to face skype calls) because they are effective and much more convenient in conveying the message.

Nowadays, Verbal communication is an important aspect and is looked as a key strength in an individual.

A manager or an executive needs to have good verbal communication skills. A manager has to handle a team of people and he needs to be

skilled to convince the team of people in acting like he wants them to. Executives meet many customers who are each different in terms of their understanding and talking skills. Thus, Executives to need excellent verbal communication skills.

The higher up an organization you go, the better should be the verbal skills that you have. This is because you need to ensure that your speech is precise and to the point and does not leave any scope for any misunderstanding.

7. Written Communications

Ans :

There are many many ways that written communications can be used. The number of ways is ever increasing with the penetration of smartphones and the internet. One of the most common forms of written commu-nications used till date is Email. But slowly, written type of communications is becoming more informal with Whatsapp and other online messaging apps being used regularly.

All different forms of written communication can be formal or informal. If today, we visit a court of law, you will find that even Whatsapp messages are considered to be legal in nature. In fact, there have been so many cases of celebrities brought under the scanner because of wrong written communications on their social media account.

8. Bandwidth.

Ans :

Bandwidth refers to data transfer rate of a communication system (amount of data that it can transfer per unit of time). It is analogous to a road's width. Wider a road, the more traffic it can handle in a given time. Similarly, higher the bandwidth of a communication system, the more data it can transfer in a given time.

Bandwidth is measured in bits per second (bps) (also called baud). Generally, baud is identical to bits per second (bps). Hence, a rate of 300 baud means 300 bps. However, technically, baud refers to number of signal (state) changes per second. Hence, using more sophisticated coding techniques 1 baud can represent 2 or even 3 bps. However, for most communication systems, 1 baud represents one signal change per second, and is equivalent to 1 bps.

9. What is modem ?

Ans :

A special device called modem (modulator/ demodulator) is used to carry out the process of modulation and 'demodulation (conversion of digital data to analog form and vice-versa). Hence, when an analog facility is used for data communication between two digital devices (say two computers interconnected by a telephone line), two modems are required, one near each device. As Figure below shows digital signal generated at sender computer's end is converted to analog form by modulator of the modem placed near it.

The analog signal is transmitted through telephone line and is converted to digital form by demodulator of the modem placed near receiver computer. The receiver computer processes the data, and then the modem near it modulates the processed data to analog form.

The analog data is returned via telephone line to the sender computer end, where analog signals are demodulated to digital form first by the modem there, and then the digital data is passed on to the sender computer. Hence, modem is an essential piece of hardware for any application in which two digital devices (say two computers) want to communicate over an analog transmission channel (Say a telephone line).

10. Network.

Ans :

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 of Network

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.

11. Advantages of networks.

Ans :

The main advantages of networking are:

(i) Hardware Resource Sharing

Network enables sharing of expensive resources such as processor, storage space and peripherals like modern, fax, and laser printer.

(ii) Sharing of Databases

The network permits concurrent access to the same data file by many users in the network. Thus, user in the sales department, production department, inventory department etc share corporate databases.

(iii) Sharing of Software

Any user in a network can load and use the software installed on any of the computer of file server in the network.

(iv) Communication between users

The Network users can communicate between them. E-mail facility can also be used for communication.

(v) Decentralized Data Processing

In a network, the data processing can be decentralized by enabling local offices to capture and store data, and generate information to meet most of their requirements a local level itself.

(vi) Security of Data

In a networked environment the data is backed up with duplicate storage. Adequate security measures are also put in place to product the data.

12. Local area network (LAN).

Ans :

Local Area Networks (LANs) are most often described as privately owned networks that offer reliable high speed communication channels optimized for connecting information processing equipment in a limited geographical area, namely, an office building, complex of buildings, or campus.

A LAN is a form of local (limited-distance), shared packet network for computer communications. LANs interconnect computers and peripherals over a, common medium in order that users might share access to host computers, databases, files, applications, and peripherals.

The main users of LANs include business organizations, research and development groups in science and engineering, industry, educational institution.

13. Metropolitan Area Network.

Ans :

MAN is ideal for many kinds of network users because it is a medium-size network. MANs are used to build networks with high data connection speeds for cities and towns.

A MAN is a relatively new class of network, it serves a role similar to an ISP (Internet Service Provider), but for corporate users with large LANs.

The network size falls intermediate between LANs and WANs. A MAN typically covers an area of between 5 and 50 km diameter.

Many MANs cover an area the size of a city, although in some cases MANs may be as small as a group of buildings or as large as the entire city.

14. Wide Area Network.

Ans :

A WAN is a data communications network that covers a relatively broad geographic area and that often uses transmission facilities provided by common carriers, such as telephone companies.

WANs are interconnection of any number of LANs and MANs. They connect networks across cities, states and countries. The internet can be thought of as the largest WAN.

WAN technologies generally function at the lower three layers of the OSI reference model: the physical layer, the data link layer, and the network layer.

15. 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. They are described below. Choice of a topology for a computer network depends on a combination of factors such as :

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

16. Define Protocols ? Explain different types of computer protocols.

Ans :

It is a digital language through which we communicate with others on the Internet.

Protocol is a set of mutually accepted and implemented rules at both ends of the communications channel for the proper exchange of information. By adopting these rules, two devices can communicate with each other and can interchange information. We can't even think of using the Internet without Protocols. Each protocol is defined in different terms and different use with unique name. Message travel from sender to reciever via a medium (The medium is the physical path over which a message travels) using a protocol.

'Protocols' are developed by industry wide organizations. All data of protocols are stored in binary information. Protocol language is a mixture of bits, characters, integers, etc.

Each of it has its own access method of exchanging data over a computer network, such as LAN, Internet, Intranet, etc.

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

FACULTY OF COMMERCE

B.Com. I - Semester (CBCS) Examination

August - 2021

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time : $1^1/_2$ Hours] **[Max. Marks : 50**

PART - A (5 × 2 = 10 Marks)

[Short Answer Type]

Note: Answer any Five of the following questions.

Answers

1. Scanner **(Unit-I, SQA-12)**
2. Flash Drive **(Unit-II, Q.No. 36)**
3. High Level Language **(Unit-III, Q.No. 10)**
4. Time Sharing **(Unit-IV, SQA-7)**
5. Computer Protocol **(Unit-V, SQA-16)**
6. Compiler **(Unit-IV, SQA-3)**
7. PROM **(Unit-II, SQA-10)**
8. Mouse **(Unit-I, Q.No. 16)**

PART - B (5 × 8 = 40 Marks)

[Essay Answer Type]

Note: Answer any Five questions.

9. Write about the various Generations of Computer. **(Unit-I, Q.No. 5)**
10. Explain about impact printers and its types. **(Unit-I, Q.No. 24)**
11. Write short note on the following number system:
    - (i) Binary **(Unit-II, Q.No. 4)**
    - (ii) Decimal **(Unit-II, Q.No. 6)**
    - (iii) Octal **(Unit-II, Q.No. 5)**
    - (iv) Hexadecimal **(Unit-II, Q.No. 7)**
12. Distinguish between RAM and ROM. **(Unit-II, Q.No. 25)**
13. Discuss about Programming Languages and its types. **(Unit-III, Q.No. 5, 6, 8)**
14. Discuss in detail about System Software. **(Unit-III, Q.No. 2)**
15. What is Operating System? Explain the functions of an Operating System. **(Unit-IV, Q.No. 1, 3)**
16. Discuss briefly about:
    - (i) Multitasking **(Unit-IV, Q.No. 14)**
    - (ii) Multiprocesing **(Unit-IV, Q.No. 16)**
17. What are different types of Communictions? **(Unit-V, Q.No. 8)**
18. explain about LAN topologies. **(Unit-V, Q.No. 28)**

FACULTIES OF COMMERCE

B.Com. I - Semester (CBCS) Examination

(Only for Computer Applications Courses)

November / December - 2020

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time : 1½ Hours] **[Max. Marks : 50**

PART - A (5 × 2 = 10 Marks)
[Short Answer Type]

Note: Answer any **FIVE** of the following questions.

Answers

1. Dumb Terminal

Ans :

A dumb terminal is simply an output device that accepts data from the CPU. In contrast, a smart terminal is a monitor that has its own processor for special features, such as bold and blinking characters. Dumb terminals are not as fast as smart terminals, and they do not support as many display features, but they are adequate for most applications.

2. LCD Monitor **(Unit-I, Q.No.22)**

3. Zip File **(Unit-II, SQA.18)**

4. Flash Drive **(Unit-II, Q.No.36)**

5. Low Level Language **(Unit-III, Q.No.6)**

6. WYSIWYG Concept

Ans :

A WYSIWYG editor or program is one that allows a developer to see what the end result will look like while the interface or document is being created. WYSIWYG is an acronym for "what you see is what you get". A WYSIWYG editor can be contrasted with more traditional editors that require the developer to enter descriptive codes (or markup) and do not permit an immediate way to see the results of the markup. The first true WYSIWYG editor was a word processing program called Bravo.

7. Time sharing **(Unit-IV, SQA.7)**

8. Bus Topology **(Unit-V, Q.No.28)**

PART - B (5 × 8 = 40 Marks)
[Essay Answer Type]

Note: Answer any **FIVE** questions.

9. What are Scanners ? What are its types ? **(Unit-I, Q.No.17)**

10. Explain the classification of computers. **(Unit-I, Q.No.6)**

11. Elucidate various devices available for Secondary Storage. **(Unit-II, Q.No.27,28,29,30)**

12. Discuss about Number Systems and its types. **(Unit-II, Q.No.3)**

13. Discuss programming languages and its types. **(Unit-III, Q.No.6,8,10)**

14. Bring out the differences between System Software and Application Software.

Ans :

S.No.	System Software	Application Software
1.	Computer software designed to provide a platform to other software	Software designed to perform a group of coordinated functions, tasks or activities for the benefit of the user
2.	Manages resources and helps to run hardware and application software	Performs a specific task according to their type
3.	Runs when the system starts and runs till the end	Runs when the user requires
4.	Developed using languages like C, C++, Assembly	Developed using languages like Java, C, C++, Visual Basic
5.	Essential for the proper functioning of a system **Ex:** operating system, language processors and device drivers	Not extremely important for the functioning of the system **Ex:** Word processor, Spreadsheet, Presentation software, web browsers, graphics software.

15. Write a brief note on :

    (i) Assemblers **(Unit-IV, Q.No.5)**

    (ii) Interpreters **(Unit-IV, Q.No.7)**

16. Define Operating System. Explain its functions. **(Unit-V, Q.No.1,3)**

17. What is Networking ? Write about different types of Networks. **(Unit-V, Q.No.18,23,24,25)**

18. Define Protocol. Explain various computer protocols. **(Unit-V, Q.No.29)**

FACULTY OF COMMERCE

B.Com. I - Semester (CBCS) Examination

November / December - 2019

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time : $1^1/_2$ Hours] **[Max. Marks : 50**

PART - A (5 × 2 = 10 Marks)

[Short Answer Type]

Note: Answer any Five of the following questions.

Answers

1. Smart Terminal

Ans :

A smart terminal can mean various things in the world of computer science. In the times of early personal computers, people used the term "smart terminal" to describe auxiliary components that would work with a mainframe system. Since then, smart terminals have done many things, including supporting a thin client functionality that works with an external server setup.

2. LCD Monitor **(Unit-I, Q.No.22)**

3. Impact Printer **(Unit-I, Q.No.24)**

4. Star Topology **(Unit-V, Q.No.28)**

5. EEPROM **(Unit-II, SQA.11)**

6. 'What-if-Analysis' Concept

Ans :

What-If analysis is one of the most common processes that data analysts, managers, or excel users tend to use these days for advanced business analysis. What-if analysis is a data-intensive simulation whose goal is to inspect the behavior of a complex system, such as the corporate business or a part of it, under some given hypotheses called scenarios. In particular, what-if analysis measures how changes in a set of independent variables impact a set of dependent variables with reference to a given simulation model such a model is a simplified representation of the business, tuned according to the historical corporate data.

7. Multiprogramming **(Unit-IV, SQA.4)**

8. Compact Disk **(Unit-II, Q.No.32)**

PART - B (5 × 8 = 40 Marks)

[Essay Answer Type]

Note: Answer all from the following questions.

9. (a) Bring out the differences between Impact and Non-Impact Printers

S.No.	Impact printer	S.No.	Non impact Printer
1.	It prints characrers or ima images by striking print hammer (or) wheel against an inked ribbon.	1.	It prints characters and images without striking the papers.
2.	Its speed is slower.	2.	Its speed is faster.
3.	Its printing quality is lower.	3.	Its printing quality is higher.

4.	It normally uses continuous paper sheet.	4.	Its normally uses individual paper sheet.
5.	It geneiates noise duiing printing.	5.	it does not generate noise during printing.
6.	It uses inked ribbon for printing.	6.	It uses toner (or) cartridge for painting.
7.	It is less expensive.	7.	It is more expensive.
8.	Dot matrix is an impact printer.	8.	Laser printer is a non-impact printer.

(OR)

(b) Discuss briefly about:

(a) Voice Recognition System **(Unit-I, Q.No.18)**

(b) Vision Input System **(Unit-I, Q.No.19)**

10. (a) What is Binary Arithmetic? How does it help in programming? **(Unit-II, Q.No.2)**

(OR)

(b) What is Data Storage? What are its types? **(Unit-II, Q.No.38,39)**

11. (a) What are Utility Programs? Explain with fine examples. **(Unit-III, Q.No.4)**

(OR)

(b) Write about Application Software and its types. **(Unit-III, Q.No.12,13,16)**

12. (a) Bring out the differences between Assemblers, Compilers and Interpreters and write about Batch Processing.

(Unit-IV, Q.No.9)

Ans :

S.No.	Compiler	Interpreter	Assembler
1.	The sofware that converts programs programs written in a high level language into machine language.	The Software that translates a high level language program into machine language.	The Software that converts programs written in assembly lan guage into machine language.
2.	Converts the whole high level language program to machine language at a time.	Converts the high level language program to machine language line by line.	Converts assembly language program to machine language.
3.	Used by C, C + +	Used by Ruby, Perl, Python, PHP	Used by assembly language.

(OR)

(b) Explain Operating System. What are its types? **(Unit-IV, Q.No.1,10)**

13. (a) What is Data Communication? Explain various types of media used for Data Transmission.

(Unit-V, Q.No.4,11,12)

(OR)

(b) Discuss in detail about LAN Topologies. **(Unit-V, Q.No.28)**

MAHATMA GANDHI UNIVERSITY

FACULTY OF COMMERCE

B.Com. I - Semester (CBCS) Examination

November / December - 2019

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time : $1^1/_2$ Hours] **[Max. Marks : 50**

PART - A (5 × 2 = 10 Marks)
[Short Answer Type]

Note: Answer any Five of the following questions.

Answers

1. Explain Computer Applications. **(Unit-I, Q.No. 8)**
2. Write about Input devices with example. **(Unit-I, Q.No. 11)**
3. Expalin types of printers. **(Unit-I, Q.No. 24, 25)**
4. Write about Hexa Decimal Number system with example. **(Unit-II, Q.No. 7)**
5. Write about PROM nad EPROM. **(Unit-II, Q.No. 22, 23)**
6. Explain Applications software. **(Unit-III, Q.No. 12)**
7. What is operating system. **(Unit-IV, SQA-1)**
8. Write about LAN. **(Unit-V, SQA-12)**

PART - B (5 × 8 = 40 Marks)
[Essay Answer Type]

Note: Answer all from the following questions.

9. (a) Explain the Block Diagram of a Computer. **(Unit-I, Q.No. 4)**

OR

(b) Explain the Generations of Computers **(Unit-I, Q.No. 5)**

10. (a) Explain the types of Number System. **(Unit-II, Q.No. 3)**

OR

(b) Explain Primary and Secondary Storge devices with example. **(Unit-II, Q.No. 18, 19)**

11. (a) What is Software ? Expalin the types of softwares. **(Unit-III, Q.No. 1, 2, 3)**

OR

(b) Explain the types of Computer Languges with examples. **(Unit-III, Q.No. 6, 8, 10)**

12. (a) What is Operating System? Explain the functions of Operating System. **(Unit-IV, Q.No. 1, 3)**

OR

(b) Expalin the types of Operating system. **(Unit-IV, Q.No. 10)**

13. (a) What is Network? Explain the types of Networks. **(Unit-V, Q.No. 18, 23, 24 ,25)**

OR

(b) Explain Basic Network Devices. **(Unit-V, Q.No. 5)**

KAKATIYA UNIVERSITY

FACULTY OF COMMERCE

B.Com. I - Semester (CBCS) Examination

December - 2019

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time : 3 Hours] **[Max. Marks : 60**

Answer all questions in serial order

SECTION - A (5 × 3 = 15 Marks)

Answers

1. Answer any **FIVE** questions
   - (a) Define Computer. **(Unit-I, SQA-1)**
   - (b) Mainframe Computer. **(Unit-I, SQA-4)**
   - (c) What is Hexadecimal System? **(Unit-II, Q.No. 7)**
   - (d) What is Software? **(Unit-III, SQA-1)**
   - (e) What is a Spreadsheet? **(Unit-III, SQA-8)**
   - (f) What is DBMS? **(Unit-III, SQA-9)**
   - (g) What is Operating System? **(Unit-IV, SQA-1)**
   - (h) What is LAN? **(Unit-V, SQA-12)**

SECTION - B (5 × 9 = 45 Marks)

[Essay Answer Type]

Note: Answer all from the following questions.

2. (a) Explain the block diagram of a computer. **(Unit-I, Q.No. 4)**

   OR

   (b) Explain various output units. **(Unit-I, Q.No. 21)**

3. (a) Explain the steps involved in conversion of decimal number to octal number. **(Unit-II, Q.No. 8, 9)**

   OR

   (b) Explain various types of Primary memory. **(Unit-II, Q.No. 18)**

4. (a) What is system software? Explain its types. **(Unit-III, Q.No. 2, 3, 4, 5)**

   OR

   (b) What is Word Processing? Explain its features. **(Unit-III, Q.No. 13)**

12. (a) Explain different types of Operating System. **(Unit-IV, Q.No. 10)**

    OR

    (b) Explain the features of disk operating system. **(Unit-IV, Q.No. 21)**

13. (a) Explain various types of communication networks. **(Unit-V, Q.No. 8)**

    OR

    (b) Explain different types of network topology. **(Unit-V, Q.No. 28)**

FACULTIES OF COMMERCE

B.Com. I Year (CBCS) - I Semester Examination

MODEL PAPER - I

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time : $1^1/_2$ Hours] **[Max. Marks : 50**

SECTION - A (5 × 2 = 10 M)
Short Answer Type Questions. Answer any 5 Questions

Answers

1. Define Computer **(Unit-I, SQA.1)**
2. What is scanner ? **(Unit-I, SQA.12)**
3. What is data storage ? **(Unit-II, SQA.19)**
4. What is secondary storage ? **(Unit-II, SQA.7)**
5. What is Programming Language? **(Unit-III, SQA.4)**
6. Define Time Sharing ? **(Unit-IV, SQA.7)**
7. Define Data. **(Unit-V, SQA.1)**
8. Characteristics of Data Communication. **(Unit-V, SQA.3)**

SECTION - B (5 × 8 = 40 M)
Long Answer Type Questions

9. (a) Explain the classification of computers based on size and working principle. **(Unit-I, Q.No.6)**

OR

(b) What are the benefits and limitations of a computer ? **(Unit-I, Q.No.10)**

10. (a) What is number system ? Explain different types of number systems. **(Unit-II, Q.No.3)**

OR

(b) What are the differences between RAM and ROM ? **(Unit-II, Q.No.25)**

11. (a) What is software? Explain the features of software. **(Unit-III, Q.No.1)**

OR

(b) What is Spread Sheet ? Explain the uses of spread sheet. **(Unit-III, Q.No.16)**

12. (a) What is Operating System? What are the functions of Operating System? **(Unit-IV, Q.No.1, 3)**

OR

(b) Explain the various internal and external commands of disk operating system ? **(Unit-IV, Q.No.22)**

13. (a) Define communication. Explain the characteristics of communicaion. **(Unit-V, Q.No.2, 3)**

OR

(b) Explain briefly about TCPI / IP Model. **(Unit-V, Q.No.32)**

FACULTIES OF COMMERCE

B.Com. I Year (CBCS) - I Semester Examination

MODEL PAPER - II

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time : $1^1/_2$ Hours] **[Max. Marks : 50**

SECTION - A (5 × 2 = 10 M)
Short Answer Type Questions. Answer any 5 Questions

Answers

1. What is key board ? **(Unit-I, SQA.7)**
2. Optical Mouse **(Unit-I, SQA.11)**
3. What is primary storage ? **(Unit-II, SQA.6)**
4. Define Floppy Disk. **(Unit-II, SQA.16)**
5. What is Spread Sheet ? **(Unit-III, SQA.8)**
6. What is a Compiler ? **(Unit-IV, SQA.3)**
7. Verbal Communication. **(Unit-V, SQA.6)**
8. Bandwidth. **(Unit-V, SQA.8)**

SECTION - B (5 × 8 = 40 M)
Long Answer Type Questions

9. (a) Explain the various generations of computer. **(Unit-I, Q.No.5)**

OR

(b) Explain the various types of Input Devices. **(Unit-I, Q.No.11)**

10. (a) (i) What are binary arithmetic operations ? **(Unit-II, Q.No.2)**

(ii) What is decimal number system? **(Unit-II, Q.No. 6)**

OR

(b) Define magnetic disks. What are the different types of magnetic disks? **(Unit-II, Q.No.28)**

11. (a) What are utility programs ? **(Unit-III, Q.No.4)**

OR

(b) What are the Advantages of Word Processing? **(Unit-III, Q.No.14)**

12. (a) What do you understand by batch processing ? Explain advantages and disadvantages of batch processing ? **(Unit-IV, Q.No.9)**

OR

(b) (i) UNIX **(Unit-IV, Q.No.28)**

(ii) LINUX **(Unit-IV, Q.No. 29)**

13. (a) Explain the process of communication. **(Unit-V, Q.No.6)**

OR

(b) How communication satellites are used ? What advantages and disadvantages are there in using a communication satellite ? **(Unit-V, Q.No.14)**

FACULTIES OF COMMERCE

B.Com. I Year (CBCS) - I Semester Examination

MODEL PAPER - III

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time : $1^1/_2$ Hours] **[Max. Marks : 50**

SECTION - A (5 × 2 = 10 M)

Short Answer Type Questions. Answer any 5 Questions

Answers

1. Mainframe Computer **(Unit-I, SQA.4)**
2. Functions of Mouse **(Unit-I, SQA.10)**
3. What is read only memory? **(Unit-II, SQA.9)**
4. Non-Positional Number Systems **(Unit-II, SQA.2)**
5. What is Database Management System? **(Unit-III, SQA.9)**
6. What is Operating System ? **(Unit-IV, SQA.1)**
7. LAN **(Unit-V, SQA.12)**
8. Topology **(Unit-V, SQA.15)**

SECTION - B (5 × 8 = 40 M)

Long Answer Type Questions

9. (a) Define Computer. List and Explain some important characteristics of a computer. **(Unit-I, Q.No.1,2)**

OR

(b) What is impact printer ? Explain the different types of impact printers. **(Unit-I, Q.No.24)**

10. (a) Explain the relationship between decimal, hexadecimal, binary and octal. **(Unit-II, Q.No.16)**

OR

(b) (i) PROM **(Unit-II, Q.No.22)**

(ii) Optical Disk **(Unit-II, Q.No. 32)**

11. (a) What is meant by Application Software? **(Unit-III, Q.No.12)**

OR

(b) What is Graphics Software ? List some features normally supported in graphic software. **(Unit-III, Q.No.18)**

12. (a) Define Multi Programming. Explain how multi programming ensures effective utilization of Main Memory and CPU ? **(Unit-IV, Q.No. 11)**

OR

(b) What is Microsoft Windows ? What are the features of Microsoft Windows ? **(Unit-IV, Q.No.23)**

13. (a) Explain different types of topologies. **(Unit-V, Q.No.28)**

OR

(b) Explain briefly about OSI Model. **(Unit-V, Q.No.31)**

FACULTIES OF COMMERCE

B.Com. I Year (CBCS) - I Semester Examination

MODEL PAPER - I

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time : $1^1/_2$ Hours] **[Max. Marks : 50**

SECTION - A (5 × 2 = 10 M)
Short Answer Type Questions. Answer any 5 Questions

Answers

1. Define Computer **(Unit-I, SQA.1)**
2. What is scanner ? **(Unit-I, SQA.12)**
3. What is data storage ? **(Unit-II, SQA.19)**
4. What is secondary storage ? **(Unit-II, SQA.7)**
5. What is Programming Language? **(Unit-III, SQA.4)**
6. Define Time Sharing ? **(Unit-IV, SQA.7)**
7. Define Data. **(Unit-V, SQA.1)**
8. Characteristics of Data Communication. **(Unit-V, SQA.3)**

SECTION - B (5 × 8 = 40 M)
Long Answer Type Questions

9. (a) Explain the classification of computers based on size and working principle. **(Unit-I, Q.No.6)**

OR

(b) What are the benefits and limitations of a computer ? **(Unit-I, Q.No.10)**

10. (a) What is number system ? Explain different types of number systems. **(Unit-II, Q.No.3)**

OR

(b) What are the differences between RAM and ROM ? **(Unit-II, Q.No.25)**

11. (a) What is software? Explain the features of software. **(Unit-III, Q.No.1)**

OR

(b) What is Spread Sheet ? Explain the uses of spread sheet. **(Unit-III, Q.No.16)**

12. (a) What is Operating System? What are the functions of Operating System? **(Unit-IV, Q.No.1, 3)**

OR

(b) Explain the various internal and external commands of disk operating system ? **(Unit-IV, Q.No.22)**

13. (a) Define communication. Explain the characteristics of communicaion. **(Unit-V, Q.No.2, 3)**

OR

(b) Explain briefly about TCPI / IP Model. **(Unit-V, Q.No.32)**

FACULTIES OF COMMERCE

B.Com. I Year (CBCS) - I Semester Examination

MODEL PAPER - II

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time : $1^1/_2$ Hours] **[Max. Marks : 50**

SECTION - A (5 × 2 = 10 M)
Short Answer Type Questions. Answer any 5 Questions

Answers

1. What is key board ? **(Unit-I, SQA.7)**
2. Optical Mouse **(Unit-I, SQA.11)**
3. What is primary storage ? **(Unit-II, SQA.6)**
4. Define Floppy Disk. **(Unit-II, SQA.16)**
5. What is Spread Sheet ? **(Unit-III, SQA.8)**
6. What is a Compiler ? **(Unit-IV, SQA.3)**
7. Verbal Communication. **(Unit-V, SQA.6)**
8. Bandwidth. **(Unit-V, SQA.8)**

SECTION - B (5 × 8 = 40 M)
Long Answer Type Questions

9. (a) Explain the various generations of computer. **(Unit-I, Q.No.5)**

OR

(b) Explain the various types of Input Devices. **(Unit-I, Q.No.11)**

10. (a) (i) What are binary arithmetic operations ? **(Unit-II, Q.No.2)**

(ii) What is decimal number system? **(Unit-II, Q.No. 6)**

OR

(b) Define magnetic disks. What are the different types of magnetic disks? **(Unit-II, Q.No.28)**

11. (a) What are utility programs ? **(Unit-III, Q.No.4)**

OR

(b) What are the Advantages of Word Processing? **(Unit-III, Q.No.14)**

12. (a) What do you understand by batch processing ? Explain advantages and disadvantages of batch processing ? **(Unit-IV, Q.No.9)**

OR

(b) (i) UNIX **(Unit-IV, Q.No.28)**

(ii) LINUX **(Unit-IV, Q.No. 29)**

13. (a) Explain the process of communication. **(Unit-V, Q.No.6)**

OR

(b) How communication satellites are used ? What advantages and disadvantages are there in using a communication satellite ? **(Unit-V, Q.No.14)**

FACULTIES OF COMMERCE

B.Com. I Year (CBCS) - I Semester Examination

MODEL PAPER - III

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time : $1^1/_2$ Hours] **[Max. Marks : 50**

SECTION - A (5 × 2 = 10 M)

Short Answer Type Questions. Answer any 5 Questions

Answers

1. Mainframe Computer **(Unit-I, SQA.4)**
2. Functions of Mouse **(Unit-I, SQA.10)**
3. What is read only memory? **(Unit-II, SQA.9)**
4. Non-Positional Number Systems **(Unit-II, SQA.2)**
5. What is Database Management System? **(Unit-III, SQA.9)**
6. What is Operating System ? **(Unit-IV, SQA.1)**
7. LAN **(Unit-V, SQA.12)**
8. Topology **(Unit-V, SQA.15)**

SECTION - B (5 × 8 = 40 M)

Long Answer Type Questions

9. (a) Define Computer. List and Explain some important characteristics of a computer. **(Unit-I, Q.No.1,2)**

OR

(b) What is impact printer ? Explain the different types of impact printers. **(Unit-I, Q.No.24)**

10. (a) Explain the relationship between decimal, hexadecimal, binary and octal. **(Unit-II, Q.No.16)**

OR

(b) (i) PROM **(Unit-II, Q.No.22)**

(ii) Optical Disk **(Unit-II, Q.No. 32)**

11. (a) What is meant by Application Software? **(Unit-III, Q.No.12)**

OR

(b) What is Graphics Software ? List some features normally supported in graphic software. **(Unit-III, Q.No.18)**

12. (a) Define Multi Programming. Explain how multi programming ensures effective utilization of Main Memory and CPU ? **(Unit-IV, Q.No. 11)**

OR

(b) What is Microsoft Windows ? What are the features of Microsoft Windows ? **(Unit-IV, Q.No.23)**

13. (a) Explain different types of topologies. **(Unit-V, Q.No.28)**

OR

(b) Explain briefly about OSI Model. **(Unit-V, Q.No.31)**

FACULTIES OF COMMERCE

B.Com. I Year (CBCS) - I Semester Examination

MODEL PAPER - I

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time : $1^1/_2$ Hours] **[Max. Marks : 50**

SECTION - A (5 × 2 = 10 M)
Short Answer Type Questions. Answer any 5 Questions

Answers

1. Define Computer **(Unit-I, SQA.1)**
2. What is scanner ? **(Unit-I, SQA.12)**
3. What is data storage ? **(Unit-II, SQA.19)**
4. What is secondary storage ? **(Unit-II, SQA.7)**
5. What is Programming Language? **(Unit-III, SQA.4)**
6. Define Time Sharing ? **(Unit-IV, SQA.7)**
7. Define Data. **(Unit-V, SQA.1)**
8. Characteristics of Data Communication. **(Unit-V, SQA.3)**

SECTION - B (5 × 8 = 40 M)
Long Answer Type Questions

9. (a) Explain the classification of computers based on size and working principle. **(Unit-I, Q.No.6)**

OR

(b) What are the benefits and limitations of a computer ? **(Unit-I, Q.No.10)**

10. (a) What is number system ? Explain different types of number systems. **(Unit-II, Q.No.3)**

OR

(b) What are the differences between RAM and ROM ? **(Unit-II, Q.No.25)**

11. (a) What is software? Explain the features of software. **(Unit-III, Q.No.1)**

OR

(b) What is Spread Sheet ? Explain the uses of spread sheet. **(Unit-III, Q.No.16)**

12. (a) What is Operating System? What are the functions of Operating System? **(Unit-IV, Q.No.1, 3)**

OR

(b) Explain the various internal and external commands of disk operating system ? **(Unit-IV, Q.No.22)**

13. (a) Define communication. Explain the characteristics of communicaion. **(Unit-V, Q.No.2, 3)**

OR

(b) Explain briefly about TCPI / IP Model. **(Unit-V, Q.No.32)**

FACULTIES OF COMMERCE

B.Com. I Year (CBCS) - I Semester Examination

MODEL PAPER - II

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time : $1^1/_2$ Hours] **[Max. Marks : 50**

SECTION - A (5 × 2 = 10 M)
Short Answer Type Questions. Answer any 5 Questions

Answers

1. What is key board ? **(Unit-I, SQA.7)**
2. Optical Mouse **(Unit-I, SQA.11)**
3. What is primary storage ? **(Unit-II, SQA.6)**
4. Define Floppy Disk. **(Unit-II, SQA.16)**
5. What is Spread Sheet ? **(Unit-III, SQA.8)**
6. What is a Compiler ? **(Unit-IV, SQA.3)**
7. Verbal Communication. **(Unit-V, SQA.6)**
8. Bandwidth. **(Unit-V, SQA.8)**

SECTION - B (5 × 8 = 40 M)
Long Answer Type Questions

9. (a) Explain the various generations of computer. **(Unit-I, Q.No.5)**

OR

(b) Explain the various types of Input Devices. **(Unit-I, Q.No.11)**

10. (a) (i) What are binary arithmetic operations ? **(Unit-II, Q.No.2)**

(ii) What is decimal number system? **(Unit-II, Q.No. 6)**

OR

(b) Define magnetic disks. What are the different types of magnetic disks? **(Unit-II, Q.No.28)**

11. (a) What are utility programs ? **(Unit-III, Q.No.4)**

OR

(b) What are the Advantages of Word Processing? **(Unit-III, Q.No.14)**

12. (a) What do you understand by batch processing ? Explain advantages and disadvantages of batch processing ? **(Unit-IV, Q.No.9)**

OR

(b) (i) UNIX **(Unit-IV, Q.No.28)**

(ii) LINUX **(Unit-IV, Q.No. 29)**

13. (a) Explain the process of communication. **(Unit-V, Q.No.6)**

OR

(b) How communication satellites are used ? What advantages and disadvantages are there in using a communication satellite ? **(Unit-V, Q.No.14)**

FACULTIES OF COMMERCE

B.Com. I Year (CBCS) - I Semester Examination

MODEL PAPER - III

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time : $1^1/_2$ Hours] **[Max. Marks : 50**

SECTION - A (5 × 2 = 10 M)

Short Answer Type Questions. Answer any 5 Questions

Answers

1. Mainframe Computer **(Unit-I, SQA.4)**
2. Functions of Mouse **(Unit-I, SQA.10)**
3. What is read only memory? **(Unit-II, SQA.9)**
4. Non-Positional Number Systems **(Unit-II, SQA.2)**
5. What is Database Management System? **(Unit-III, SQA.9)**
6. What is Operating System ? **(Unit-IV, SQA.1)**
7. LAN **(Unit-V, SQA.12)**
8. Topology **(Unit-V, SQA.15)**

SECTION - B (5 × 8 = 40 M)

Long Answer Type Questions

9. (a) Define Computer. List and Explain some important characteristics of a computer. **(Unit-I, Q.No.1,2)**

OR

(b) What is impact printer ? Explain the different types of impact printers. **(Unit-I, Q.No.24)**

10. (a) Explain the relationship between decimal, hexadecimal, binary and octal. **(Unit-II, Q.No.16)**

OR

(b) (i) PROM **(Unit-II, Q.No.22)**

(ii) Optical Disk **(Unit-II, Q.No. 32)**

11. (a) What is meant by Application Software? **(Unit-III, Q.No.12)**

OR

(b) What is Graphics Software ? List some features normally supported in graphic software. **(Unit-III, Q.No.18)**

12. (a) Define Multi Programming. Explain how multi programming ensures effective utilization of Main Memory and CPU ? **(Unit-IV, Q.No. 11)**

OR

(b) What is Microsoft Windows ? What are the features of Microsoft Windows ? **(Unit-IV, Q.No.23)**

13. (a) Explain different types of topologies. **(Unit-V, Q.No.28)**

OR

(b) Explain briefly about OSI Model. **(Unit-V, Q.No.31)**

FACULTIES OF COMMERCE

B.Com. I Year (CBCS) - I Semester Examination

MODEL PAPER - I

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time : $1^1/_2$ Hours] **[Max. Marks : 50**

SECTION - A (5 × 2 = 10 M)
Short Answer Type Questions. Answer any 5 Questions

Answers

1. Define Computer **(Unit-I, SQA.1)**
2. What is scanner ? **(Unit-I, SQA.12)**
3. What is data storage ? **(Unit-II, SQA.19)**
4. What is secondary storage ? **(Unit-II, SQA.7)**
5. What is Programming Language? **(Unit-III, SQA.4)**
6. Define Time Sharing ? **(Unit-IV, SQA.7)**
7. Define Data. **(Unit-V, SQA.1)**
8. Characteristics of Data Communication. **(Unit-V, SQA.3)**

SECTION - B (5 × 8 = 40 M)
Long Answer Type Questions

9. (a) Explain the classification of computers based on size and working principle. **(Unit-I, Q.No.6)**

OR

(b) What are the benefits and limitations of a computer ? **(Unit-I, Q.No.10)**

10. (a) What is number system ? Explain different types of number systems. **(Unit-II, Q.No.3)**

OR

(b) What are the differences between RAM and ROM ? **(Unit-II, Q.No.25)**

11. (a) What is software? Explain the features of software. **(Unit-III, Q.No.1)**

OR

(b) What is Spread Sheet ? Explain the uses of spread sheet. **(Unit-III, Q.No.16)**

12. (a) What is Operating System? What are the functions of Operating System? **(Unit-IV, Q.No.1, 3)**

OR

(b) Explain the various internal and external commands of disk operating system ? **(Unit-IV, Q.No.22)**

13. (a) Define communication. Explain the characteristics of communicaion. **(Unit-V, Q.No.2, 3)**

OR

(b) Explain briefly about TCPI / IP Model. **(Unit-V, Q.No.32)**

FACULTIES OF COMMERCE

B.Com. I Year (CBCS) - I Semester Examination

MODEL PAPER - II

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time : $1^1/_2$ Hours] **[Max. Marks : 50**

SECTION - A (5 × 2 = 10 M)
Short Answer Type Questions. Answer any 5 Questions

Answers

1. What is key board ? **(Unit-I, SQA.7)**
2. Optical Mouse **(Unit-I, SQA.11)**
3. What is primary storage ? **(Unit-II, SQA.6)**
4. Define Floppy Disk. **(Unit-II, SQA.16)**
5. What is Spread Sheet ? **(Unit-III, SQA.8)**
6. What is a Compiler ? **(Unit-IV, SQA.3)**
7. Verbal Communication. **(Unit-V, SQA.6)**
8. Bandwidth. **(Unit-V, SQA.8)**

SECTION - B (5 × 8 = 40 M)
Long Answer Type Questions

9. (a) Explain the various generations of computer. **(Unit-I, Q.No.5)**

OR

(b) Explain the various types of Input Devices. **(Unit-I, Q.No.11)**

10. (a) (i) What are binary arithmetic operations ? **(Unit-II, Q.No.2)**

(ii) What is decimal number system? **(Unit-II, Q.No. 6)**

OR

(b) Define magnetic disks. What are the different types of magnetic disks? **(Unit-II, Q.No.28)**

11. (a) What are utility programs ? **(Unit-III, Q.No.4)**

OR

(b) What are the Advantages of Word Processing? **(Unit-III, Q.No.14)**

12. (a) What do you understand by batch processing ? Explain advantages and disadvantages of batch processing ? **(Unit-IV, Q.No.9)**

OR

(b) (i) UNIX **(Unit-IV, Q.No.28)**

(ii) LINUX **(Unit-IV, Q.No. 29)**

13. (a) Explain the process of communication. **(Unit-V, Q.No.6)**

OR

(b) How communication satellites are used ? What advantages and disadvantages are there in using a communication satellite ? **(Unit-V, Q.No.14)**

FACULTIES OF COMMERCE

B.Com. I Year (CBCS) - I Semester Examination

MODEL PAPER - III

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time : $1^1/_2$ Hours] **[Max. Marks : 50**

SECTION - A (5 × 2 = 10 M)

Short Answer Type Questions. Answer any 5 Questions

Answers

1. Mainframe Computer **(Unit-I, SQA.4)**
2. Functions of Mouse **(Unit-I, SQA.10)**
3. What is read only memory? **(Unit-II, SQA.9)**
4. Non-Positional Number Systems **(Unit-II, SQA.2)**
5. What is Database Management System? **(Unit-III, SQA.9)**
6. What is Operating System ? **(Unit-IV, SQA.1)**
7. LAN **(Unit-V, SQA.12)**
8. Topology **(Unit-V, SQA.15)**

SECTION - B (5 × 8 = 40 M)

Long Answer Type Questions

9. (a) Define Computer. List and Explain some important characteristics of a computer. **(Unit-I, Q.No.1,2)**

OR

(b) What is impact printer ? Explain the different types of impact printers. **(Unit-I, Q.No.24)**

10. (a) Explain the relationship between decimal, hexadecimal, binary and octal. **(Unit-II, Q.No.16)**

OR

(b) (i) PROM **(Unit-II, Q.No.22)**

(ii) Optical Disk **(Unit-II, Q.No. 32)**

11. (a) What is meant by Application Software? **(Unit-III, Q.No.12)**

OR

(b) What is Graphics Software ? List some features normally supported in graphic software. **(Unit-III, Q.No.18)**

12. (a) Define Multi Programming. Explain how multi programming ensures effective utilization of Main Memory and CPU ? **(Unit-IV, Q.No. 11)**

OR

(b) What is Microsoft Windows ? What are the features of Microsoft Windows ? **(Unit-IV, Q.No.23)**

13. (a) Explain different types of topologies. **(Unit-V, Q.No.28)**

OR

(b) Explain briefly about OSI Model. **(Unit-V, Q.No.31)**

FACULTIES OF COMMERCE

B.Com. I Year (CBCS) - I Semester Examination

MODEL PAPER - I

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time : $1^1/_2$ Hours] **[Max. Marks : 50**

SECTION - A (5 × 2 = 10 M)
Short Answer Type Questions. Answer any 5 Questions

Answers

1. Define Computer **(Unit-I, SQA.1)**
2. What is scanner ? **(Unit-I, SQA.12)**
3. What is data storage ? **(Unit-II, SQA.19)**
4. What is secondary storage ? **(Unit-II, SQA.7)**
5. What is Programming Language? **(Unit-III, SQA.4)**
6. Define Time Sharing ? **(Unit-IV, SQA.7)**
7. Define Data. **(Unit-V, SQA.1)**
8. Characteristics of Data Communication. **(Unit-V, SQA.3)**

SECTION - B (5 × 8 = 40 M)
Long Answer Type Questions

9. (a) Explain the classification of computers based on size and working principle. **(Unit-I, Q.No.6)**

OR

(b) What are the benefits and limitations of a computer ? **(Unit-I, Q.No.10)**

10. (a) What is number system ? Explain different types of number systems. **(Unit-II, Q.No.3)**

OR

(b) What are the differences between RAM and ROM ? **(Unit-II, Q.No.25)**

11. (a) What is software? Explain the features of software. **(Unit-III, Q.No.1)**

OR

(b) What is Spread Sheet ? Explain the uses of spread sheet. **(Unit-III, Q.No.16)**

12. (a) What is Operating System? What are the functions of Operating System? **(Unit-IV, Q.No.1, 3)**

OR

(b) Explain the various internal and external commands of disk operating system ? **(Unit-IV, Q.No.22)**

13. (a) Define communication. Explain the characteristics of communicaion. **(Unit-V, Q.No.2, 3)**

OR

(b) Explain briefly about TCPI / IP Model. **(Unit-V, Q.No.32)**

FACULTIES OF COMMERCE

B.Com. I Year (CBCS) - I Semester Examination

MODEL PAPER - II

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time : $1^1/_2$ Hours] **[Max. Marks : 50**

SECTION - A (5 × 2 = 10 M)
Short Answer Type Questions. Answer any 5 Questions

Answers

1. What is key board ? **(Unit-I, SQA.7)**
2. Optical Mouse **(Unit-I, SQA.11)**
3. What is primary storage ? **(Unit-II, SQA.6)**
4. Define Floppy Disk. **(Unit-II, SQA.16)**
5. What is Spread Sheet ? **(Unit-III, SQA.8)**
6. What is a Compiler ? **(Unit-IV, SQA.3)**
7. Verbal Communication. **(Unit-V, SQA.6)**
8. Bandwidth. **(Unit-V, SQA.8)**

SECTION - B (5 × 8 = 40 M)
Long Answer Type Questions

9. (a) Explain the various generations of computer. **(Unit-I, Q.No.5)**

OR

(b) Explain the various types of Input Devices. **(Unit-I, Q.No.11)**

10. (a) (i) What are binary arithmetic operations ? **(Unit-II, Q.No.2)**

(ii) What is decimal number system? **(Unit-II, Q.No. 6)**

OR

(b) Define magnetic disks. What are the different types of magnetic disks? **(Unit-II, Q.No.28)**

11. (a) What are utility programs ? **(Unit-III, Q.No.4)**

OR

(b) What are the Advantages of Word Processing? **(Unit-III, Q.No.14)**

12. (a) What do you understand by batch processing ? Explain advantages and disadvantages of batch processing ? **(Unit-IV, Q.No.9)**

OR

(b) (i) UNIX **(Unit-IV, Q.No.28)**

(ii) LINUX **(Unit-IV, Q.No. 29)**

13. (a) Explain the process of communication. **(Unit-V, Q.No.6)**

OR

(b) How communication satellites are used ? What advantages and disadvantages are there in using a communication satellite ? **(Unit-V, Q.No.14)**

FACULTIES OF COMMERCE

B.Com. I Year (CBCS) - I Semester Examination

MODEL PAPER - III

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time : $1^1/_2$ Hours] **[Max. Marks : 50**

SECTION - A (5 × 2 = 10 M)

Short Answer Type Questions. Answer any 5 Questions

Answers

1. Mainframe Computer **(Unit-I, SQA.4)**
2. Functions of Mouse **(Unit-I, SQA.10)**
3. What is read only memory? **(Unit-II, SQA.9)**
4. Non-Positional Number Systems **(Unit-II, SQA.2)**
5. What is Database Management System? **(Unit-III, SQA.9)**
6. What is Operating System ? **(Unit-IV, SQA.1)**
7. LAN **(Unit-V, SQA.12)**
8. Topology **(Unit-V, SQA.15)**

SECTION - B (5 × 8 = 40 M)

Long Answer Type Questions

9. (a) Define Computer. List and Explain some important characteristics of a computer. **(Unit-I, Q.No.1,2)**

OR

(b) What is impact printer ? Explain the different types of impact printers. **(Unit-I, Q.No.24)**

10. (a) Explain the relationship between decimal, hexadecimal, binary and octal. **(Unit-II, Q.No.16)**

OR

(b) (i) PROM **(Unit-II, Q.No.22)**

(ii) Optical Disk **(Unit-II, Q.No. 32)**

11. (a) What is meant by Application Software? **(Unit-III, Q.No.12)**

OR

(b) What is Graphics Software ? List some features normally supported in graphic software. **(Unit-III, Q.No.18)**

12. (a) Define Multi Programming. Explain how multi programming ensures effective utilization of Main Memory and CPU ? **(Unit-IV, Q.No. 11)**

OR

(b) What is Microsoft Windows ? What are the features of Microsoft Windows ? **(Unit-IV, Q.No.23)**

13. (a) Explain different types of topologies. **(Unit-V, Q.No.28)**

OR

(b) Explain briefly about OSI Model. **(Unit-V, Q.No.31)**

FACULTIES OF COMMERCE

B.Com. I Year (CBCS) - I Semester Examination

MODEL PAPER - I

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time : $1^1/_2$ Hours] **[Max. Marks : 50**

SECTION - A (5 × 2 = 10 M)
Short Answer Type Questions. Answer any 5 Questions

Answers

1. Define Computer **(Unit-I, SQA.1)**
2. What is scanner ? **(Unit-I, SQA.12)**
3. What is data storage ? **(Unit-II, SQA.19)**
4. What is secondary storage ? **(Unit-II, SQA.7)**
5. What is Programming Language? **(Unit-III, SQA.4)**
6. Define Time Sharing ? **(Unit-IV, SQA.7)**
7. Define Data. **(Unit-V, SQA.1)**
8. Characteristics of Data Communication. **(Unit-V, SQA.3)**

SECTION - B (5 × 8 = 40 M)
Long Answer Type Questions

9. (a) Explain the classification of computers based on size and working principle. **(Unit-I, Q.No.6)**

OR

(b) What are the benefits and limitations of a computer ? **(Unit-I, Q.No.10)**

10. (a) What is number system ? Explain different types of number systems. **(Unit-II, Q.No.3)**

OR

(b) What are the differences between RAM and ROM ? **(Unit-II, Q.No.25)**

11. (a) What is software? Explain the features of software. **(Unit-III, Q.No.1)**

OR

(b) What is Spread Sheet ? Explain the uses of spread sheet. **(Unit-III, Q.No.16)**

12. (a) What is Operating System? What are the functions of Operating System? **(Unit-IV, Q.No.1, 3)**

OR

(b) Explain the various internal and external commands of disk operating system ? **(Unit-IV, Q.No.22)**

13. (a) Define communication. Explain the characteristics of communicaion. **(Unit-V, Q.No.2, 3)**

OR

(b) Explain briefly about TCPI / IP Model. **(Unit-V, Q.No.32)**

FACULTIES OF COMMERCE

B.Com. I Year (CBCS) - I Semester Examination

MODEL PAPER - II

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time : $1^1/_2$ Hours] **[Max. Marks : 50**

SECTION - A (5 × 2 = 10 M)
Short Answer Type Questions. Answer any 5 Questions

Answers

1. What is key board ? **(Unit-I, SQA.7)**
2. Optical Mouse **(Unit-I, SQA.11)**
3. What is primary storage ? **(Unit-II, SQA.6)**
4. Define Floppy Disk. **(Unit-II, SQA.16)**
5. What is Spread Sheet ? **(Unit-III, SQA.8)**
6. What is a Compiler ? **(Unit-IV, SQA.3)**
7. Verbal Communication. **(Unit-V, SQA.6)**
8. Bandwidth. **(Unit-V, SQA.8)**

SECTION - B (5 × 8 = 40 M)
Long Answer Type Questions

9. (a) Explain the various generations of computer. **(Unit-I, Q.No.5)**

OR

(b) Explain the various types of Input Devices. **(Unit-I, Q.No.11)**

10. (a) (i) What are binary arithmetic operations ? **(Unit-II, Q.No.2)**

(ii) What is decimal number system? **(Unit-II, Q.No. 6)**

OR

(b) Define magnetic disks. What are the different types of magnetic disks? **(Unit-II, Q.No.28)**

11. (a) What are utility programs ? **(Unit-III, Q.No.4)**

OR

(b) What are the Advantages of Word Processing? **(Unit-III, Q.No.14)**

12. (a) What do you understand by batch processing ? Explain advantages and disadvantages of batch processing ? **(Unit-IV, Q.No.9)**

OR

(b) (i) UNIX **(Unit-IV, Q.No.28)**

(ii) LINUX **(Unit-IV, Q.No. 29)**

13. (a) Explain the process of communication. **(Unit-V, Q.No.6)**

OR

(b) How communication satellites are used ? What advantages and disadvantages are there in using a communication satellite ? **(Unit-V, Q.No.14)**

FACULTIES OF COMMERCE

B.Com. I Year (CBCS) - I Semester Examination

MODEL PAPER - III

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time : $1^1/_2$ Hours] **[Max. Marks : 50**

SECTION - A (5 × 2 = 10 M)

Short Answer Type Questions. Answer any 5 Questions

Answers

1. Mainframe Computer **(Unit-I, SQA.4)**
2. Functions of Mouse **(Unit-I, SQA.10)**
3. What is read only memory? **(Unit-II, SQA.9)**
4. Non-Positional Number Systems **(Unit-II, SQA.2)**
5. What is Database Management System? **(Unit-III, SQA.9)**
6. What is Operating System ? **(Unit-IV, SQA.1)**
7. LAN **(Unit-V, SQA.12)**
8. Topology **(Unit-V, SQA.15)**

SECTION - B (5 × 8 = 40 M)

Long Answer Type Questions

9. (a) Define Computer. List and Explain some important characteristics of a computer. **(Unit-I, Q.No.1,2)**

OR

(b) What is impact printer ? Explain the different types of impact printers. **(Unit-I, Q.No.24)**

10. (a) Explain the relationship between decimal, hexadecimal, binary and octal. **(Unit-II, Q.No.16)**

OR

(b) (i) PROM **(Unit-II, Q.No.22)**

(ii) Optical Disk **(Unit-II, Q.No. 32)**

11. (a) What is meant by Application Software? **(Unit-III, Q.No.12)**

OR

(b) What is Graphics Software ? List some features normally supported in graphic software. **(Unit-III, Q.No.18)**

12. (a) Define Multi Programming. Explain how multi programming ensures effective utilization of Main Memory and CPU ? **(Unit-IV, Q.No. 11)**

OR

(b) What is Microsoft Windows ? What are the features of Microsoft Windows ? **(Unit-IV, Q.No.23)**

13. (a) Explain different types of topologies. **(Unit-V, Q.No.28)**

OR

(b) Explain briefly about OSI Model. **(Unit-V, Q.No.31)**

FACULTIES OF COMMERCE

B.Com. I Year (CBCS) - I Semester Examination

MODEL PAPER - I

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time : $1^1/_2$ Hours] **[Max. Marks : 50**

SECTION - A (5 × 2 = 10 M)
Short Answer Type Questions. Answer any 5 Questions

Answers

1. Define Computer **(Unit-I, SQA.1)**
2. What is scanner ? **(Unit-I, SQA.12)**
3. What is data storage ? **(Unit-II, SQA.19)**
4. What is secondary storage ? **(Unit-II, SQA.7)**
5. What is Programming Language? **(Unit-III, SQA.4)**
6. Define Time Sharing ? **(Unit-IV, SQA.7)**
7. Define Data. **(Unit-V, SQA.1)**
8. Characteristics of Data Communication. **(Unit-V, SQA.3)**

SECTION - B (5 × 8 = 40 M)
Long Answer Type Questions

9. (a) Explain the classification of computers based on size and working principle. **(Unit-I, Q.No.6)**

OR

(b) What are the benefits and limitations of a computer ? **(Unit-I, Q.No.10)**

10. (a) What is number system ? Explain different types of number systems. **(Unit-II, Q.No.3)**

OR

(b) What are the differences between RAM and ROM ? **(Unit-II, Q.No.25)**

11. (a) What is software? Explain the features of software. **(Unit-III, Q.No.1)**

OR

(b) What is Spread Sheet ? Explain the uses of spread sheet. **(Unit-III, Q.No.16)**

12. (a) What is Operating System? What are the functions of Operating System? **(Unit-IV, Q.No.1, 3)**

OR

(b) Explain the various internal and external commands of disk operating system ? **(Unit-IV, Q.No.22)**

13. (a) Define communication. Explain the characteristics of communicaion. **(Unit-V, Q.No.2, 3)**

OR

(b) Explain briefly about TCPI / IP Model. **(Unit-V, Q.No.32)**

FACULTIES OF COMMERCE

B.Com. I Year (CBCS) - I Semester Examination

MODEL PAPER - II

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time : $1^1/_2$ Hours] **[Max. Marks : 50**

SECTION - A (5 × 2 = 10 M)
Short Answer Type Questions. Answer any 5 Questions

Answers

1. What is key board ? **(Unit-I, SQA.7)**
2. Optical Mouse **(Unit-I, SQA.11)**
3. What is primary storage ? **(Unit-II, SQA.6)**
4. Define Floppy Disk. **(Unit-II, SQA.16)**
5. What is Spread Sheet ? **(Unit-III, SQA.8)**
6. What is a Compiler ? **(Unit-IV, SQA.3)**
7. Verbal Communication. **(Unit-V, SQA.6)**
8. Bandwidth. **(Unit-V, SQA.8)**

SECTION - B (5 × 8 = 40 M)
Long Answer Type Questions

9. (a) Explain the various generations of computer. **(Unit-I, Q.No.5)**

OR

(b) Explain the various types of Input Devices. **(Unit-I, Q.No.11)**

10. (a) (i) What are binary arithmetic operations ? **(Unit-II, Q.No.2)**

(ii) What is decimal number system? **(Unit-II, Q.No. 6)**

OR

(b) Define magnetic disks. What are the different types of magnetic disks? **(Unit-II, Q.No.28)**

11. (a) What are utility programs ? **(Unit-III, Q.No.4)**

OR

(b) What are the Advantages of Word Processing? **(Unit-III, Q.No.14)**

12. (a) What do you understand by batch processing ? Explain advantages and disadvantages of batch processing ? **(Unit-IV, Q.No.9)**

OR

(b) (i) UNIX **(Unit-IV, Q.No.28)**

(ii) LINUX **(Unit-IV, Q.No. 29)**

13. (a) Explain the process of communication. **(Unit-V, Q.No.6)**

OR

(b) How communication satellites are used ? What advantages and disadvantages are there in using a communication satellite ? **(Unit-V, Q.No.14)**

FACULTIES OF COMMERCE

B.Com. I Year (CBCS) - I Semester Examination

MODEL PAPER - III

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time : $1^1/_2$ Hours] **[Max. Marks : 50**

SECTION - A (5 × 2 = 10 M)

Short Answer Type Questions. Answer any 5 Questions

Answers

1. Mainframe Computer **(Unit-I, SQA.4)**
2. Functions of Mouse **(Unit-I, SQA.10)**
3. What is read only memory? **(Unit-II, SQA.9)**
4. Non-Positional Number Systems **(Unit-II, SQA.2)**
5. What is Database Management System? **(Unit-III, SQA.9)**
6. What is Operating System ? **(Unit-IV, SQA.1)**
7. LAN **(Unit-V, SQA.12)**
8. Topology **(Unit-V, SQA.15)**

SECTION - B (5 × 8 = 40 M)

Long Answer Type Questions

9. (a) Define Computer. List and Explain some important characteristics of a computer. **(Unit-I, Q.No.1,2)**

OR

(b) What is impact printer ? Explain the different types of impact printers. **(Unit-I, Q.No.24)**

10. (a) Explain the relationship between decimal, hexadecimal, binary and octal. **(Unit-II, Q.No.16)**

OR

(b) (i) PROM **(Unit-II, Q.No.22)**

(ii) Optical Disk **(Unit-II, Q.No. 32)**

11. (a) What is meant by Application Software? **(Unit-III, Q.No.12)**

OR

(b) What is Graphics Software ? List some features normally supported in graphic software. **(Unit-III, Q.No.18)**

12. (a) Define Multi Programming. Explain how multi programming ensures effective utilization of Main Memory and CPU ? **(Unit-IV, Q.No. 11)**

OR

(b) What is Microsoft Windows ? What are the features of Microsoft Windows ? **(Unit-IV, Q.No.23)**

13. (a) Explain different types of topologies. **(Unit-V, Q.No.28)**

OR

(b) Explain briefly about OSI Model. **(Unit-V, Q.No.31)**