

Basic Concepts of Computer → Memory Classification

SESSION 4

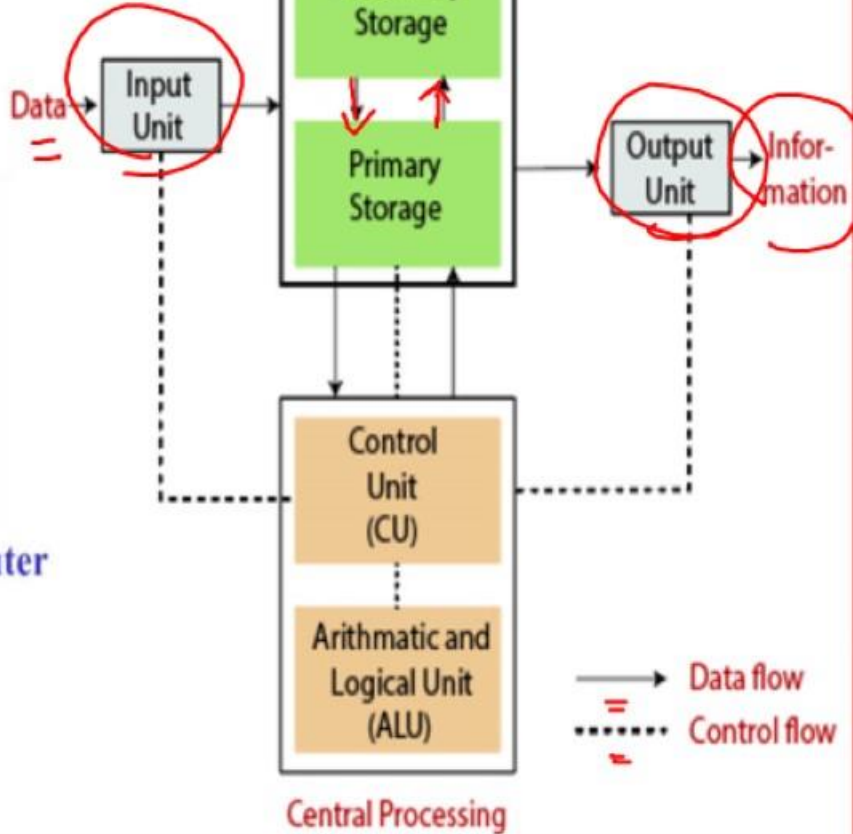
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Printer  
monitor  
Projector  
Plotter

Headphones  
DVD / CD

Storage Unit



Block diagram of computer

GPS  
Speakers

## 1. The major functions of the Input Unit are-

- The Input Unit takes the data to be processed by the user.
- The data is then converted into machine-readable form.
- The Input Unit then transmits the converted data into the main memory of the computer.
- The main purpose of this process is to connect the user and the computer by creating an easy connection between them.

Keyboard  
mouse  
touch screen  
light pen  
mic  
joystick  
Scanner  
Camera  
Sensors

- ## 2. Output unit presents processed data to the user.
- Examples include printers, monitors, projectors.
  - Presents data as soft copy (on screen) or hard copy (on paper).
  - Receives binary data from computer, converts it into readable format.
  - Accepts data from main memory.
  - Converts binary data into human-readable form.

The computer system consists of three main parts:

Input Units, CPU, and Output Units

o/p devices  
Printer → Dot Matrix  
→ Daisy Wheel Printer } Impact Printer.  
→ Line printer  
→ chain Printer

Non-Impact Printers

↳ Laser printer  
Inkjet printer



*impact printers*



*non impact printer*



**3. CPU Functions:**

- Acts as computer's brain, managing tasks and operations.
- Controls components, software, and data processing.

**Registers:** Small, high-speed storage locations within the CPU used to temporarily hold data and instructions.

**Cache Memory:** High-speed memory used to store frequently accessed data and instructions, providing quick access for the CPU.

**Clock:** Generates timing signals to synchronize operations within the CPU and other components of the computer system.

**ALU (Arithmetic Logic Unit) Functions:**

- Performs arithmetic and logical operations.
- Handles addition, subtraction, AND, OR, etc.

**CU (Control Unit):**

- Coordinates tasks and operations.
- Converts instructions into control signals.

**Memory Units:****•Primary Memory (e.g., RAM):**

- Stores temporary data.
- Directly accessible by CPU for reading and writing.

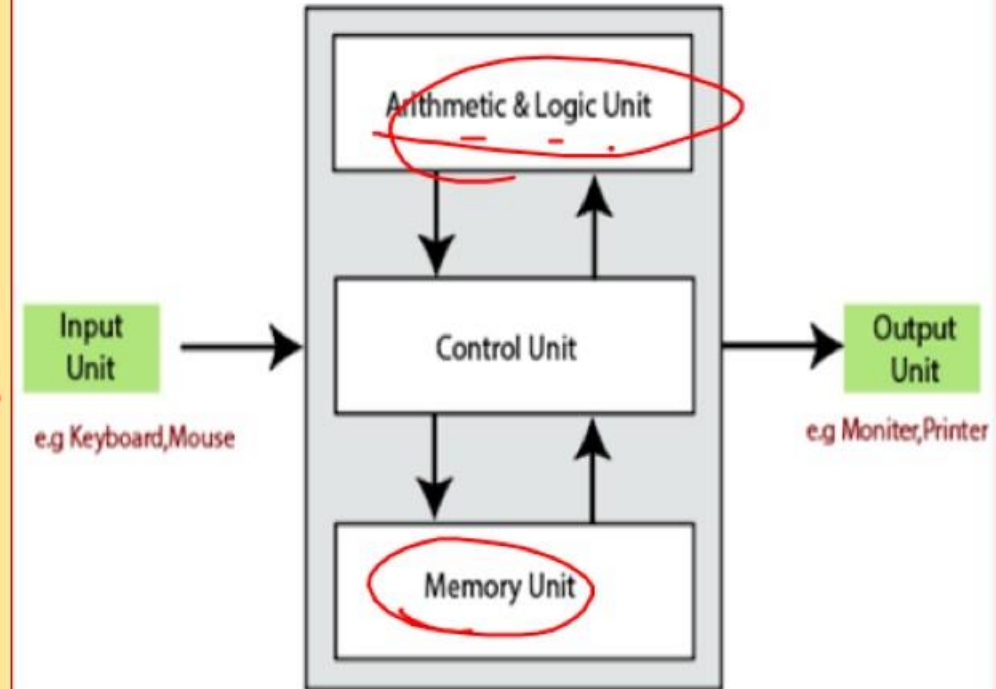
**•Secondary Memory (e.g., hard disk):**

- Stores permanent data.
- Data persists even during power failure.

2019

Quick Access

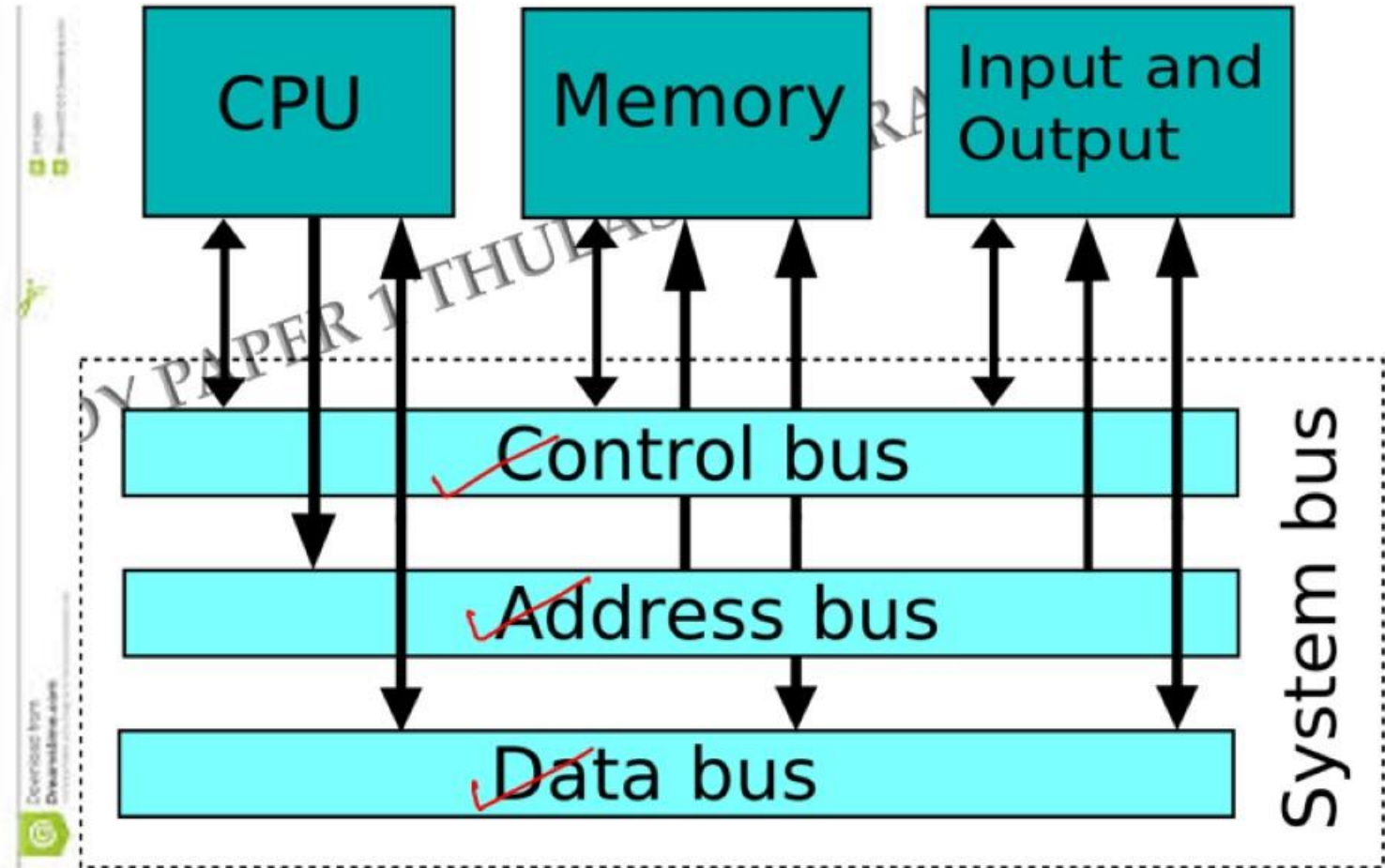
Buses - collection of wires

**Central Processing Unit (CPU)**



address - unidirectional →  $\mu p$  to i/o devices  
data → bidirectional memory

Bus



# 5 Generations of Computers

## Generations

## Time-Period

## Technology Used

✓ 1st Generation

1940s – 1950s

Vacuum Tube Based

✓ 2nd Generation

1950s – 1960s

Transistor Based

✓ 3rd Generation

1960s – 1970s

Integrated Circuit Based

✓ 4th Generation

1970s – Present

Microprocessor Based

✓ 5th Generation

Present – Future

Artificial Intelligence Based

First Generation  
(1940 to 1956)

Second Generation  
(1956 to 1964)

Third Generation  
(1964 to 1971)

Fourth Generation  
(1971 to present)

Fifth Generation  
(Present & beyond)





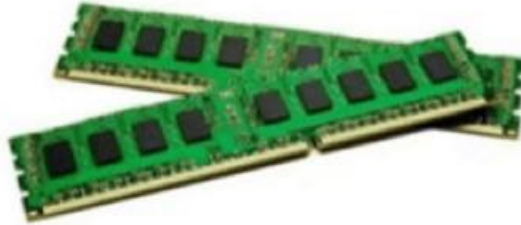
VT T IC 1.6GHz Per sec 1.6GHz μp VLSI

## Generation of Computer

Subject	1 <sup>st</sup> generation	2 <sup>nd</sup> generation	3 <sup>rd</sup> generation	4 <sup>th</sup> generation	5 <sup>th</sup> generation
Period	1940-1956	1956-1963	1964-1971	1971-present	present & beyond
Circuitry	Vacuum tube	Transistor	Integrated chips (IC)	Microprocessor (VLSI)	ULSI (Ultra Large Scale Integration) technology
Memory Capacity	20 KB	128KB	1MB	Semiconductor type and very high	VLSI and ULSI
Processing Speed	300 IPS inst. Per sec.	300 IPS	1MIPS(1 million inst. Per sec.)	Faster than 3 <sup>rd</sup> generation	Very fast
Programming Language	Assembly Language	High level language (FORTRAN, COBOL, ALGOL)	C, C++	C, C++, Java	All the Higher level languages, Neural networks,
Example of computers	UNIVAC, EDVAC	IBM 1401, IBM 7094, CDC 3600, D UNIVAC 1108	IBM 360 series, 1900 series	Pentium series Multimedia, Stimulation	Artificial Intelligence, Robotics



## INTERNAL MEMORY



RANDOM ACCESS MEMORY



READ ONLY MEMORY

# Computer Memory And Its Types

## EXTERNAL MEMORY



Memory Card Reader



USB Flash  
Memory



Media  
Devices



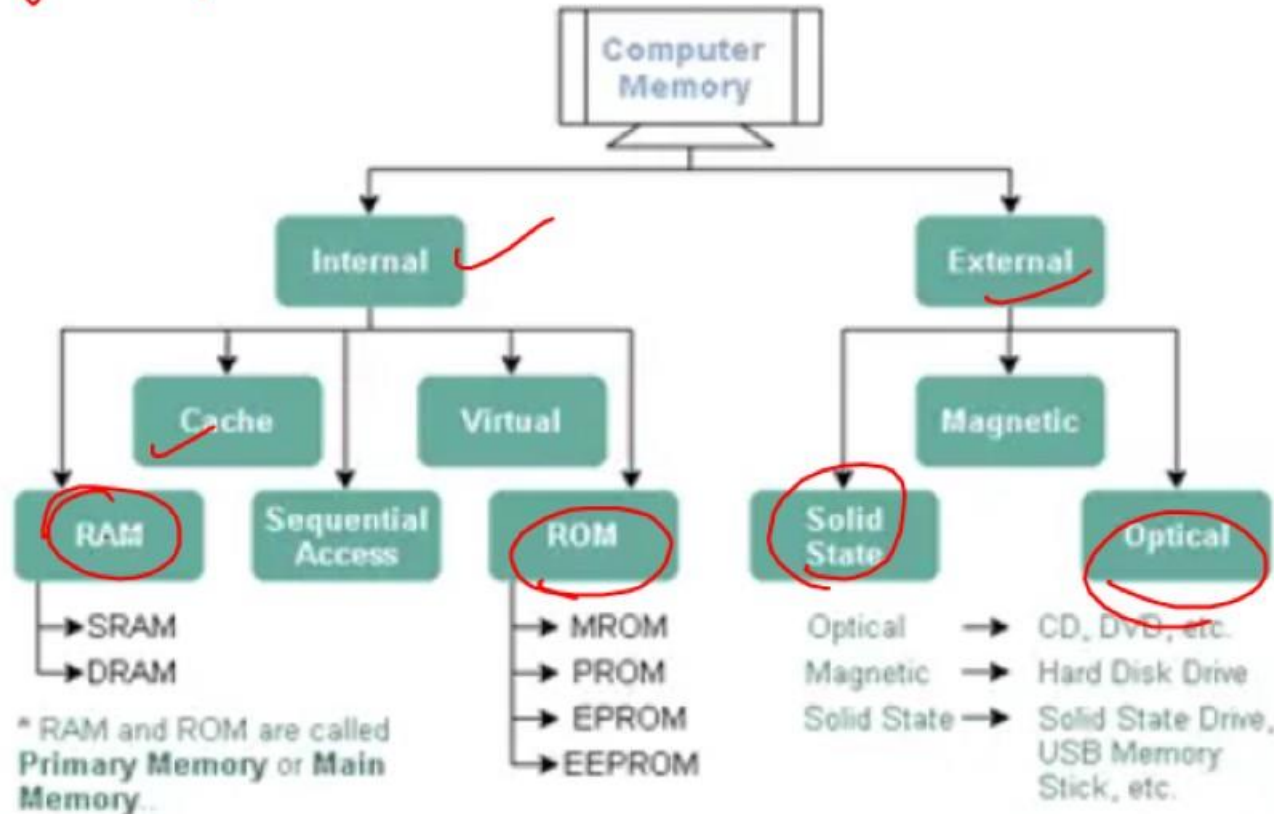
External Optical Drives



ZIP Drive

Computer memory is essential for storing and retrieving data and instructions necessary for executing tasks on a computer system. It consists of memory cells, each with a unique address, forming the building blocks of memory. The CPU accesses these memory cells to read or write data. Memory is crucial for the performance of a computer system, as the CPU can only store basic instructions. A computer's ability to handle large sets of data and execute tasks efficiently depends on its memory capacity and performance.

*Modern of Computer Architecture Von Neumann*





## Internal Memory

Internal Memory refers to the chips or modules that are directly connected to the motherboard

- **RAM (Random Access Memory)** is the internal memory of the CPU.
- Also known as read-write memory.
- Primary volatile memory, data is lost on power off.
- Smaller and faster than other computer memories.
- Not as fast as registers.



RAM can further be divided into the following categories-

**SRAM: Static Random Access Memory** or **SRAM** stores the data in a static form, meaning the data remains in the memory for as long as the computer is on. SRAM uses a matrix of six transistors and no capacitors. Transistors do not need the power to prevent leakage hence, we do not need to refresh SRAM again and again.

**DRAM: Dynamic Random Access Memory** is widely used in computer systems.

Earlier, there was a single data rate (SDR) used in computers but now, a dual data rate (DDR) is used in them. DDR is also available in different versions such as **DDR2, DDR3 and DDR4** which are more energy efficient and provide better performance. **DRAM is made up of a transistor and a capacitor in each cell** because of which it has a leakage problem. Hence, **we need to refresh a DRAM again and again**.



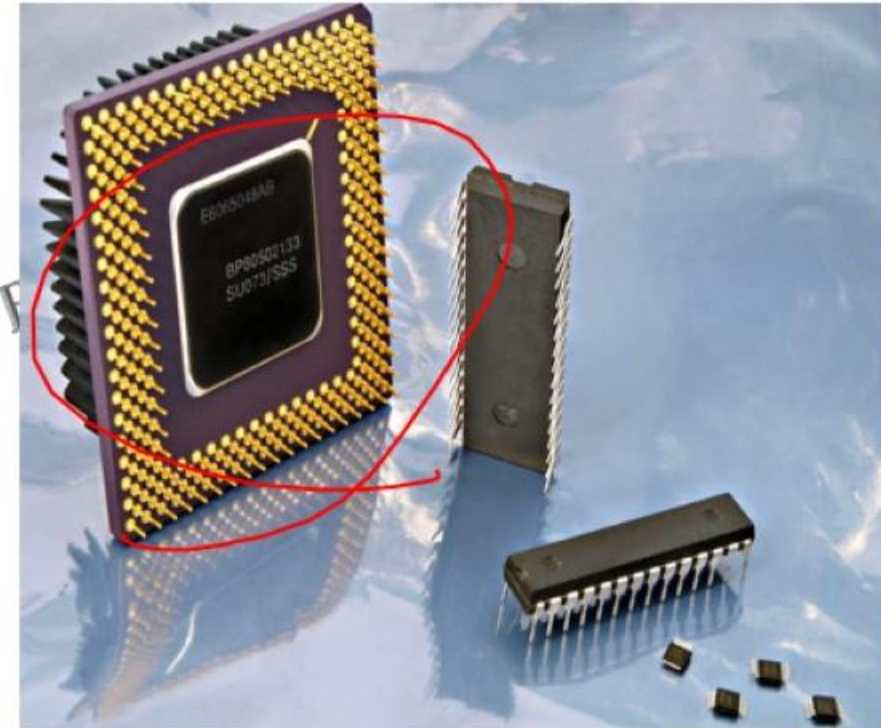
ROM stands for Read Only Memory into which the data cannot be normally written.

While the data can easily be read from this type of memory.

ROM is a primary non-volatile memory, meaning it can retain all the data in the memory without the power supply.

It is a very fast computer memory that stores the instructions required to start the computer as soon as we connect it to the power source.

When we connect the computer to the power source, the CPU starts reading the instructions stored in ROM. It also does not require support from the driver or any complex software to load the necessary parts of the operating system in the primary memory.





Bootling → process of starting a computer

Cold Boot → normal working of switching on the power button  
(hard " ⏻)

Warm Boot → Restart the  
(soft Boot) computer

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### 1. MROM (Masked Read Only Memory):

Contents pre-programmed by the manufacturer.

Data cannot be changed by users.

Altering data is difficult or slow due to manufacturing process.

### 2. PROM (Programmable Read Only Memory):

User-programmable memory.

Manufactured as blank memory.

Programmed using PROM programmer.

Once programmed, data cannot be changed.

### 3. EPROM (Erasable Programmable Read Only Memory):

Upgraded version of PROM.

Allows erasing and rewriting of data.

Data erased by exposing to ultraviolet light.

Data can be reprogrammed multiple times.

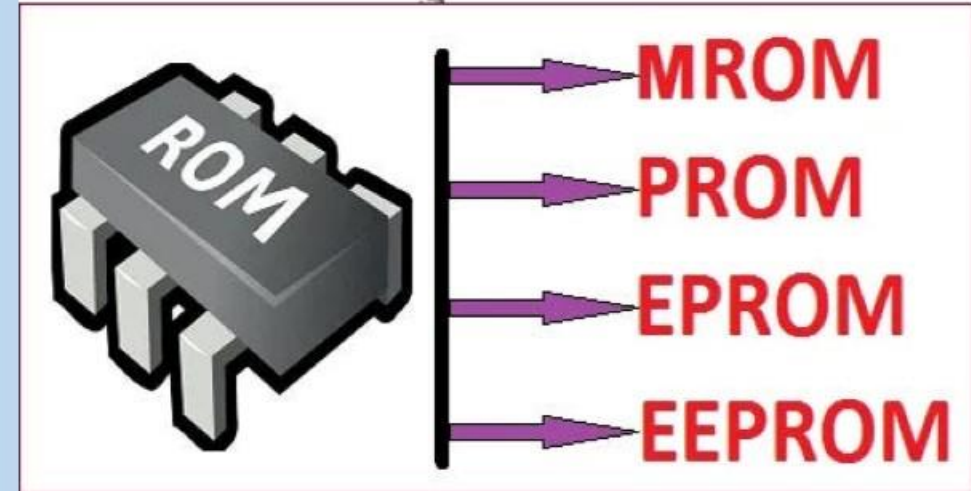
### 4. EEPROM (Electrically Erasable Programmable Read Only Memory):

Programmable and erasable electrically.

Programming and erasing take 4 to 10 milliseconds.

Can be erased 1 byte at a time.

Offers flexibility but slower compared to other types of memory.

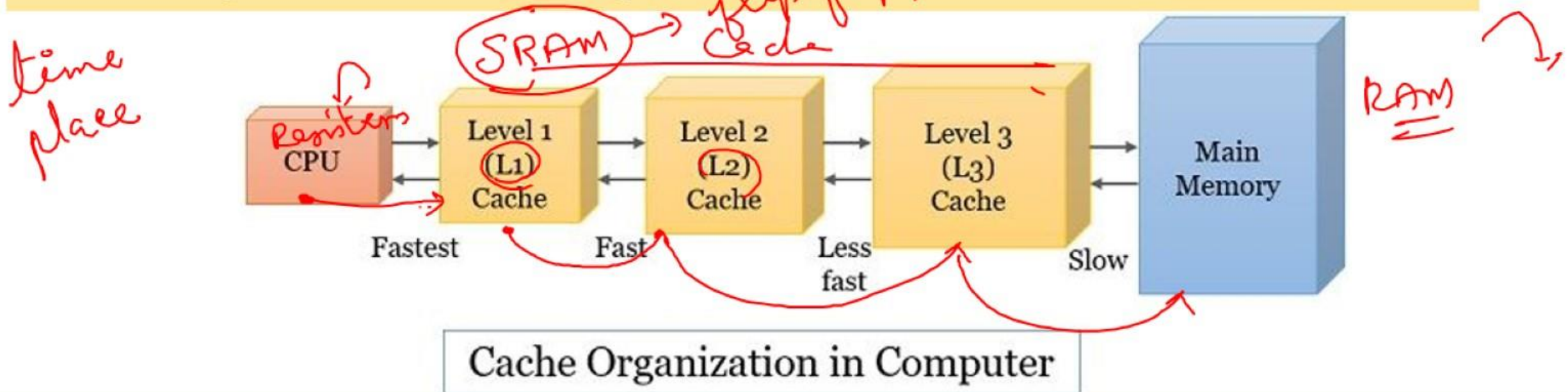




RAM	ROM
1. Temporary Storage	1. Permanent Storage
2. Store data in MBs	2. Store data in GBs
3. Volatile	3. Non-Volatile
4. Used in normal operation	4. Used for <u>startup</u> <u>process</u> of computer
5. Writing data is faster	5. Writing data is slower

Cache Memory → *internal*

Cache Memory is small-sized chip-based memory in a computer that lies between the main memory and CPU. It is very close to the chip of the CPU. The aim of this type of computer memory is to enhance the performance of the CPU. This memory is an extremely fast memory type that acts as a buffer between RAM and the CPU. This Memory holds frequently request data and instructions so that they are immediately available to the CPU when needed. Cache memory is costlier than main memory or disk memory but more than CPU registers.

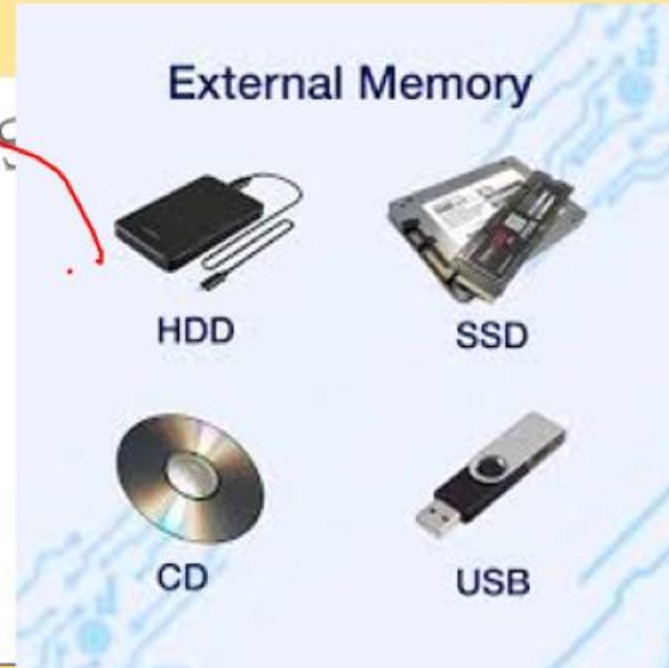




## External Memory: ✓

- Also known as secondary or auxiliary memory.
- Attached separately to the computer system.
- Used for permanent data storage.
- CPU cannot access directly; data transferred to primary memory first.
- Not as fast as primary memory.
- Examples include hard disks, solid-state drives (SSDs), optical disks, and USB flash drives.

Ind Memory Extension  
Registers  
Cache  
RAM / ROM



## Magnetic Storage Devices:

- Data encoded using magnetic fields.
- Each section magnetized represents Binary ONE, demagnetized represents Binary ZERO.
- Examples: Hard Disk Drives (HDDs), Magnetic Tapes, Floppy Disks.

## Solid State Storage Devices:

- Made of silicon microchips.
- Non-volatile retains data even when power is off.
- No moving parts, portable, and durable.
- Examples: Solid State Drives (SSDs), USB Flash Drives.

## Optical Storage Devices:

- Data read/written using laser beam.
- Consist of spinning discs with tracks, lands, and pits.
- Can store large amounts of data.
- Examples: CD-ROM, DVD-ROM, WORM (Write Once Read Many).

## EXTERNAL MEMORY



Memory Card Reader



USB Flash Memory



Media Devices



External Optical Drives



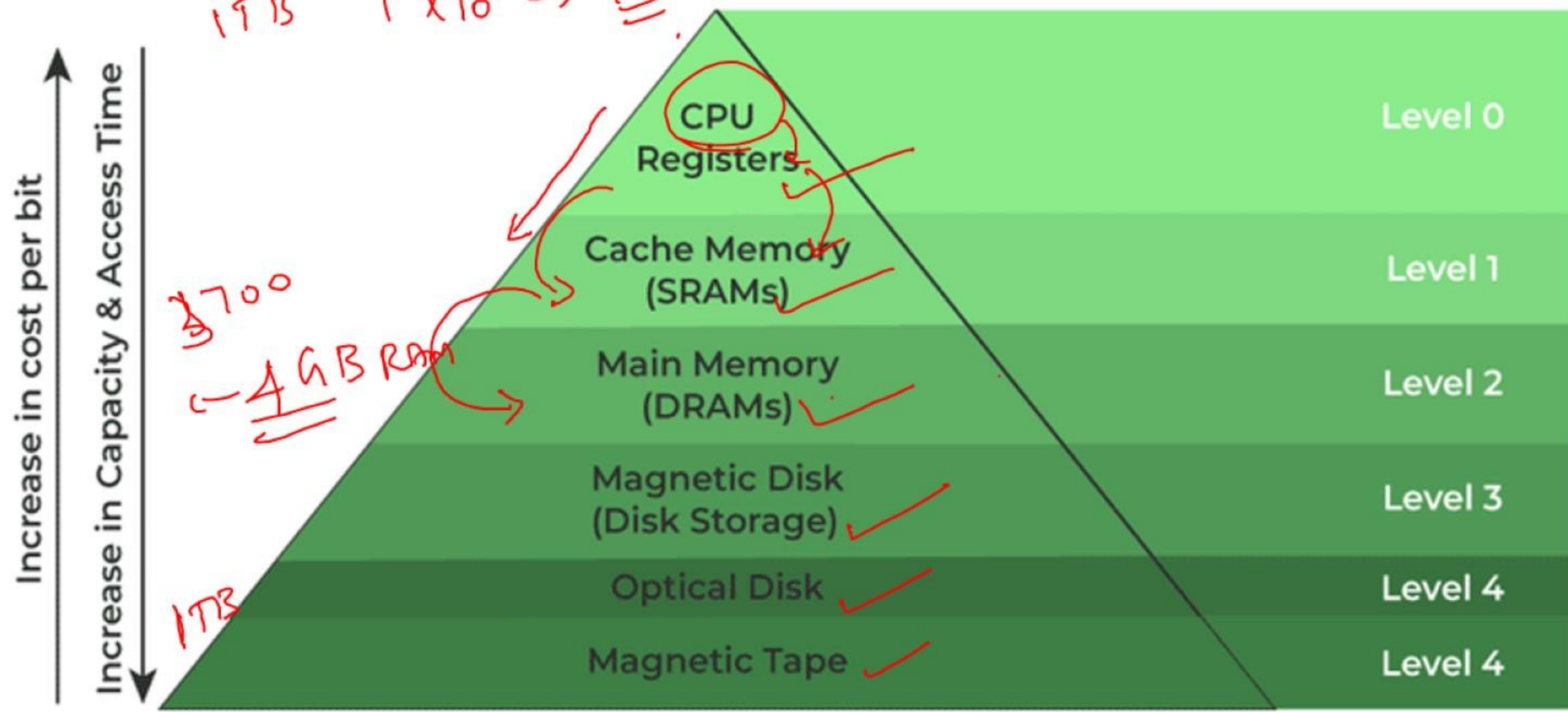
ZIP Drive





ICT

4 GB  $\rightarrow 4 \times 10^9 \rightarrow 3700$   
1 TB  $1 \times 10^{12} \rightarrow 4000$



Memory Hierarchy Design

Match List I with List II.

List I (Computer Components)

A. HDD

B. RAM

C. ROM

D. CRT

List II (Description)

1. Visual Display Unit

2. Volatile Memory

3. External Memory

4. Non-Writable Memory

Choose the correct answer from the options given below:

1. A-2

B-3

C-4

D-1

2. A-3

B-2

C-1

D-4

3. A-4

B-3

C-2

D-1

4. A-3

B-2

C-4

D-1



Given below are two statements:

~~Statement I~~ : CPU executes software directly from secondary memory. *→ False*

**Statement II** : A software is termed as Open Source Software if it can be downloaded from the Internet.

In the light of the above statements, choose the correct answer from the options given below:

- (1) Both Statement I and Statement II are true
- (2) Both Statement I and Statement II are false
- (3) Statement I is true but Statement II is false
- (4) Statement I is false but Statement II is true

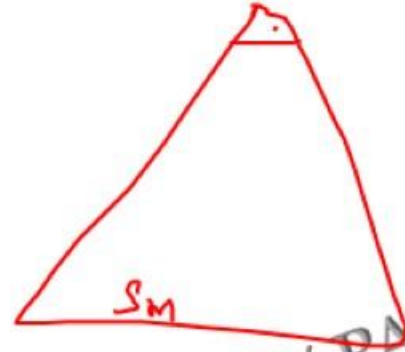
Open source software (OSS) is software that is distributed with its source code, making it available for use, modification, and distribution with its original rights.

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Identify the correct order of following computer memory types ranked from slowest to fastest in terms of access time.

- (A) Cache
- (B) CDROM
- (C) Hard Disk
- (D) RAM
- (E) Register



Choose the correct answer from the options given below:

- (1) (C), (B), (A), (D), (E)
- ~~(2) (E), (A), (D), (C), (B)~~
- ~~(3) (B), (C), (D), (A), (E)~~
- ~~(4) (D), (A), (E), (B), (C)~~

Given below are two statements

**Statement I** : DRAM consists of a number of transistors and capacitors.

**Statement II** : DRAM needs to be constantly refreshed.

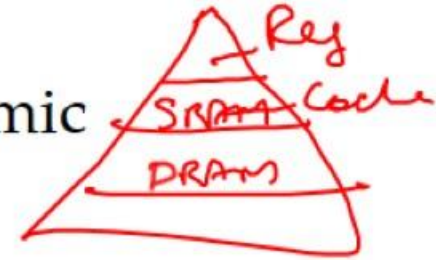
In the light of the above statements, choose the correct answer from the options given below:

- (1) Both Statement I and Statement II are true
- (2) Both Statement I and Statement II are false
- (3) Statement I is true but Statement II is false
- (4) Statement I is false but Statement II is true



Given below are two statements

Statement I: Most PCs use Dynamic RAMs for CPU Cache ~~X~~  
Statement II: Static RAM is faster and more expensive than Dynamic RAM



In light of the above statements, choose the correct answer from the options given below:

1. Both Statement I and Statement II are false
2. Both Statement I and Statement II are true.
3. ~~Statement I is false but Statement II is true.~~
4. Statement I is true but Statement II is false.

Given below are two statements

Statement I: Cache memory is faster than random access memory ✓

Statement II: Random access memory is closer to the processor than cache memory ✗

In light of the above statements, choose the most appropriate answer from the options given below

1. Both Statement I and Statement II are correct
2. Both Statement I and Statement II are incorrect
3. Statement I is correct but Statement II is incorrect ✓
4. Statement I is incorrect but Statement II is correct



Arrange the following computer memory types from the slowest to the fastest speed:

- A. Main memory (RAM) →
- B. L2 Cache →
- C. Hard Disk →
- D. L1 Cache →
- E. CD-ROM →

Choose the correct answer from the options given below:

- 1. ~~E,C,A,B,D~~
- 2. E,C,A,D,B
- 3. B,D,A,C,E
- 4. C,E,B, A,D