Memory :- A memory is just like a human brain. It is used to store data & instructions. Computer memory is the storage space in the computer, where data is to be processed & instructions required for processing are stored. The memory is divided into large number of small parts called cells. Each cell/location has a unique address, which varies from zero to m/r size minus one.

Memory is categorised in 3 following Types :-

(1) Cache memory
(2) Primary memory/main memory
(3) Secondary memory.

(1) Cache memory :- It is very high speed semiconductor memory which can speed up the CPU. It acts as a buffer between the C.P.U & the main memory. It is used to hold those parts of data & program which are most frequently used by the C.P.U. The parts of data & programs are transferred from the disk to cache memory by operating system from where the C.P.U can access them.

Advantages :- (1) faster then main memory
(2) It consumes less access time as compared to main memory.
(3) It stores the program that can be executed with in a short period of time.
(4) It stores data for temporary use.

Disadvantage :- (1) It has limited capacity
(2) very expensive.

(2) Primary memory :- primary memory holds only those data & instructions on which the computer is currently working. It has a limited capacity & data is lost when power is switched off. It is generally made up of semiconductor device. These memories are not fast as registers. The data & instruction required to be processed resides in the main memory. It is devided in to two category :-
① RAM ② ROM

Characteristics of main memory:-

1. These are semiconductor memories.
2. It is known as the main m/r.
3. Usually voletile memory.
4. Data is lost in case of power is switched off.
5. It is the working memory of the computer.
6. Faster then secondary memory.
7. A computer can not run without the primary m/r.

3. Secondary memory:- It is also known as external memory or non-voletile. It is slower than the main memory. These are used for storing data permanently. CPU directly does not access these memory, instead they are accessed via input output routines. The contents of secondary memories are first transferred to the main memory, & then the C.P.U. can access it. eg:- HDD, DVD etc.

Characterstics of secondary memory:-

1. These are magnetic & optical memories.
2. also known as backup memory.
3. non-volatile memory.
4. Data is permanently stored even if power is off.
5. used to store data in computer.
6. computer may run without secondary memory.
7. slower then primary memories.

## RANDOM ACCESS MEMORY [R.A.M.] :-

RAM is the internal memory of the C.P.U. for storing data, program & program result. It is a read/write memory which stores data until the machine is working. As soon as the machine is switched off, data is erased. RAM is small, both in terms of its physical size & in the amount of data it can hold.

RAM is of two types :- (1) Static RAM [SRAM]
(2) Dynamic RAM [DRAM]

(1.) **Static RAM :-** The word static indicates that the memory retains its contents as long as power is being supplied. SRAM chips use a matrix of 6-transistors & no capacitors. Transistors do not require power to prevent leakage, so SRAM need not be refreshed on regular basis. SRAM is thus used as cache memory & has very fast access.

Characteristics :- (1) Long life (2) No Need to refresh
(3) Faster (4) used as Cache memory
(5) Large size (6) Expensive
(7) High Powe consumption

(2.) **Dynamic RAM :-** Unlike SRAM, DRAM must be continuously 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 is used for most system memory as it is cheap & small. All DRAMs are made up of memory cells, which are composed of one capacitor & one transistor.

Characteristics of DRAM:-

(1) Short data lifetime.
(2) refreshed continuously
(3) slower than SRAM
(4) Smaller in size
(5) Less expensive.
(6) Less power consumption

## (*) Read only Memory [ROM]:-

The memory from which we can only read but can not write on it. This type of memory is non-volatile. The information is stored permanently in such memories during manufacture. A ROM stores such instructions that are required to start a computer. This operation is refferred to as **bootstrap**.

Types of ROMs:-

(1) MROM [MASKED ROM]:- The very first ROMs were hard-wired devices that contained a preprogramed set of data or instructions. These kinds of ROMs are known as MROM, which are inexpensive. It is programmed by IC manufacturer.

## 2. PROM [Programmable Read only Memory]:-

It is a computer memory chip that can be programmed once after it is created. One the PROM is programmed, the information written is permanent & can not be erased or deleted. PROM was first developed by Wen Tsing Chow in 1956. Programmed by user.
Eg:- BIOS in early systems.
Todays, PROM in computers has be Replaced by EEPROM.

## 3. EPROM [Erasable Programmable Read only Memory]:-

It is a memory chip that does not lose data even when the power is switched off. This is a non-volatile memory. Each EPROM is individually programmed by an electronic device. After that the data can be erased by exposing the EPROM to strong ultraviolate light.

Advantage:- (*) Non volatile
(*) quite effective
(*) It is reprogrammable.

Disadvantage:- (*) Transistors used in EPROM have higher resistance.
(*) Needs U.V. light to erase the data.
(*) not possible to erase a perticular by of data in EPROM. whole data is deleted.
(*) It take some time to erase the data in EPROM.

Secondary Storage Devices :- If we need to store large amount of data permanently, we need a cheaper & permanent memory. Such memory called secondary memory.

Types of secondry storage devices :-

1. Floppy Disk [F.D.] :- It is a type of storage media that reads data storage. also known as a floppy diskette, floppy, or floppy disk that is used to store data. It was extremely expensive as it was one of first types of hardware storage created in 1967 by IBM.

It Contained four basic components :-

- Megnetic read/write heads.
- a lever with a frame that helps to open & close the device.
- Containing all of the electronics, it includes a circuit board.
- It is placed through a spindle clamping device because it is spinning 300 to 360 rotations every minute.

Types of floppy DISK :- There are three type

(1) 8-Inch Drive :- In the early 1970's, 8-inch was the first floppy design that was used as read only format then become able for both read & write. Storage 80 Kb.

2. $5\frac{1}{4}$ inch Drive :- during 1980s, a $5\frac{1}{4}$-inch floppy disk drive was produced that was widely in use on PC. In 1990s, $5\frac{1}{4}$ inch floppy were also included on computers that could have the ability to store data between 360 Kb & 1.2 MB.

3. $3\frac{1}{2}$ Inch Drive :- This drive is encased in plastic, which can hold 1.44 mb on high-density disk & 730 Kb on a double density disk.

Advantages :- (1) Portability (2) Compatibility

Disadvantages :- (1) Speed (2) Storage (3) File corrupt (4) lack of Reliability (5) Physical Damages.

2. C.D. [Compact Disc] :- A circular disk introduced by James Russell. It is 4.75 in diameter, which is a flat, round, portable storage medium used to record, store & playback audio, video & other data. On 17-Aug-1982, in Germany, the first CD was created at a philips factory. It can store data upto 700 mb. It stores data as small notches & read with the help of leaser from an optical drive & notches are converted into usable data by drives.

different types of C.D. :-

(1) CD-ROM :- It allows the computer to read data, which is already stored in CD, It can not be deleted or change.

(2) Recordable CD (CD-R) :- Also known as CD-WORM (write once read many) or CD-WO (write once). Sony & Philips jointly developed it.

3. C.D. + R :- A group of companies developed the +R format. It was developed to increase the amount of storage available on a compact disc. CD.+R has twice storage then CD-R.

4. Rewritable CD (C.D-RW) :- It can be used to write data a number of times, erased & reused, and also used as normal CD-R.

5. Video CD (VCD) :- It was a CD. including moving images & pictures. It had a capacity of 650 mb/700 mb.

6. mini-CD :- It is wide around 3 inches & can store 210 mb data.

3. Hard Disk :- Also known as magnetic disc that stores data. It is located in a drive unit. It is non-volatile storage device that contains platters & magnetic disks rotating at high speed.

It is designed to store data permanently including large storage capacity compared to primary memory.

H.D. was introduced in the year 1956 by IBM. The first P.C. contains a hard drive of less then 1 mb. while modern PC containing a H.D. of 1 TB.

Advantages :- (*) Low cost (*) faster then optical drive (*) large storage.

Disadvantages :- (*) slower then RAM.
(*) HDD is noisy. (*) Consume more power

4. Pen Drive :- It is a small removable storage device. It is a portable storage device that you can use anywhere & connect to any computer. Also known as USB flash drive. USB Pen drive can be of three type namely USB 1.0, 2.0, 3.0

Use of Pen drive :- (1) data transfer (2) Back up (3) updating motherboard firmware (4) Booting O/S (5) store digital data.

disadvantage :- ① not capable to store large data.
② data may corrupt due to virus.