5

INTRODUCTION TO COMPUTERS

The modern world characterized by technological advancement, employs a wide variety of computer systems varying in size, complexity and power. The term 'Computer' can logically be applied to any calculating device. But in common parlance, it refers to an electronic device that accepts information, process it, manipulate its qualities and provides the output to the end-user. It allows us to handle many tedious and routine problems. At present computers are widely used in industries, business, government departments, hospitals, educational institutions, and research organizations.

Characteristics of Computers

The distinguishing features of a computer, which increase its necessity in modern society are:

1. Computer is an electronic device using components like transistors, resistors, diodes, etc.
2. It facilitates complex and repetitive calculations without causing boredom.
3. It helps to make comparisons of statements with others and to make appropriate decisions.
4. It accepts inputs, stores them and converts them into outputs, by performing manipulations on input data.
5. A computer can perform various arithmetic functions such as addition, subtraction, multiplication and division.

6. It can keep a model programme which can be used in different situations.
7. It stores huge amounts of data and instructions and supplies them to the end-user as and when required.
8. It provides data in the form of graphs, reports etc.
9. A computer, unlike a human being, doesn't require any rest.
10. It operates very fast to carry out instructions when compared to human beings and other electronic and mechanical devices.
11. It is possible for the computer to change the stored programme of instructions during the time of execution of projects.
12. Computers are automatic in the sense that, once we give instructions to them they perform all necessary tasks until we stop instructions.
13. Computers are small enough to be held in hand and are less expensive in nature.
14. A computer helps to transmit information to different parts of the world.
15. Computers also provide certain intangible benefits such as attracting consumers to buy a product, a service, etc.

Computer Fundamentals

A computer system consists of three sets of components. They are:

1. Basic Component: Basic components of a computer comprise five individual units, such as:

(a) Input unit,

(b) Memory ,

(c) Arithmetical and Logical unit (ALU),

(d) Output unit, and

(e) Control unit.

Memory, Arithmetic and Logical unit, and control unit are together called the Central Processing Unit (CPU) of a computer.

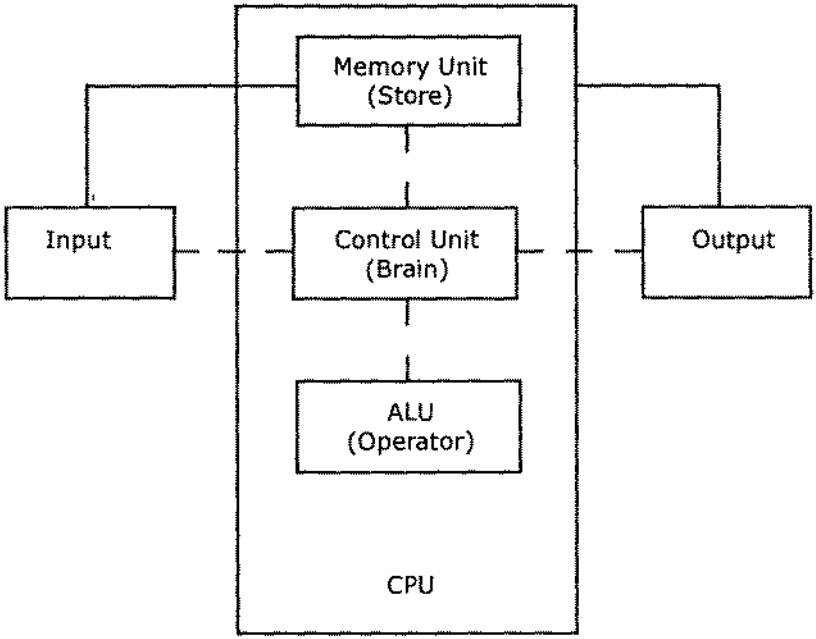

Fig. 5.1: Components of a computer

2. Input - Output devices.

3. Auxiliary / secondary storage units.

Computer Hardware

Computer hardware refers to the components of a computer or the operating pieces in a computer, which we can see, touch and feel, and include: the central processor, printer and CRT terminal. The hardware components of a computer are made up of a number of electronic and mechanical devices. Generally, there are six classes of computer hardware. They are:

1. Desk calculators: They have the ability to accept keyboard inputs, store a moderate size information, process and manipulate it, and finally print the output in a serial printer or on a paper tape. The name of Hewlett Packard is associated with the development of this class of hardware.

2. Personal computers: The personal computer is composed of a keyboard, screen, printer and very small disk storage capacity. It can be used only by a single user at a time (used in a one-to-one situation).

3. Central processor: Central processors are of two types:

(a) General-purpose central processor: This type of central processors range from micros to mainframes.

(b) Special-purpose central processor: These include scientific processors having very high internal speed and floating-point scientific units. They are characterized by the ability to perform high-precision mathematical calculations. They are directed towards specific purposes or jobs, like typesetting and numerical control. They are special versions of scientific or analog processors; having special micro-coded instructions which enable them to perform the specialized application for which they are intended.

4. Peripheral devices: These refer to equipment items required to accept the input and provide the output to the end-user. The input devices include keyboard, visual display screen (Cathode Ray Tube (CRT), optical and magnetic fonts like, bar code and magnetic characters found on bank cheques. The output devices are printers, CRTs., Computer Output Micro film (COM) etc.

5. Storage devices: Storage devices are of two types, namely, primary storage devices and secondary storage devices. The main memory of the computer is called the primary storage device. Secondary storage devices form the auxiliary memory of a computer, which consists of magnetic tape, magnetic disk or hard disk, floppy disk, optical disk (CD ROM) DVD ROMs, (Digital Video Disk), etc.

6. Work stations: It is a device, which enables the power of MIS to expand to remote sites, to offices, to factories throughout a company's operating net work. Normally, it is both an input and output device. In its advanced form, work station is an information satellite, processing data in its own right and communicating the information to a remote and larger host system. It can be divided into two types:

1. Office-environment work station: It uses a combination of CRT terminals, output printers, disk storage and a central processor, to accomplish the routine data processing functions and also to communicate with other computers in the network. The workstation can be located in an office, point-of-sale, office automation center, or in a home environment.

2. Factory-environment work station: In the factory, both general purpose and point-of-transaction workstation are prevalent. In this type of work stations, units produced, time, employee identification, etc. are recorded at collection points in the production process and the data is processed or communicated to a host computer.

The functions of computer hardware include:

(a) Input,

(b) Output,

(c) Secondary storage,

(d) Computation, control and primary storage,

(e) Data communications, and

(f) Data preparation.

The Visual Display Terminal (VDT), used for the display of data can be of two types:

Intelligent terminal: This type VDT can perform data processing and input validation, store information, operate offline, and keep records of transactions for subsequent transmission.

Dumb terminal: This terminal performs processing or storage activity. They can only receive and send data.

Types of Computers

On the basis of operating principles, computers are classified into three categories:

1. Digital computers: A computer which can posses information and perform computations using symbols or digits is called a digital computer. They evaluate arithmetic calculations, expressions, manipulations of data etc. with the help of binary codes.

2. Analog computers: The Analog Computers is a device, which calculates data, which changes continuously like speed, time, temperature, etc. These computers draw a similarity (analogy) between the object being represented and the computer representation.

3. Hybrid computers: These computers are capable of possessing both analog and digital data. For instance, the computers used in a hospital intensive-care unit can measure the temperature, heart function, etc., of the patients and convert them into numbers that give the patient's vital signs.

On the basis of their application, computers can be classified into two categories:

1. Special purpose computers: A special purpose computer serves only a particular task. It uses instructions stored internally to perform the specific task, using a single command. For instance, computers used in TV sets, camera, etc., perform only the special tasks assigned to them.

2. General purpose computers: A computer of this description is applicable to different situations. It does not contain instructions to perform a specific task in its memory. On the other hand, when one job is finished, instructions for another job can be entered into the memory. All computers other than those used as parts of other appliances are of this type.

General-purpose computers are again classified into five sub-categories. They are:

1. Super computers: These are high-speed computers, which have large storage capacities and are more powerful than mainframes. They are ten times faster than mainframe computers. The speed of a super computer is measured in billions of floating point operations per second. The main applications of the super computer include cryptography, medicine, computer animations, weather predictions, petroleum engineering, etc.

2. Large-scale computers or mainframes: These computers have very large storage capacities and high speed of processing. They are also called central host-computer since they support a large number of terminals simultaneously. Their applications include: military services, aerospace corporation works, and weather predictions.

3. Medium-scale computers: Their storage capacity and speed are lower than that of mainframes.

4. Mini computers: They are small and inexpensive. They fall in between mainframes and microcomputers in power and cost. They are designed to serve many uses simultaneously. Minicomputers support online processing from multiple remote locations and are widely used in business organizations.

5. Microcomputers: These are very small computers intended for office and personal use. Microcomputers are self-contained and can be used only by one person at a time.

They are also called personal computers. the operating system of micro-computers is simple and they have very small storage capacity.

Depending upon size, computers are classified into following categories:

1. Desktop computers: They are small enough to be fixed on the top of a desk and can be controlled by a person sitting in front of the machine

2. Tower computers: They are the biggest type of P.C and can be set on the floor.

3. Laptop computers: These are portable computers; they are too big to go into a briefcase, but small enough to be carried. They are called laptops because they can be placed on our lap, and are light enough to allow blood to flow through our legs.

4. Notebook computers: Notebook computers are smaller versions of laptops. They can be carried in a briefcase.

S. Subnotebook computers: These are smaller than notebooks and look like calculators; they serve specific purposes like running a single program.

Computer Software

Software refers to the set of instructions that direct the hardware to operate. The set of instructions for a specific task is called a routine, while those require to perform a related set of tasks is called a program. Software instructions are otherwise called code. Computer software is divided into two categories. They are:

1. System software: It is an operating system closely attached to the computer, and designed to assist the programmer in executing application programs and in transforming an application into a machine language,. More over it helps the computer operator in scheduling and running the computer efficiently. Normally, it is provided by the hardware vender, instead of the buyer being required to develop it internally. System softwares are of the following types:

(a) Languages: They are used by the programmer to express a specific job to be performed. Languages can again be divided into two. They are:

(i) Machine: oriented languages which are tied to the specific characteristic of a computer, and

(ii) Higher: level languages enabling to execute the programs written in the language on different computers and are English language-orented and standardized. COBOL, FORTRAN, BASIC, etc. are examples of high - level languages.

(b) Utilities: These are programs assisting the programmer in carrying out common functions like sorting, collecting, auditing and checking routines, etc.

(c) Conversion: Conversion software aids the transfer of data and programs from one computer system to another and helps to interchange data files or to replace one computer with another.

(d) Dperating systems: Operating Systems monitor the internal activities by residing in the computer memory, and manage the execution of programs and help in economical scheduling and allocation of resources in performing a set of tasks.

(e) Database management systems: They provide the facility of managing and controlling the integrated database. The functions of DBMS software include the ability to organize, capture, update and retrieve data from information files. They are purchased separately either from the hardware vendor or from an independent software vender.

(f) Programming/Dperational aids: They are software techniques enabling the programmers to achieve their jobs in a speedy manner. Automatic flow-charting programs are examples of programming aids.

(g) Distributed Data Processing (DDP) networks: This type of softwares helps to ensure that the various systems tied to the network communicate and co-operate.

2. Application software: They are computer programs written for a specific application like payroll processing. Application softwares are the end-products, utilizing the system software in their execution. Application software can again be divided into two categories:

(a) Business application software: These are also called application packages. A business application package is developed for a general application, to which a general

solution is applicable, and can be used for a wide group of customers. Packages are available in three business areas like operational control, management control and strategic planning. The importance of business application package is more in operational control area, medium in management control area, and much use in strategic planning. Packages are available for production scheduling, sales forecasting, and business and financial model building.

(b) Scientific application software: It is similar to business application software. This softwares are available in five areas. They are:

(i) Management Science: It includes packages such as linear programming, Inventory control, revenue modeling, forecasting, etc.

(ii) Statistics: These are packages for specialized mathematical and statistical functions like regression analysis, ANOVA, Chi-square, etc.

(iii) Project Control: It includes software for PERT, CPM, etc.

(iv) Numerical Control: They are general programs to produce tapes that automatically control a wide variety of machine tools. APT and ADAPT packages are examples of numerical control packages.

(v) Engineering Science: It includes software for stress and failure analysis, co-ordinate geometry program, etc. Also packages are available in the area of computer Aided Design (CAD).

Since the cost of developing application software is very high, normally it is duly sold or leased by companies with expertise in software development. Generally, application packages are purchased and then internal development is made in the packages to suit the unique needs of the organization.

Memory

Memory of a computer can be divided into two. They are:

1. Main memories or Primary memory: It is the memory or storage capacity within the computer system. It provides speedy access storage and processing of stored data. But it is highly expensive and can have limited storage capacity. It is highly useful in data processing.

2. Auxiliary memories or Secondary memory: It is the memory or storage capacity of external devices which can be utilized in a computer system. It is non-volatile and possesses long-term greater storage capacity at lower cost. But the accessing speed is very low in the case of auxiliary memory, when compared to main memory. It is highly useful for permanent storage.

Storage and Retrieval of Data

Since the accessing speed of secondary storage is very low, in common practice, data are transformed to the main memory for processing and are then returned to the auxiliary memory for permanent storage. Secondary storage devices are mainly of two types. They are magnetic disks and magnetic tapes. The important secondary storage devices are:

1. Floppy Disk (FD): This is a very small storage device, which can be used as both input medium and output medium. This is made of elastic, plastic material and is coated with magnetic oxide. This disk is placed in plastic cover to avoid damage. The floppy is available in three standard sizes of 8", 5.5", and 3.5". The storage capacity of each floppy is different. Therefore, while selecting a floppy the amount of data, which can be stored, is to be taken into consideration.

Floppy size	*Storage capacity*
1. 8 inches	250 K.B - 1.5 M.B
2. 5.5 inches	125 K.B - 1 M.B
3. 3.5 inches	720 K.B - 1.44 M.B

Features or Advantages of Floppy Disk

1. It is very small and thus it is convenient to be taken from one Place to another.
2. This medium of secondary storage is very cheap.
3. It can be used for both reading and writing.
4. It is highly useful in personal computers.
5. Floppy disk acts as both input device and output device.
6. It is highly useful for commercial firms, which are small in size of operation.
7. Access and transfer speed is very high.

8. Permanent storage is possible and corrections or additions can be made to the stored data.
9. Outdated data can be deleted or modified, or even replaced.

Disadvantages

1. Floppy disk requires careful handling.
2. Its work is very slow when compared to hard disk.
3. Chances of malpractices are very high.
4. Storage capacity is very low, when compared to the latest secondary Storage devices, such as MD, DVD, etc.

2. Magnetic Disk (MD): Magnetic Disk pad consists of six or more disks, which are elastic in nature. It is made of plastic. The disk rotates on a spindle. The distance between two magnetic disks is 0.5 inches, and they rotate at the rate of 60 or more rotation per second. These disks can be used from both the surfaces. The surface coated with magnetic oxide contains circular paths, called tracks, and each track is divided into sectors. The data can be stored equally in each track. The size of the inner track is smaller when compared to the outer tracks. The packing density of the tracks is also different. The storage capacity of the disk depends on packing density, which is more in tracks near to the center of the disk, the number of surfaces, the number of tracks in each surface, and the number of sectors in each track.

3. Hard Disk (HD): Hard disks are called fixed disks. they are hard because they are made of aluminum and fixed because they are permanently mounted on the disk drive and cannot be removed and stored separately. They can store 5 to more than 1000M.B data, and provide faster access.

4. Magnetic Tape (MT): Magnetic tape is a storage device in the form of plastic ribbon (tape), which is rolled on a reel. This is similar to a tape recorder cassette. The ribbon is made of plastic material, and has a fine coating of magnetic oxide. Data is recorded on the tape as magnetic spots. Normally, the length of the tape in a real is 2400 feet and is of the standard width of 0.5 inch. In the case of magnetic tapes, it is not possible to read a few records and then stop and write a record on the tape. Instead, it can be read or written in a single processing run. The accessing speed is

based on three factors, such as tape density, tape speed, and size of interlock gap. Magnetic tape is a sequential access medium in which data can be read from the tape only in the order in which they are recorded. The storage capacity depends upon the tape density; interblock gap and the length of the reel. Tape density is calculated in terms of the number of rows of bits per inch of tape. In a magnetic tape, records are stored in blocks on it. A block means the amount of data transferred at one time from secondary to primary stora[illegible] the gap between two such block is called interblock gap.

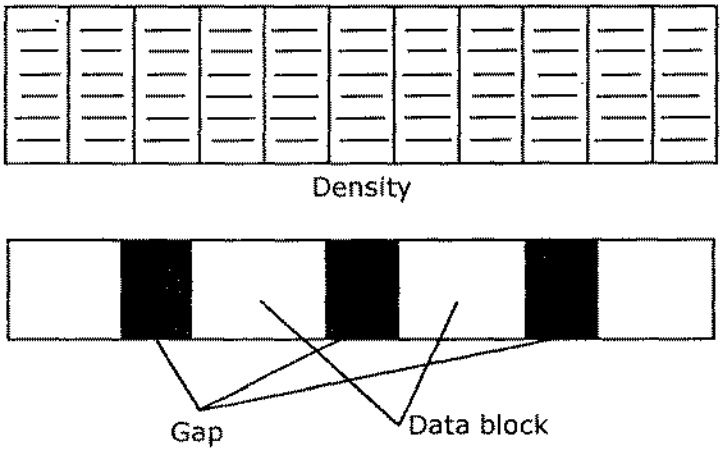

Fig. 5.2 : Interblock gap

5. Optical Disk (CD ROM): The optical disk is also called compact disk. Data is recorded on an optical disk by burning microscopic pits into its surface with a pinpoint laser beam. The absence or presence of a pit determines whether a bit is zero or one. Optical disks are commonly available in two forms: videodisks and compact disks. Optical disks have very high storage capacity, normally 500 M.B or more. The diameter of the disk is 12 c.m. Data in a C.D is stored permanently and hence it cannot be removed or altered. At present, CD writers are available which help to overcome this difficulty.

6. DVD ROMs (Digital Video Disk): The Digital Video Disk can be used for storing approximately 20 G.B information. it can be applied for storing music, movies, and multimedia packages.

7. CD -R (CD- Recordable), WORM Disk and Photo CD: CD - R drives allow us to create our own CD - ROM disks which are readable with any C D - ROM drive. WORM disk is an ideal medium for recording permanent data. Photo CD is developed for storing digital photographic images on a CD. WORM (Write Once Read Many) drives involve the application of a more flexible optical technology.

8. Magnetic Drum: As in magnetic disks, the tracks of this device are of equal length and run parallel to each other on the surface of a cylindrical drum which rotates at a speed up to 2000 rpm. Even though the access time is faster, its storage capacity is smaller.

9. Magnetic Bubbles: These are electronic forms of secondary storage. They are magnetized spots about one twentieth of the diameter of a human hair on a thin crystalline film of an appropriate material like synthetic garnet. They store more information than silicon chips, and the retrieval speed is higher than that of tapes and disks. They do not lose data if power is turned off.

10. Magneto - Optical Drives: These combine the features of both magnetic and optical recording technologies. They have the capacity of an optical disk but can be used for re-writing like a magnetic disk. The disk is coated with magnetically sensitive metallic crystals sandwiched inside a thin layer of plastic. MO disks are portable and the data stored in them cannot be corrupted by magnets, heat or humidity.

Input Devices

Data is fed into the computer with the help of certain devices. Any such devices which help data entry into the computer system is called input device, Input devices can convert data in any form to binary codes and can manipulate them internally. The input devices are used:

1. To fed new data,
2. To remove old data or record additional data, and
3. To alter the data or make corrections of records.

There are various types of input devices such as:

1. Key board: It is the most popularly used input device. It is a typing machine with modified functions. Normally, it has 101 keys in order. Keyboards with 104 keys and 105 keys are also available at present. When we press any key on

the key board, the corresponding character will appear on the Visual Display Unit (VDU), or the computer will act accordingly on the basis of the key pressed.

2. Mouse: A mouse is a handhold 'point-and-click' device that can be moved over a smooth surface, to control the position of the curser on the screen. It is a small box-like object connected to the computer by a cable. The user can press the left or right button on the mouse to execute various commands. It can also be used to open menus, select texts for editing, move objects on the screen, and draw images or diagrams. Mouse's may be either Mechanical or Optical. Mechanical mouses use rubber-coated balls on the underside, the movement of which sends electrical signals to the system. But in optical mouse (also called opto-mechanical mouse) diodes are used to emit light on to the metal pad to perform the specified task.

3. Joystick: It is an input device commonly used for professional applications and computer games. It looks like a gearshift level set in a box. Joystick is an electronic device like a mouse for controlling cursor movement. It consists of four micro switches arranged in four directions (North, East, West, South). When the joystick is used in a particular direction, the switch is activated in that direction and it gives a signal to the curser. The curser moves in the same direction in which the stick has been move.

4. Track ball: It is an input device related to the mouse. Track Ball is a metal ball mounted on a panel. While moving the top surface of the ball, which is exposed, in a specific direction, it produces a corresponding movement in the pointer on the screen. These devices are used in some microcomputers often used in airplanes and in situations not suitable for the movement of a mouse roll.

5. Light pen: It is a pen-shaped device, which uses a light sensitive cell (photo-electric cell) at its tip to enter data into the computer; it is connected to the computer through a cable. Light pen is a pointing device, which helps to point out something on the video screen. The device can be used only with video displays. The tip of the pen is placed over the point the user wants to designate; when the point is scanned the photoelectric cell sends an electrical pulse to the computer, which enables it to find out the point at which the light pen is

positioned. Light pens are not frequently used for mundane tasks like selecting an item from command menus.

6. Touch-sensitive screen: It allows the user to use the computer by touching the surface of its video display screen. The computer senses the point in the grid, which the user touches and responds with an appropriate action. The screen is coated with an electricity conductive film; touching the coating changes its electrical properties and allows the computer to determine where the screen has been touched.

7. Voice recognition: Voice input devices recognize and execute a set of instructions based on voice commands. The device converts the human language into machine language with the help of a microphone or telephone. The human speech is first converted into a digital pattern (electric signals) and is then compared to a set of pre-recorded patterns in the computer dictionary. When a close match is found, the computer produces the appropriate output. Most voice systems require training the computer to recognize a limited vocabulary of standard words for each system user. (Speaker-dependent System). Currently, Speaker-independent voice recognition systems have also gained prominence in life.

8. Scanners: A scanner is a peripheral input device used to assist the data entry. It is used for scanning a diagram, photograph, etc. and the image can be brought to the computer system, and can be edited and shaped into a desired form. To use a scanner, special software is required to be loaded in the computer system.

9. Optical scanners: Scanners of this type use light sources and light sensors for recognizing mark or characters. These scanners are capable of interpreting handword marks, characters, printer characters and barcode. Frequently used optical scanner devices are:

(a) *Optical Mark Reader (OMR):* These are capable of recognizing a pre-specified type of mark made by pen or pencil. OMR documents are frequently used for recording answer to multiple-choice examinations. Both numeric and alphabetic data may be recorded by blackening the appropriate circles. The document is directly fed to the OMR reader that converts the data in the blackened circle to computer readable form and stores it in a disk or tape. The

information is then processed by a computer, which grades the examination and prints the result.

(b) *Optical Character reader (OCR):* They read handwritten or typewritten characters and symbols and convert them directly into computer codes. Optical character readers may be either handprint readers or printed font readers. OCR devices are used only for large volumes of processing applications.

(c) *Bar Code Reader (BCR):* It is a rapidly growing area in the field of source data automation. Bar code reader can scan a set of vertical bars having different width for specific data. The article with the bar-coded information is passed over a hand-held wand reader, the tip of which contains photocells that are sensitive to the presence or absence of light. These devices are used to read merchandise in stores, library books, medicines, etc.

10. Magnetic Ink Character Recognition (MICR): These are concerned with the recognition of characters inscribed on documents in ink containing recognized particles. This technique is often used by banking companies for processing cheques.

The ink used in MICR is magnetic and MICR readers are sensitive to the magnetized ink. The sensors recognise each character by comparing it to a grid pattern. In the case of cheques, cheque number, bank name, and the customer's account number are printed along the bottom of the cheque in magnetic ink. When the cheque is presented to the bank for encashment, the amount of the cheque is typed manually at the bottom right. Using a special key operated machine, the fair items can be read from the cheque and the characters are converted into the internal computer code and transmitted to a computer for processing. The MICR reader detects the magnetic patterns formed by the characters and matches them against the stored patterns of possible characters. Documents are rejected when a pattern cannot be matched.

11. Digitizer: It is a device that scans pictorial material such as photographs, diagrams and maps, and converts them into digital data, which is stored by a computer and can be displayed on a screen.

12. Computer Terminals: Terminals are used for communicating with a computer through a communication channel like telephone line. It consists of a keyboard for input and a printer or display unit for output. The most commonly used terminal is Video Display Terminal (VDT), otherwise called Cathode Ray Tube (CRT)

13. Punch card and Card reader: A punch card can hold a maximum of 80 characters. Such cards are punched by a machine called card punch. Card readers transfer to the computer, data that has been recorded in the form of holes punched in cards. Punch cards were the primary data entry medium in the early 1970's.

Output Devices

The peripheral devices used for converting the binary coded data in the computer, into test and pictures, are called output devices. The frequently used output devices are:

1. Displays: A display is an output device, which displays the data recorded in the computer. Monitors serve the same purposes. Computer monitors are called Video Display Tubes (VDTs) or Cathode Ray Tubes (CRTs). A variety of display screens are available at present, such as text display, monochrome display, color display, liquid crystal display, Video graphics array, etc. The display device consists of a display controller connected to the monitor. The image to be displayed is stored in the display memory. The controller scans the stored image and sends video signals to the monitor, who adjusts the intensity of electron beams, to give each point the brightness specified in the stored image. Data stored in this segment of memory is automatically displayed.

2. Printers: They are the most popularly used output device. In a printer, the data stored in the computer memory is transferred to the memory of the printer and the same is printed in the form of output. The printed output may be in the form of letters, graphs, reports, etc. Basically, printers can be classified into two. They are:

(a) Impact Printers: The working of an impact printer is like that of a typewriter. The printer consists of a mechanical hammer against a ribbon. When the hammer touches the ribbon, it leaves an impression on the paper. Multiple print can be taken with the help of carbon paper. Impact printers can again be divided into three sub-categories. They are:

(a) *Daisy Wheel Printer:* This type of printer is mounted on bars that extend from the central hub of a wheel, like the petals of a daisy. When the finger with appropriate symbol is located on the print position above the paper, the finger is struck by the hammer against the ribbon, which in turn struck the paper and produces an impression on the paper. Since the output is of better quality, printers of this type are also called letter-quality printers. They are noisier, slower and more failure-prone than dot matrix printers.

(b) *Line printers:* They are printers that print at least 3000 lines per minute. They arrange the symbols on a continuous loop that spins at a very high speed. At every print position, the hammer strikes a symbol, and when the symbol to be printed is above the correct print position, the hammer strikes the band against the ribbon, leaving an impression on the paper.

(c) *Dot-Matrix Printer:* Printers of this variety leave the impression of characters in the form of dots. The printer consists of a number, which prints the characters one by one. This printer is widely used in personal computers. The hammer of the head contains 9 pins or 24 pins. The typical speed of a dot-matrix printer is 40-1000 characters per second. They are0 compact, reliable and relatively fast and quiet.

(b) Non-Impact Printers: These printers produce outputs with the help of thermal, chemical, electrostatic, laser and inkjet technologies. They produce reports at high speeds. They are faster, have few moving parts, and are quieter. Non-impact printers can again be divided into three categories. They are:

(a) *Inkjet printers:* In this type of printers, the drops of ink appear in the form of characters. Small pumps released tiny drops of ink through nozzles onto the paper in the form of characters. The print is of good quality. These printers do not make noise during printing. They can print graphics as well as texts. The speed of this type of printer ranges from 50 to 300 characters per second.

(b) *Thermal printers:* These are dot-matrix printers, which function with the help of thermal power. They perform the printing activity by driving heated pins against special heat-sensitive paper to burn the image onto the paper. When the hot pins press the ribbon against the paper, the wax in the wax-binder, which contains ink, melts and the ink is spread over the paper in the form of characters.

(c) *Laser Printer:* Printers of this description works on the technique of laser and photocopy. They are the fastest type of non-impact printers. The printer generates both graphics and text as image output. They can print more than 300 pages in one minute. They can also print multi-colored graphics. Since the quality of the output is very good, these printers are used in Desk Top Publishing (DTP). These printers write the desired output image on the copier drum with a light beam that works under computer control. The laser-exposed areas attract a toner that attaches to the drum. The toner is then permanently fused on the paper with heat or pressure. They are quite and costly.

3. Sound Boards: Speakers are an important part of a soundboard. The soundboards take a snapshot of incoming or outgoing sound. These boards also called speech synthesizers. They provide an audio response system with the help of a single integrated circuit chip, costing a few hundred rupees, which synthesizes the selected sounds and use them for audio response.

4. Microfilm: This is also called Computer Output Microfilm (COM) and is used for storing information in less space than is taken up by paper documents. COM technology is used to record computer output information as microscopic film images. The information that can be printed on paper can be reduced to size 48 or more, and recorded on a sheet or roll of microfilm. A 4/6-inch sheet of film is called a microfiche. It reproduces up to 270 page - sized images.

5. Plotters: These are output devices, which help to make drawings. Plotters are used to plot graphs, draw maps, produce engineering drawings, and also to draw patterns from which microprocessor's memory chips and other integrated circuits are manufactured.

Data Representation and Data Processing

For everyday writing, human beings utilize numerals 0 to 9, alphabet consisting of 26 letters, and various symbols, signs and punctuation marks. But a computer performs all calculations with the help of two numbers representing the presence or absence of a character, that is 0 and 1. These two numbers are called bits or binary digits and can be used for manipulating both decimal numbers and alphanumeric characters (alphabetic, numeric and special characters such as period and asterisk). In short, computers convert the input data into 0's and 1's and store them in the memory as 0's and 1's.

Binary Code

It is a way to represent various characters with the help of dual digits. A binary code represents information stored inside a computer in a form, which the computer can manipulate. Four binary bits, grouped together, form a nibble, and the combination of eight bits is called a byte. A group of 1024 bytes together represents a kilobyte. A word is formed by a group of bits processed as a single number or instruction.

In binary code, the computer converts the input data into binary digits (0's and 1's) and for each alphanumeric character, there is a separate combination of 0 and 1. For instance, a three-bit set will have eight combinations, such as:

000, 001, 010, 011, 100, 101, 110, 111

Binary Number System is otherwise called Base 2 Number System, and has only 2 digits, namely, 0 and 1. This numbering system is used in actual computer operations. The first 15 binary numbers equivalent to decimals are:

Decimals	*Binary*
0	0
1	1
2	10
3	11
4	100
5	101
6	110

7	111
8	1000
9	1001
10	1010
11	1011
12	1100
13	1101
14	1110
15	1111

The computer can perform arithmetic operations on these binary codes representing a decimal. This is called binary-coded decimal or packed-decimal arithmetic. Thus, it allows the computer to encode alphanumeric characters with the help of various combinations of 8 bits. Generally there are two standard coding schemes, namely,

1. ASCII - American Standard Code for Information Interchange, and

2. EBCDIC- Extended Binary Coded Decimal Interchange Code.

ASCII code represents a character or symbol with the help of 7 bits. EBCDIC represents each character with 8 bits. A modern standard has been evolved for representing data, which is known as Unicode Worldwide Character Standard (UWCS), which uses two bytes (16 bits) to represent each character.

Data processing is performed by the central processing unit with the help of these binary digits; after processing, the data is again converted into decimals and other forms which the end-user can easily understand and which provide the processed data to user through the output devices.

Conclusion

Even though information system can be developed without computers, they become an inevitable part of an MIS. In the modern world, the word 'computer' is used as a synonym for Information System. The computer system consisting of hardware and software involves a Central Processing Unit combining the Primary Storage, Arithmetic and Logic Unit, and the Control unit. The system also contains

secondary storage input and output devices, and various instructions are given to the computer to perform various functions. With the help of these components, computers assist in the development and operation of an MIS.

Exercise

Short Answer Questions

1. What are the physical components of a computer?
2. What is meant by the 'computer hardware'?
3. What is a special purpose central processor?
4. What do you mean by a workstation?
5. Describe various types of work stations.
6. What are the functions of computer hardware?
7. Write short note on intelligent terminal and dumb terminal.
8. Distinguish between special purpose and general purpose computers.
9. What is analog computer?
10. Write short note on super computers and mainframes.
11. What is a laptop computer?
12. What do you mean by system software?
13. What are the different types of system softwares ?
14. Describe various application software.
15. What is auxiliary memory?
16. Describe the functioning of a joystick.
17. Explain binary code.
18. Describe the working of OMR.
19. What is a light pen?
20. What is a hybrid computer?

Essay Questions

1. What are the different types of computers?
2. Explain different secondary storage devices.
3. Describe various input devices.
4. What are the different types of output devices?
5. What are the physical and functional components of a computer?