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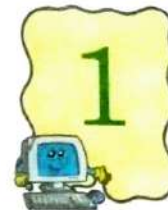
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DIGITAL LITERACY (FUNDAMENTAL) BASICS OF COMPUTER



Objective of Learning

- 1.1 Computer System (Characteristic, Basic Application & components Viz., CPU).
- 1.2 Input Devices : (Mouse, Keyboard, Scanner, Joystick, Light Pen, Digital Camera, OCR, MICR, Bar Code Reader, Magnetic Stripe Reader)
- 1.3 Output Devices : (Monitor or VDU, Printer, Plotter, Speaker, Projector)
- 1.4 Concept of Computer memories (Primary : RAM & ROM)
- 1.5 Storage devices / Secondary Memory : (Hard Disk, CD & DVD, Pen Drive)
- 1.6 Unit of Memory : Nibble, Bits, Bytes Kilobytes, Megabytes, Gigabytes, Terabytes.

◆ INTRODUCTION

Now-a-days computer is playing a main role in everyday life. It has become the need of people just like television, telephone or other electronic devices at home. Millions of people use computer all over the world. It solves the problems and does calculations very quickly and accurately.



Fig. Computer System

The word "Computer" is derived from the word "compute" which means to calculate. In the past, the computer was normally considered to be a calculating device used to perform arithmetic operations. But today, computer is used in every field like Schools, Banks, Hospitals, Railways, Airlines and Entertainment also. Computer cannot do anything without instruction.

DEFINITION OF COMPUTER

Computer is an electronic machine. It takes input from the user, processes it and gives the output to the user. Input taken by the computer is data and instructions. A computer can also store information. The process of giving Data and Instructions to Computer is called Input. Computer process the input and after processing it gives final result which is called Output.



TYPES OF COMPUTER

In terms of capacity, purpose, functioning, size, price and performance, computers can be broadly classified as follows :

1. **Microcomputer** : Microcomputers are one of the latest type of computers used these days. They are called so because they are designed for personal use of individuals or small business units. These computers are used in an office, school or at home.



Fig. Micro Computer (Personal Computer)

(i) **Personal computers** can be used for basic programming, games, business and professional applications, tele-communications, data base management, accounting, word processing etc.

Following are the types of microcomputer :

(ii) **Laptop** : Laptop is a portable and compact personal computer with the same capabilities as a desktop computer. It is portable, light in weight and small enough so suitable for use while travelling. It has its own battery and can be charged easily as required.



Fig. Laptop

(iii) **Notebook** : You can call notebook a smaller laptop. Notebook is also a portable computer. It is smaller as well as light in weight as compared to laptop. It also has its own battery. It can be charged very easily. As it is small and portable so it is suitable for use while travelling.



Fig. Notebook

(iv) **Palmtop** : Palmtop a battery-powered computer. It is small enough to fit in the palm of the hand. It has a very small screen and compressed keyboard. It is often used as a personal organizer and stores message, contacts, calendar etc.



Fig. Palmtop

(v) **Tablet** : A tablet is smaller than a notebook computer but larger than a mobile phone. It is a wireless, thin and portable personal computer with a touch screen interface. It is usually battery-powered. It doesn't have a physical keyboard and flap like a laptop.



Fig. Tablet

2. **Mini computer** : Mini computer has most of the features and capabilities of a large computer. It is actually the smaller versions of the large computer. They offer same computing power as bigger computers. It is cheaper in cost, small in size, and reliable. It is mainly used in scientific applications.



Fig. Minicomputer (For Scientific use)

Fig. Minicomputer



Fig. Minicomputer

3. **Mainframe Computers** : Mainframe computers have maximum computing power. So they can handle and process very large amount of data quickly. They are most expensive of all the computers, are very big in size. They are generally used in air line reservation system, government organizations, nationalized banks and large corporations. But mainframe computer is not as powerful as super computer.



Fig. Main frame computer

(4) **Super computer** : Supercomputer is a very fast and powerful computer. It is the fastest type of computer with a very high processing speed. It has large data storage. Supercomputers are very costly and are used for specialized applications that require large amount of calculations. Super computers are used in advanced military and scientific applications.



Fig. Supercomputer

◆ 1.1 COMPUTER SYSTEM (CHARACTERISTIC, BASIC APPLICATION & COMPONENTS VIZ., CPU, VDU, KEYBOARD ETC.)

Computer System

A computer is a machine that can be instructed to carry out sequences of arithmetic or logical operations automatically. Modern computers have the ability to follow generalized sets of operations, called **programs**. These programs enable computers to perform an extremely wide range of tasks. A "complete" computer including the hardware, the operating system (main software), and peripheral equipment required and used for "full" operation can be referred to as a **computer system**.

1.1.1 Characteristics of computer System

Computer is a very powerful and useful machine. It has the following characteristics:

1. Speed :

Computer works at very high speed. It can solve the problems with in seconds. It takes only few seconds for calculations that you take hours to complete. A computer can process millions of instructions and even more, in one second.

2. Accuracy :

Computer is a very accurate device. The degree of accuracy of computer is very high and every calculation is performed with the same accuracy. It never makes a mistake as long as the entered input is correct.

3. Automation :

Computer works automatically. Once the instructions are fed into computer it works automatically on it without any human intervention. It works till the completion of the job. It executes the program until it finds instruction to terminate the job.

4. Storage :

A computer is capable of storing large amount of data and remembers every detail of it. The computer has an in-built memory where it stores a large amount

of data. You can also store data in secondary storage devices such as CD' s, DVD's and USB Pen Drives, which can be kept outside your computer and can be carried to other computers also. You can get data whenever required because of its secondary storage (Hard Disk etc.).

5. Diligence :

A computer can work continuously for a long time. It can work 24X7. It never feels bored or tired. It is free from lack of concentration and can work for hours without creating any error.

6. Versatility :

It is the most important feature of computer. It means the capability to perform completely different types of work. A computer can perform almost all kind of tasks at the same time. At one moment you are playing game on computer, the next moment you are preparing a project report on it.

7. No Feeling :

- (i) It does not have feelings or emotion, taste, knowledge and experience.
- (ii) It does not get tired even after long hours of work.
- (iii) It does not distinguish between users.

8. Power of remembering : The data stored in the computer can be recalled at any time.

Limitations of computer :

Although computer is very fast, powerful and accurate machine, but it has some limitations too:

- 1. A computer has no brain. It cannot do any work without getting instruction from the user.
- 2. A computer cannot correct wrong instructions on its own.
- 3. It could not take decisions on its own.
- 4. Maintenance of computer is very costly.
- 5. It has no feelings or emotions.
- 6. Computer possesses no intelligence of its own like the human beings.

1.1.2 Application/Uses of computer

Computer is used in the following areas :

1 In Education, 2. In Business, 3. In Banks, 4. In Government fields 5. In Hospital, 6. In Entertainment field, 7. In Libraries, 8. In Marketing.

Computer is used in the following areas :

1. In Education : Computers are widely used in education field by teachers and students. Teachers use computers to make their lesson plans, presentations, projects, reports and timetable etc. Students use computers to make assignments, presentation, projects and drawing etc. Computer is also used to get different information on the Internet.



Fig. Education field

2. In Business : A computer has high speed of calculation, diligence, accuracy, reliability or versatility which made it an integrated part in all business organisation. Computer is used in business organisation for : Payroll calculatins, Sales analysis, Budgeting, Finanical forecasting, Managing employees database and maintenance of stocks etc.



Fig. In Business

3. In Banks : Computers are used in banks to maintain account records, calculate interest rates etc. Most of the banks provide the facility of ATMs (Debit Card) through which the customers can withdraw and deposit money in their account. Online banking is only possible through computers.



Fig. In Banks

4. In Government fields : Many Government departments use computer for their departmental planning, control and law enforcement activities. Computer are widely used in-Traffic, Tourism, Information & Broadcasting, Education, Aviation and many other areas of government.



Fig. Government fields

5. In Hospital : These days every area of health and medicine uses computers. In hospitals computers are used to store patient related data, to prescribe medicine, to perform various tests and scans. In health and medicine

field computer based machines are used to help doctors during operations. Computers are also used for patient monitoring and diagnosis of diseases etc.



Fig. Health and Medicine field

6. **In Entertainment field** : Computer is also a helpful tool for Entertainment. Computers are used at homes to watch movies, play games, listen to music etc. A computer designer can give special effects in movies with the help of computer. With the help of computers even imaginary characters (cartoons) can play a part in movies, videos, and commercials.



Fig. In Entertainment field

7. **In Libraries** : In library computer is used to maintain the record of all the books. It is also used to keep the records of books issued to the students and returned by them.

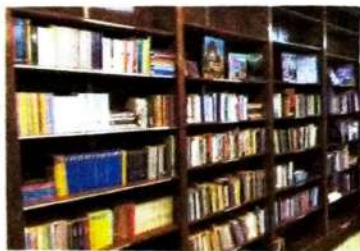


Fig. In Library

8. **In Marketing** : In marketing uses of computer are :

Advertising : With computers, advertising professionals create art and graphics, write and revise copy and print and disseminate ads with the goal of selling more products.

Home Shopping : Home shopping has been made possible through use of computerised catalogues that provides access to product information and permit direct entry of orders to be filled by the customers.



Functioning of Computer :

A computer performs mainly five major computer operations. These operations are given below :

1. **Input** : Computer receives data and instructions from the user.
2. **Store** : Computer saves data and instructions.
3. **Process** : Computer performs arithmetic operations and logical operations on data to convert them into useful information.
4. **Output** : Computer produces useful information or results for a user.
5. **Control** : Computer controls the sequence in which the above operations are performed.

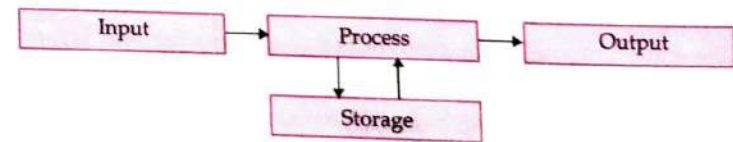


Fig. Basic Functions of Computer

To perform these operations computer system has four basic components. These four components are Input unit, storage unit, output unit and central processing unit.

1.1.3 Component of computer

Components of computer are given below :

1. Input Unit.
2. Output Unit.
3. Storage Unit.
4. Central Processing Unit (CPU)
5. Arithmetic and Logic Unit (ALU)
6. Control Unit.

1.1.4 Central Processing Unit (CPU)

The CPU is the brain of the computer. Full form of CPU is Central Processing Unit. A computer cannot work without it. It takes the input, processes the input and gives the output to the user. It performs all calculations and takes all decisions. CPU has three sub parts :

- (i) Memory unit
- (ii) Control unit
- (iii) Arithmetic logic unit

(i) Memory unit : Memory unit is the amount of data that can be stored in the storage unit. This storage capacity is expressed in terms of Bytes.

(ii) Control unit : A computer control unit is the control unit that is a part of the computer processor. The control unit fetches internal instructions of programs from the main memory to the processor (computer) instruction register. The control signals are distributed to all smaller and larger elements of the computer that participate in execution of instructions and need to be controlled. The control signals are usually transmitted by the part of the over-all system bus called the control bus

(iii) Arithmetic logic unit : An arithmetic logic unit (ALU) is a major component of the central processing unit of a computer system. It does all processes related to arithmetic and logic operations that need to be done on instruction words. In some microprocessor architectures, the ALU is divided into the arithmetic unit (AU) and the logic unit (LU).

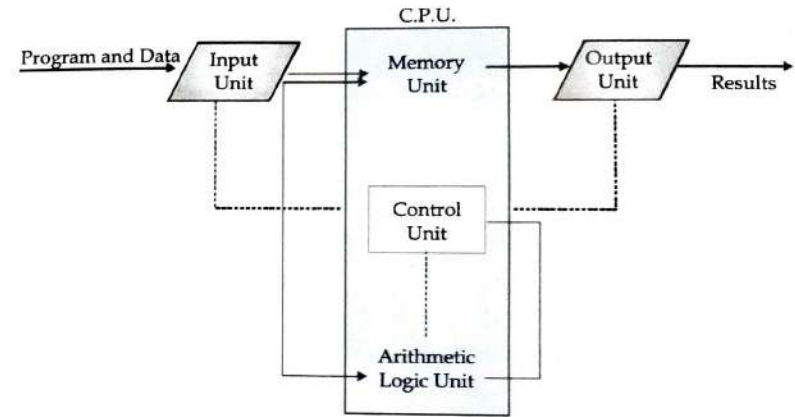


Fig. Block Diagram of Computer

◆ 1.2 INPUT DEVICES

1.2.1 Input devices :

An input device is a hardware or peripheral device used to send data to a computer. An input device allows users to communicate and feed instructions and data to computers for processing, display, storage and/or transmission. **An input device is hardware device that sends data to a computer, allowing user to interact with and control it.** The devices which give input to the computer are called Input devices.

(i) Keyboard :

Keyboard is the primary input device. It is used for typing. It is similar to a traditional typing machine called typewriter but it has many additional keys and functions. A keyboard is used for typing letters, words, numbers and special

symbols. A standard keyboard has 104 keys. When you press a key on the keyboard an electrical signal is produced. This electrical signal is input for the computer.



Fig. Keyboard

Types of Keys : Keys of keyboard are divided into five categories. These are

1. Alphabetical Keys, 2. Numeric Keys, 3. Functional key, 4. Special Keys, 5. Arrow Keys

1. Alphabetical keys (A to Z) : A to Z keys are called alphabet keys. Alphabet keys are used to type characters. These keys are present in the middle of the keyboard.

2. Numeric Keys (0 to 9) : There are ten numeric keys through 0 to 9. Numeric keys are used to type numbers. These keys are present below the function keys.

On the right side of the keyboard there is a special key pad called the numeric keypad. The numeric keypad contains seventeen keys. It looks like a calculator, because it also has mathematical symbols and an enter key. On the top left corner of the numeric keypad there is Num Lock key. The numeric keys on the keypad will work only if the Num Lock is ON.

3. Functional keys (F1 to F12) : The function keys are located at the top of the keyboard. There are twelve function keys through F1 to F12. The function of these keys can be different for different programs. But F1 key is generally used for help.



Fig. Function key

4. Multimedia key : A multimedia key or media key is a keyboard key that performs a special function not included with the traditional 104-key keyboard. For example, in the picture to the right of a Logitech keyboard, you can see that the first four buttons shown control the volume of the speakers and the computer's brightness.

Keyboard Multiple Keys



5. Arrow keys : Arrow keys are used to move cursor. They are also called cursor movement keys. There are four arrow keys. These are used to move the cursor left, right, up and down.



(ii) **Mouse :**

Mouse is an input device. It is a small device used to point to a particular place on the screen and select in order to perform one or more actions. It can be used to select menu commands, change the size of window, start programs etc.

Mouse is also called pointing device. It is called mouse because of its shape. Mouse is rolled over a flat surface. As you move mouse, the pointer also moves on the screen in same direction. These days wireless/cordless mouse are also available and are in use.

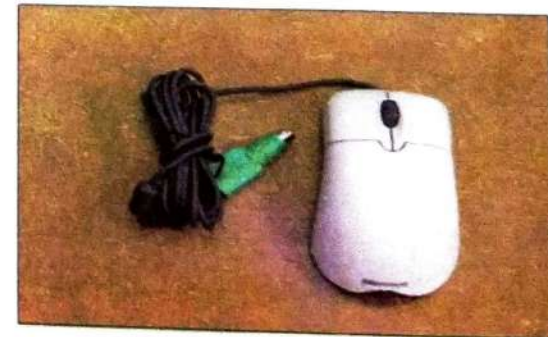


Fig. Mouse

Generally a mouse has three buttons on its top the left button, right button and scroll button.

Left button : The left button is used most frequently. When you press the left button once, it is called click. When you press the left button twice it is called double click. Left mouse button is used to open programs and select things.

Right button : When you press right mouse button is called right click. It is used to open shortcut menu.

Scroll button : It looks like a wheel fitted in the center of the mouse. Scrolling means to rotate it. It is used to move screen up and down.

(iii) Scanner :

A scanner is a device that captures images from photographic prints, posters, magazine pages, and similar sources for computer editing and display. It works like a photocopy machine. The only difference is that photocopy machine gives output on a paper on the other hand scanner save a copy in computer.



Fig. Scanner

(iv) Joy Stick :

The joystick is a vertical stick which moves the cursor in a direction the stick is moved. It consists of a base and a stick that can be moved in any direction. The stick can be moved slowly or quickly. Some joysticks are very

flexible and can also be rotated to the left or right. Joystick is mainly used to play video games.



Fig. Joy stick

(v) Light Pen :

It is a pen shaped pointing device used to select objects on a display screen. It works like the mouse but uses a light pen to move the pointer and select any object on the screen by pointing to the object. You can draw directly on screen with the help of light pen. Users of Computer Aided Design (CAD) applications commonly use the light pens to directly draw on screen.



Fig. Light pen

(vi) Digital camera :

A digital camera is a hardware device that takes pictures like a regular camera, but stores the image as data on a memory card instead of printing it to film. Many digital cameras are capable of recording video in addition to

taking photos. The picture is of a Casio QV-R62 with 6-megapixel resolution, an example of a typical digital camera.



Note : A digital camera may be considered both an input and output device (sometimes referred to as an I/O device) as it can both take pictures (input) and send them to your computer (output).

(vii) OCR :

OCR (Optical Character Recognition) is the use of technology to distinguish printed or handwritten text characters inside digital images of physical documents, such as a scanned paper document. The basic process of OCR involves examining the text of a document and translating the characters into code that can be used for data processing. OCR is sometimes also referred to as text recognition.



Fig. OCR (Optical Character Recognition)

OCR systems are made up of a combination of hardware and software that is used to convert physical documents into machine-readable text.

(viii) Magnetic Ink Character Reader (MICR)

MICR is a character-recognition input device. It is used mainly by the banking industry to ease the processing and clearance of cheques and other documents. It reads the bank code number and cheque number. The bank's code number and cheque number are printed on the cheques with a special type of ink that contains particles of magnetic material that are machine readable. This reading process is called Magnetic Ink Character Recognition.



Fig. MICR

(ix) Barcode Reader

A bar code is a set of lines of different thicknesses that represent a number.

Bar Code Readers are used to input data from bar codes. A Barcode reader is an electronic device for reading printed barcodes. It is also called barcode scanner. Like a flatbed scanner, it consists of a light source, a lens and a light sensor translating optical impulses into electrical impulses. Bar code readers work by shining a beam of light on the bar code and detecting the amount of light that is reflected back.

Most products in shops have bar codes on them. These are helpful in stores in order to maintain accurate inventory. They also help to determine the price of an item.



Fig. Bar code Reader

(x) Magnetic Stripe Reader :

A magnetic stripe reader is a device designed to read the information stored within the magnetic stripe of special cards such as credit cards and ATM cards. The magnetic stripe is usually located on the back of the card or badge and contains the account details of the person who owns the card. This information is then verified in real time with the issuer of the card.

Magnetic stripe readers are also known as magstripe readers and credit card readers.



◆ 1.3 OUTPUT DEVICES

1.3.1 Output Devices

An output device is any hardware device used to send data from a computer to another device or user. The output generated by computer is in computer language, output devices convert it into human-readable form. Most computer data output that is meant for humans is in the form of audio, video or text. Thus, most output devices used by humans are audio, video or text based. For example monitors and projectors are used for video output, speakers, headphones are used for audio output and printers and plotters are used for text and graphics output.

In other words an output device is a piece of hardware that is used to display or output the data which has been processed or has been stored on the computer. Like input devices, output devices are also connected to computer and these are used to show data in form of sound, text and images.

Uses of output device : The main use of output device is to get information from the computer. The information may be in textual, graphics, audio or video form. Whatever the computer has done is displayed by output devices.

TYPES OF OUTPUT DEVICES

Each and every Output device has a different function. The most commonly used output devices are :

- (i) Monitor,
- (ii) Printer,
- (iii) Speaker,
- (iv) Headphone,
- (v) Plotter ,
- (vi) Projector.

(i) Monitor or VDU

It is the primary output device. It comes in many different shapes, sizes and forms. It is also called soft copy output device. It looks like the television screen. It shows output on the screen. Like the television, monitors are also available in different sizes like 15", 17", 19" and 21". Earlier black and white monitors are used but now a-days only coloured monitors are used.

Following are two kinds of viewing screen used for monitors :

- (i) Cathode-Ray Tube (CRT)
- (ii) Flat-Panel Display

CRT and Flat Panel display are two types of Monitor. It has some difference.

1. Cathode-Ray Tube (CRT) Monitor : CRT monitors of many different types are available in the market these days. CRT monitor is made up of small picture elements called pixels. The smaller the pixels, the better the image clarity, or resolution. CRT Monitor screen size is measured diagonally across the screen, in inches. Monitors are available in 15", 17", 19" and 21" inches. Earlier black and white monitors were used but now we use coloured monitors. Such monitors display coloured pictures.



Fig. Cathode-Ray Tube (CRT) Monitor

There are some disadvantages of CRT :

- (i) They are large in size.
- (ii) They consume high power.
- (iii) Heat dissipation is also there.

2. Flat-Panel Display Monitor : A flat panel display usually uses an LCD (Liquid Crystal Display) screen to display output from the computer. Flat panel displays are much lighter and less bulky than CRT monitors, and they consume much less power. You can hang them on walls. They are expensive than CRT monitors. Flat-panel displays are also used in calculators, video games, monitors, laptops. Some example of Flat-Panel Display monitors are Liquid Crystal Display (LCD), Light Emitting Diode (LED, Plasma etc.



Fig. Flat-Panel Display Monitor

(ii) Printer

Printers are used to produce output on paper. It is called a hardcopy output device. The printed output can be preserved for long time. It is permanent. There are two basic qualities associated with printers : resolution, and speed.

Resolution : The resolution of a printer is measured in terms of number of dots per inch (dpi).

Speed : The speed of a printer is measured in terms of number of characters printed in a unit of time and is represented as characters-per-second (cps), lines-per-minute (lpm), or pages-per-minute (ppm).

There are black and white printers and coloured printers available in market. Black and white printer produces black and white output. Coloured printer gives colour output. The commonly used printers are :

1. Dot matrix Printer
2. Inkjet Printer
3. Laser Printer

1. Dot Matrix Printer : Dot matrix printer prints one character at a time. It prints by joining the dots. Dot matrix printer uses a print head that moves back & forth or in an up and down motion on the page and print by impact. It is a black and white printer. It is cheaper and its speed is slow. It produces lots of noise while printing. Its resolution is also very poor.



Fig. Dot Matrix Printer

Advantages :

- (i) Inexpensive
- (ii) They use paper continuously unlike other printers that require frequent change of paper.

Disadvantages :

- (i) Slow Speed
- (ii) Poor Quality

2. **Inkjet Printer** : Inkjet printer prints characters by spraying ink on a paper. Inkjet printer can be colored as well as black and white. It is costly than dot matrix printer. It does not produce noise while printing. It is faster than dot matrix printer. Its resolution is also better than dot matrix printer. You can print graphical images with a good quality using Ink jet printer.

Advantages :

- (i) High quality printing
- (ii) More reliable



Fig. Inkjet Printer

Disadvantages :

- (i) Expensive as cost per page is high
- (ii) Slow as compared to laser printer

3. **Laser Printer** : A laser printer uses the same technology that photocopy machines use. It is an electrostatic digital printer. It produces high quality graphics using laser beams. Laser printer can be colored as well as black and white. Laser printer is page printer. It prints one page at a time. It is costly than inkjet printer. The speed of laser printer is very fast. Its resolution is very high.



Fig. Laser printer

Advantages :

- (i) Very high speed
- (ii) Very high quality output
- (iii) Give good graphics quality
- (iv) Support many fonts and different character size
- (v) Cannot be used to produce multiple copies of a document in a single printing.

Disadvantages :

- (i) Expensive.
- (ii) Toner is harmful to humans

(iv) Plotter

Plotter is a special type of printer which is used to draw high quality images on a very large piece of paper. It is used by engineers, architects to draw plans of building, diagrams of machines or large maps.

A plotter differs from a printer in that it draws images using a pen. A pen can be lowered, raised and move across the paper to draw continuous lines whereas printer can only simulate lines by printing a closely spaced series of dots. The electronically controlled pen is moved around the paper by computer controlled motor.



Fig. Plotter

Multicolor plotter use different colored pen to draw different colors lines. It is used in computer aided designing. Plotter is more expensive than printer.

(v) Speaker

Speakers are an output device. They receive audio input from the computer's sound card and produce audio output in the form of sound waves. It is used to listen sounds from computer. Speakers are present in different shapes.



Fig. Speakers

Bluetooth speakers can be connected with a computer by using an Aux Jack and compatible adaptor.

(vi) Projector

A projector is an output device which connects to a computer and is used to project the video output from the computer onto a wall or screen. Projectors are used in meetings and multimedia presentations to help ensure that all participants can view the information being presented. Multimedia projectors are becoming the center piece of class room. They have changed the ambience of classroom dramatically by making teaching and learning more diversified and interaction. Students no longer have to crowd around a computer monitor to view presentations, web sites as training programmes.

Projectors are portables and easy to carry and handle. They are rarely much larger than a toaster and weigh a few pounds.



Fig. Projector

◆ 1.4 CONCEPT OF COMPUTER MEMORIES (PRIMARY : RAM & ROM)

1.4.1 Concept of computer memory

As human beings have memory to remember things. Computer also has memory to store data and information. Computer memory is the internal storage areas in the computer where data and information to be processed and instructions required for processing are stored. The computer's memory consists of many millions of bytes. Actually, the computer memory is divided into large number of small parts called cells. Each location or cell has a unique address.

1.4.2 The various units of memory :

Memory Units : As the unit of distance is kilometres and the unit of weight is kilograms, similarly the storage unit of computer memory is bit and byte. Memory capacity of a computer is the amount of data that can be stored in the storage unit. The smallest unit of memory is Bit. Bit stands for binary digit. It can take only two values either 0 or 1. The set of eight bits is called byte.

(i) **Bit :** A 'bit' (short for Binary Digit) is the smallest unit of data that can be stored by a computer. Each 'bit' is represented as a binary number, either 1 (true) or 0 (false).

(ii) **Nibble :** A group of 4 bits is referred to as nibble. It is the term given to a group of four bits. Therefore two nibbles make a byte.

$$2 \text{ nibbles} = 1 \text{ byte}$$

(iii) **Byte :** A 'byte' contains 8 bits, so for example, it could be stored as 11101001.

(iv) **Kilobytes :** A kilobyte (KB) is 1,024 bytes, not one thousand bytes as might be expected, because computers use binary (base two) math, instead of a decimal (base ten) system.

(v) **Megabytes** : Computer storage and memory is often measured in megabytes (MB) and gigabytes (GB). A medium-sized novel contains about 1 MB of information. 1 MB is 1,024 kilobytes, or 1,048,576 (1024x1024) bytes, not one million bytes.

(vi) **Gigabytes** : A gigabyte, which uses the abbreviation GB, has been a common unit of capacity measurement for data storage products since the mid-1980s. In recent years, however, terabytes of storage have become the more common unit of storage capacity measurement, especially for hard disk drives (HDDs) and solid-state drives (SSDs).

(vii) **Terabytes** : A Terabyte (TB) is a measure of computer storage capacity that is approximately 2 to the 40th power, or 10 to the 12th power, which equals approximately a trillion bytes. A Terabyte is more precisely defined as 1,024 gigabytes (GB), while a petabyte consists of 1,024 TB.

Table : Measuring Units of Computer Memory

Sr. No.	Memory Unit	Discription
1.	1 bit	It can be either 0 or 1
2.	Nibble	It is a group of 4 bits
3.	1 byte	8 bits
4.	1 Kilo Byte (KB)	1024 Bytes
5.	1 Mega Byte (MB)	1024 Kilo Bytes
6.	1 Giga Byte (GB)	1024 Mega Bytes
7.	1 Tera Byte (TB)	1024 Giga Bytes
8.	1 Peta Byte	1024 Tera Bytes

Types of Memory

The basic classification of Memory Units are :

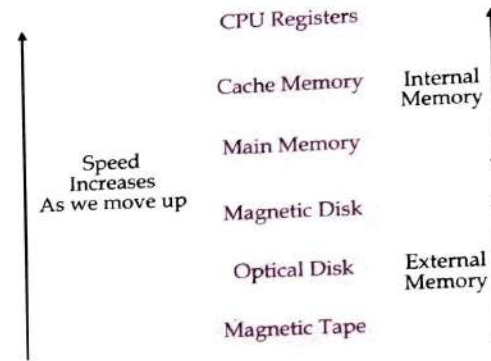


Fig. Types of memory

Memory can be classified into two main categories :

1. Internal memory
2. External memory

1. Internal Memory : The data and instructions are stored in the memory of the computer. Generally Internal memory means primary memory. Memory that is present inside the CPU is called internal memory.

In internal Memory following things are stored :

- (a) Data and instructions (Input)
- (b) Intermediate results
- (c) Final results (Output)

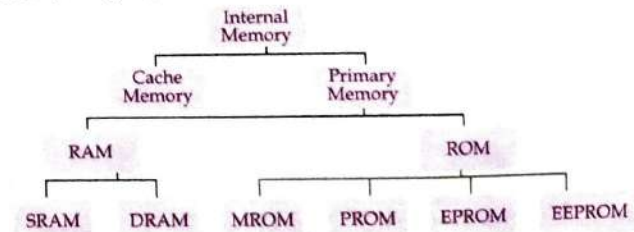


Fig. Internal Memory chart

The internal Memory is further classified into following two categories:

- (a) Primary Memory
- (b) Cache Memory

Primary Memory (Main Memory)

The Primary Memory is also known as Main Memory. It holds the data and instructions that are required by processor to perform an operation. This memory section of the computer holds both the intermediate and final results of the computer during processing as the programs proceed. It is generally made up of semiconductors. This is very high speed memory and the central processing unit can directly access it. But this memory is not as fast as registers. The primary memory is temporary in nature. The data is lost, when the computer is switched off. It has limited storage capacity. The primary memory is very costly and has limited space. Although it has a much lower access time and faster performance.

Characteristics of Main Memory :

- (i) Primary memory is the main memory so a computer cannot run without it.
- (ii) It is generally made up of semiconductor devices.
- (iii) It is volatile in nature so data is lost in case power is switched off.
- (iv) It is working memory of the computer.
- (v) Primary memory is considered faster than secondary memory.

Primary memory is further categorized into two types :

1. RAM

(a) **RAM (Random Access Memory)** : The full form of RAM is Random Access Memory. RAM is used inside a computer. You can read and write data on RAM. That is why it is also called read and write memory. RAM is placed in a computer where the operating system, application programs, and data in current use are kept so that can be quickly reached by the computer processor.



Fig. RAM (Random Access Memory)

RAM is volatile, so everything written to RAM is lost when you turn off computer. That is why a backup Uninterruptable Power System (UPS) is used with computer. When you turn your computer on again, your operating system and other files are once again loaded into RAM, usually from your hard disk. RAM is small both in term of its size and in the amount of data it can hold. It is much smaller than your hard disk. It is high-speed memory.

RAM is of two types :

1. Static RAM
2. Dynamic RAM

1. **Static RAM** : Static RAM retains the stored information as long as the power supply is on. And data is lost when power is off. The Static RAM consumes more power. Capacitors are not used in SRAM. Transistors do not require power to prevent leakage, so SRAM need not to be refreshed on regular basis. The Static RAM is faster and expensive as it needs more chips per MB than DRAM.

Characteristics of the Static RAM :

- (i) It retains the stored information as long as the power supply is on.
- (ii) It is expensive.
- (iii) It is very fast.
- (iv) It can be used as cache memory.
- (v) Static RAM consumes more power.
- (vi) SRAM need not to be refreshed on regular basis.

2. Dynamic RAM : The Dynamic RAM loses its stored information in a few milliseconds even though its power supply is ON. DRAM must be refreshed in order to maintain the data. This is done by placing the memory on a refresh circuit that rewrites the data several hundred times per second. DRAM consumes less power and it is cheaper than the SRAM. DRAM needs only one Transistor and one capacitor per memory cell and hence its package density is high.

Characteristics of the Dynamic RAM :

- (i) It stores information for a very short period of time just for a few milliseconds.
- (ii) DRAM must be refreshed in order to maintain the data.
- (iii) It can be used as RAM.
- (iv) It consumes less power.
- (v) It is cheaper than the SRAM.
- (vi) It is slower than SRAM.
- (vii) It is produced in large sizes.

2. ROM (Read Only Memory)

The full form of ROM is Read Only Memory. You can only read this memory. It does not have a write capability. It is non volatile in nature. ROM can permanently store data and applications within it. When a computer is turned off, the contents of the ROM are not lost. It contains the programming that allows your computer to be 'booted up' e.g. each time you turn it on. This operation is called bootstrap. ROM chips are also used in many electronic items like mobiles, washing machines, barcode readers, microwave etc.



Advantages of ROM :

The advantages of ROM are given below :

- (i) It is read only memory. You cannot write on it.
- (ii) It is non volatile in nature.
- (iii) It is cheap as compared to RAM.
- (iv) ROM is static in nature so there is no need of refreshing it.
- (v) It is reliable than RAM.

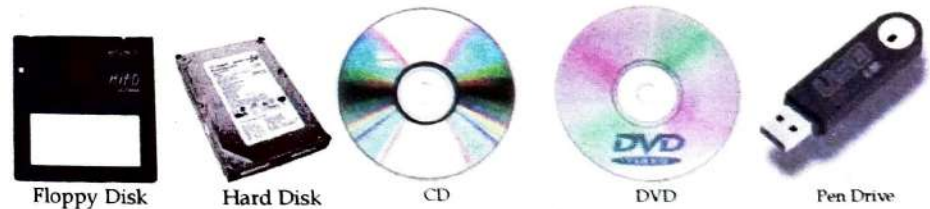
◆ 1.5 STORAGE DEVICES / SECONDARY MEMORY : (HARD DISK, CD & DVD, PEN DRIVE)

1.5.1 Storage devices

A storage device refers to a computing hardware used to store information permanently or temporarily. The device can be external or internal to a computer, server, and other computing systems. Storage devices are also known as storage medias or storage medium.

1.5.2 Secondary Memory

Secondary memory is used to overcome the limitation of Primary Memory. It works slowly than primary memory.



This memory does not lose the data when the computer is switched. So it is non-volatile in nature. Secondary memory is cheap as compared to primary memory. Secondary memory is also called permanent storage. The most familiar type of secondary memory that is widely used is Hard Disk. Other secondary storage devices are CD, DVD or USB Pen Drive.

1.5.3 Hard Disk

It is used to store data permanently in computer. A magnetic plate is present inside the Hard disk. The storage capacity of Hard Disk is greater than Floppy. Hard disk with more than 500 GB data storage capacity are available now-a-days.

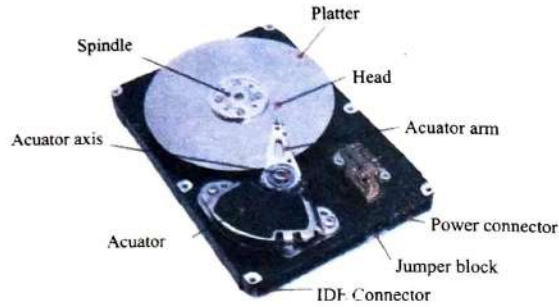


Fig. Hard Disk

1.5.4 CD ROM

It is the Compact Disk Read Only Memory. It is known as CD. It shine like a mirror. The shinning surface of CD stores data. Laser beam is used to read instructions from the CD. A single CD-ROM has the storage capacity of 700 MB. *i.e.* about 3,00,000 text pages. Commonly used CD are of three types:



Fig. CD (Compact Disk)

1. Read Only CD (CD ROM)
2. Read and Write CD (CDRW)
3. CD Recordable

1. **Read Only CD** : Information is written only once in read only CD. It cannot be changed/modify. It is only a readable disk.
2. **Read and Write CD** : We can change data or read and write in this type of CD.

1.5.5 DVD

It is Digital Video Disk. It stores very large data. It looks like CD. DVD is mainly used to store media Data like Presentations, Pictures etc.



1.5.6 Pen Drive

It is a portable Universal Serial Bus (USB) flash memory device for storing and transferring audio, video, and data files from a computer. They are small enough to fit into a pocket. Other names include flash drive, jump drive, and thumb drive. USB flash drives are often used for the same purposes for which floppy disks or CDs are used, *i.e.*, for storage, data back-up and transfer of computer files. They are smaller, faster, have thousands of times more capacity, and are more durable and reliable because they have no moving parts.



Fig. Pen Drive