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'O' Level

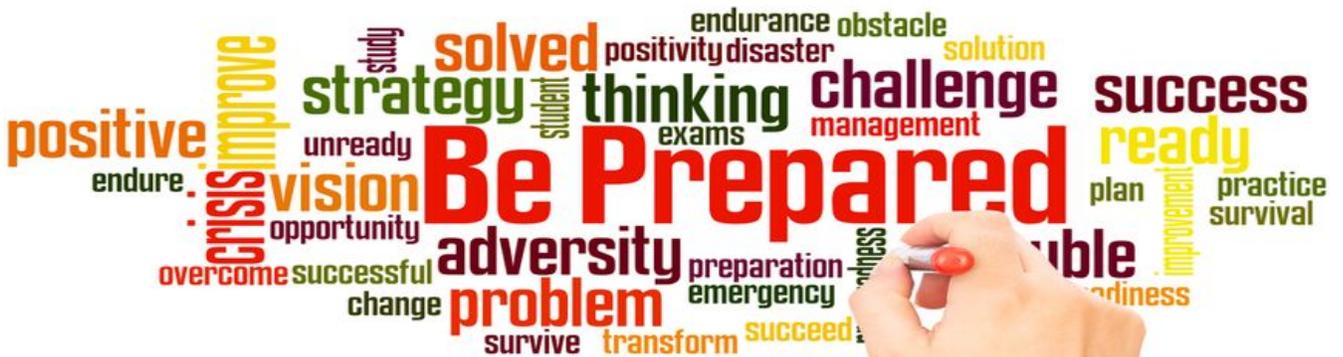
(Foundation course in Computer Application)

O Level IT Tools and Network Basics (M1-R5)

Book | Notes PDF



O-LEVEL E-BOOK



Chapter: 1

Introduction to Computer

Introduction to Computer

- The term "Computer" is derived from the Latin word "Computare" which means "to compute" or "to calculate."
- Computers are machines that perform tasks or calculations according to a **set of instructions or programs.**
- It is an electronic device used to store data and gives the results accurately within a fraction of second.



FIG 1.1: Computer

- Computers are extensively used everywhere.
- It mainly consist of four basic unit such as,
 - Input Unit
 - Storage Unit
 - CPU
 - Output Unit

- Classification of Computer
 - Analog Computer
 - Hybrid Computer
 - Digital Computer

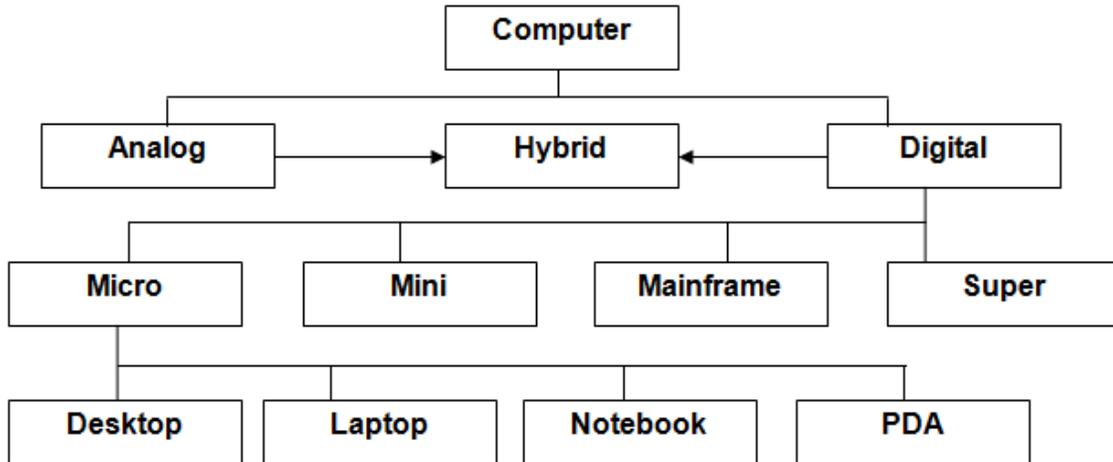


FIG 1.2: Types of Computer

Analog Computer

- An analog computer represents the data as physical quantities and operates on the data by manipulating the quantities.
- It is designed to process data in which the variable quantities vary continuously.



FIG 1.3: Analog Computer

Hybrid Computer

- A hybrid is a combination of digital and analog computers.
- It combines the best features of both types of computers, i.e. It has the speed of an analog computer and the memory and accuracy of digital computer.
- It accepts analog signals, converts them into digital and processes them in digital form.
- A hybrid computer may use or produce analog data or digital data.
- It accepts a continuously varying input, which is then converted into a set of discrete values for digital processing.

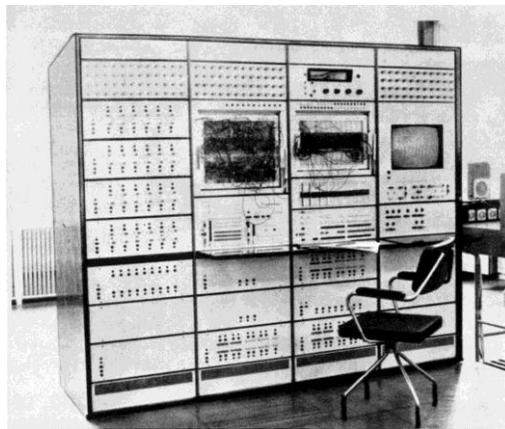


FIG 1.4: Hybrid computer

Digital Computer

- A digital computer is designed to process the data in numerical form, its circuits perform mathematical operations of addition, subtraction, multiplication and division.
- The numbers operated on by a digital computer are expressed in the **binary system**.

- Digital Computers are generally classified by size and power as follows
 - Micro Computer
 - Mini Computer
 - Mainframe Computer
 - Super Computer
- **Micro Computer**
 - Micro Computer is a small, relatively inexpensive computer with a microprocessor as its CPU.
 - The invention of the microprocessor (single chip CPU) gave birth to the much cheaper microcomputers.



FIG 1.5: Micro Computer

- Micro Computers are commonly divided into four types such as
 - ❖ Desktop
 - ❖ Laptop
 - ❖ Notebook
 - ❖ PDA (Personal Digital Assistant)

➤ Desktop Computer

- ❖ A desktop computer is a personal computer (PC) in a form intended for regular use at a single location.
- ❖ Early desktop computers are designed to lie flat on the desk, while modern towers stand upright.
- ❖ Most modern desktop computers have separate screens and keyboards.



FIG 1.6: Desktop Computer

➤ Laptop Computer

- ❖ A laptop is a portable computer that has same capabilities as a desktop, but is small enough for easy mobility.



FIG 1.7: Laptop computer

➤ Notebook Computer

- ❖ A notebook computer has a keyboard with an attached screen.
- ❖ A notebook's screen is thinner than the usual desktop computer monitor because the machine is designed to be portable, which is why the notebook itself is small, compact, and lightweight.



FIG 1.8: Notebook Computer

➤ Personal Digital Assistant (PDA)

- ❖ Personal Digital Assistant (PDA) is a device similar to a computer that fits in the palm of users hand and allows them to collect information such as contacts, appointments, files, programs, and more.



FIG 1.9: PDA

- **Mini Computer**

- Mini computers were designed for control, instrumentation, human interaction, and communication switching as it is distinct from calculation and record keeping.



FIG 1.10: Mini Computers

- A small, multi-user computer that can support 10 to hundred users simultaneously.

- **Mainframe Computers**

- Mainframe Computers is a powerful multi-user computer that can support thousand users simultaneously.
- Mainframe computers can also process data at very high speeds, i.e., hundreds of million instructions per second and they are also quite expensive.
- Normally, they are used in banking, airlines and railways, etc. for their applications.



FIG 1.11: Mainframe Computers

- **Super Computer**

- Super Computers are best in terms of processing capacity and also the most expensive one.
- An extremely fast computer that can perform hundreds of millions instructions per second.



FIG 1.12: Super Computer

Characteristics of Computer

- Computers have some important features which have made them so popular.
- A Computer can be categorized according to
 - Speed
 - Accuracy
 - Versatility
 - Reliability
 - Power of remembering
 - Diligence
 - Storage
- **Speed**
 - Computers work at an incredible speed.
 - It can carry out instructions at a very high speed.
 - A powerful computer is capable of performing about 3-4 million simple instructions per second.
 - It can perform arithmetic and logical operations within a fraction of second.
- **Accuracy**
 - Computer provides a high degree of accuracy.
 - Computers perform all jobs with 100% accuracy.
 - The degree of accuracy of a computer depends on the instruction and processor type.
- **Versatility**
 - Computer is versatile in nature.

- It can perform different types of task easily.
- At one moment user can use the computer to prepare a letter document and in the next moment they may play music or print a document.
- **Power of remembering**
 - A computer can store and recall any information because it has secondary storage.
 - All information can be retained as long as desired by the user and that can be recalled almost simultaneously and accurately even after several years.
- **Diligence**
 - Computers can perform long and complex calculations with the same speed and accuracy from the start till the end.
 - Being a machine, a computer does not suffer from the human traits of tiredness and lack of concentration.
- **Storage**
 - Large volume of data and information can be stored in the computer and also retrieved whenever required.
 - Computer has two types of storage. They are Primary storage and Secondary storage.
 - In Primary Storage, a limited amount of data can be stored temporarily like RAM, ROM.
 - Secondary storage can store a large amount of data permanently like floppy and compact disk.

Components of Computer System

- The computer is an electronic device that accepts (reads) data from the user and processes the data by performing calculations and operations on it, and generates (writes) the desired output.
- A computer consists of four major components such as
 - Input Devices (Input Unit)
 - CPU (Processing Unit)
 - Memory (Storage Unit)
 - Output Devices (Output Unit)

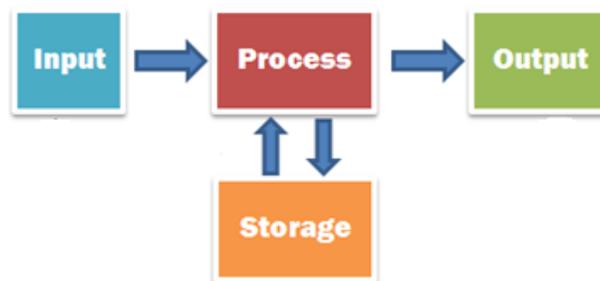


FIG 1.13: Components of Computer

Input Unit

- 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.
- The important and most commonly used input devices are
 - Keyboard
 - Mouse
- Other input devices are

- Joystick
- Scanner
- Barcode Reader

CPU (Processing Unit)

- The CPU is the heart of the computer, it is the part of a computer which interprets and executes instruction.

Functional block of CPU

- The two components in CPU are
 - Arithmetic and logic unit (ALU)
 - Control Unit (CU)

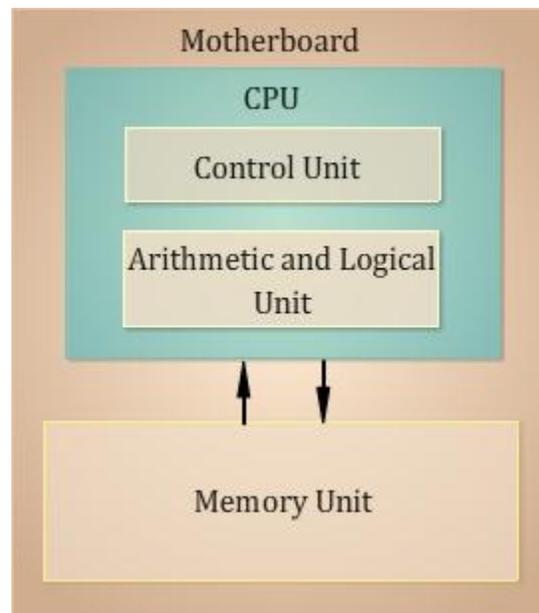


FIG 1.14: Functional block of CPU

- **Arithmetic and logic unit (ALU)**
 - The ALU performs arithmetic and logical operations.
 - Arithmetic operations include addition, subtraction, multiplication and division.

- Logical operations include comparing numbers, letters and special characters.
- The ALU is a fundamental building block of the Central Processing Unit of a computer.
- **Control Unit (CU)**
 - A Control Unit (CU) handles all processor control signals.
 - It directs all input and output flow, fetches code for instructions from micro-programs and directs other units and models by providing control and timing signals.

Memory Unit

- Computer memory is a device that stores computer's data and programs.

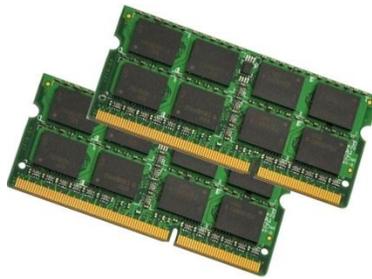


FIG 1.15: Computer Memory (RAM)

- It stores program, data results or any kind of information.
- Memory stores binary information, i.e. 0's and 1's in internal storage areas in the computer.
- Moreover, the term memory is usually used as shorthand for physical memory, which refers to the actual chips capable of holding data.
- Some computers also use virtual memory, which expands physical memory onto a hard disk.

Unit	Abbrevia- tion	Approximate Value (Bytes)	Actual Value (Bytes)
Kilobyte	KB	1,000	1,024
Megabyte	MB	1,000,000 (1 million)	1,048,576
Gigabyte	GB	1,000,000,000 (1 billion)	1,073,741,824
Terabyte	TB	1,000,000,000,000 (1 trillion)	1,099,511,627,776

Output Unit

- Output devices are peripheral equipment that converts a computer's output to a form that can be seen, heard or used as an input for another device, process or system.
- The important output devices, which are used in computer systems are
 - Monitors
 - Printer
 - Graphic Plotter

Introduction to Computer Organization

- **Computer Organization** refer to the operational units and their interconnection that realize the architectural specifications.
- **Computer Architecture** refers to those attributes of a system visible to a programmer.
- Architectural attributes that include instruction set, number of bits used to represent various data types (numbers, characters), I/O mechanism and techniques for addressing memory.
- Organizational attributes that include those hardware details transparent to the programmer, such as control signals, interfaces between the computer and peripherals and the memory technology used.

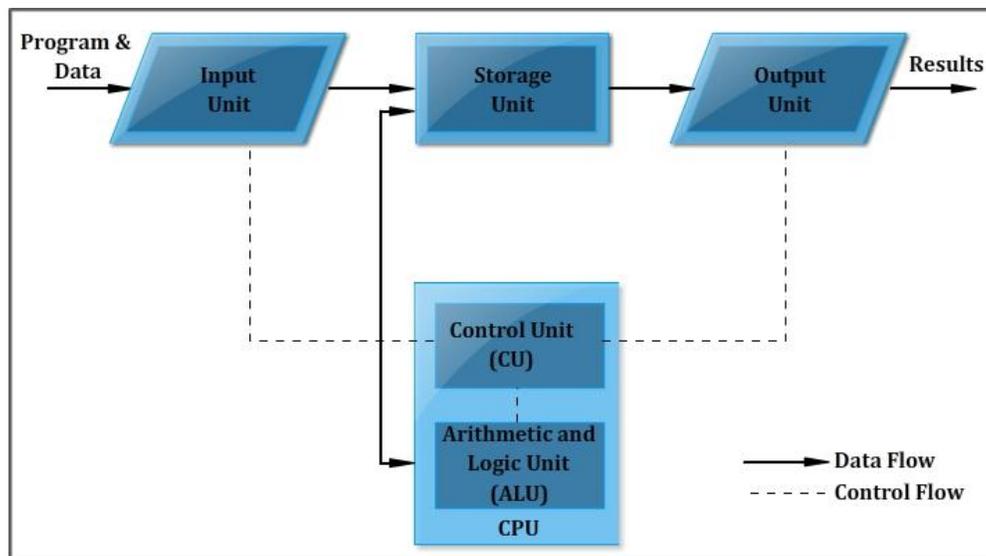


FIG 2.1: Processing of computer organization

What is CPU?

- CPU stands for Central Processing Unit.
- The Central Processing Unit (CPU) is the brain of the computer, it is a part of computer which interprets and executes instruction.

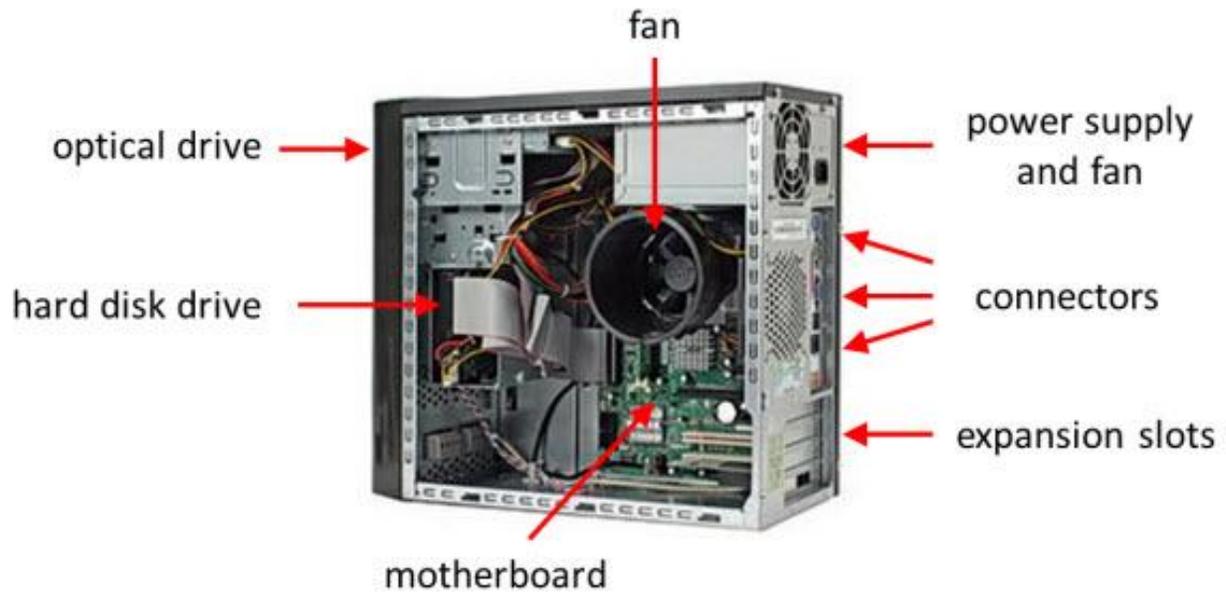


FIG 2.2: Central Processing Unit

- It is also known as microprocessor or processor.



FIG 2.3: Processor

- The task of performing operations like arithmetic and logical operations is called processing.
- The CPU takes data and instructions from the storage unit and makes all sorts of calculations based on the instructions given and the type of data provided. It is then sent back to the storage unit.
- It processes the instructions that it collects by decoding the code in programs.
- The CPU chip is usually in the shape of a square or rectangle and has one notched corner to help place the chip into the motherboard properly.
- The main functions of CPU are to Fetch, Decode, Execute and Write back.

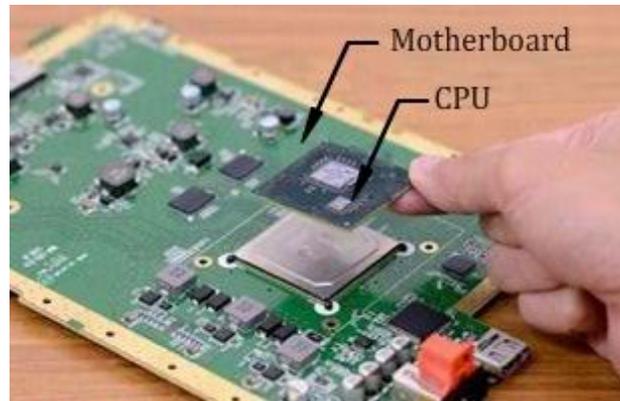


FIG 2.4: CPU Processor in Motherboard

- The CPU contains
 - Arithmetic and Logic Unit (ALU)
 - Control Unit (CU)

- **Arithmetic and Logical Unit**

- The Arithmetic and Logic Unit performs arithmetic and logical operations.
- Arithmetic operations include addition, subtraction, multiplication and division.

Operator	Description
+	Addition
-	Subtraction
*	Multiplication
/	Division

FIG 2.5: Arithmetic Operations

- **Logic Unit**

- Logic Unit performs following operations such as AND, OR, NOT, XOR, NOR, NAND, etc.

Operator	Description
&&	AND
	OR
!	NOT

FIG 2.6: Logical Operations

- **Control Unit**

- A Control Unit (CU) handles all processor control signals.
- It generates timing signals such that the coordination among devices take place.
- Control unit is designed in two ways such as
 - ❖ Hardwired control
 - ❖ Micro-program control
- **Hardwired control**
 - ❖ The Design is based on a fixed architecture.
 - ❖ The CU is made up of flip-flops, logic gates, digital circuits and encoder & decoder.
- **Micro-programs**
 - ❖ Micro-programs are stored in a special control memory and are based on flowcharts.
 - ❖ They are replaceable and ideal because of their simplicity.
 - ❖ It directs all input and output flow, fetches code for instructions from micro programs and directs other units and models by providing control and timing signals.
 - ❖ And also Central Processing Unit includes Arithmetic logic unit and control unit. It has five major operations such as
 - It accepts data as input.
 - It stores data and instruction.
 - It processes data as per instruction.
 - It controls all operations inside a computer.
 - It gives result in the form of output.

Processor Speed

- A microprocessor (processor or CPU) is where the instructions of a program are processed. (show image)
- The high level language that the programmer uses is transformed into a binary code that the CPU understands and creates an executable file that will launch the program when double-clicked.
- A hertz is one cycle per second, 1 MHz is 1 million cycles per second and 1000 MHz is 1 GHz(one billion cycles per second). (refer video)
- If user have a CPU at 2 GHz(animation: that is 2000 MHz), it can do 2 billion program instructions per second.

Steps to find the CPU speed in different operating system

- To find the CPU speed in Windows XP “click the START button, then scroll go to my computer and right click on that and select Properties”.
- User can also find the CPU speed by Help and Support Center.
- To find the CPU speed in Vista and Windows 7 “click the START button and scroll to Control Panel then select the System and Security, in that click on the System”.
- For checking CPU speed in Macs “ click on the apple menu and select About this Mac”.
- For advanced Windows users of Windows XP “click the START button and select RUN “.

Booting

- Booting is the initialization of the computerized system.
- The booting process can be “hard” when electrical power to the CPU is switched from off to on.

- Soft booting can be initiated by hardware such as a button press, or by software command.
- A boot loader is a computer program that loads an operating system or some other software for the computer.

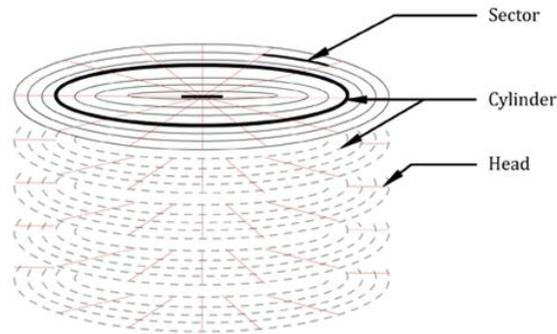


FIG 2.7: Boot Sector

- Boot sector refers to a single sector (normally the first in the active partition) that contains the code to boot the operating system.
- A sector of a hard disk, floppy disk or similar data storage device that contains code for booting programs (usually, but not necessarily, operating systems) stored in other parts of the disk.
- Before the boot sector is read, the computer's BIOS will call a small program called an MBR (Master Boot Record), which normally resides in the first record of the first disk.
- The small program stored in the boot sector is then executed and the operating system will begin to load.
- To be a valid boot sector, the two-byte hex word 0xAA55, called the boot sector signature, must exist at the end of the sector.
- Otherwise, either the BIOS or MBR code will report an error message and halt any OS bootstrapping process.

Memory

- The Memory Unit is the part of the computer that holds data and instructions for processing.
- It stores program results or any kind of information.
- Memory stores binary information i.e. 0's and 1's.
- Memory is measured in bytes.

Types of Memory

- The computer memory is divided into two types, they are
 - Primary or Main memory
 - Secondary memory (Secondary Storage Device)

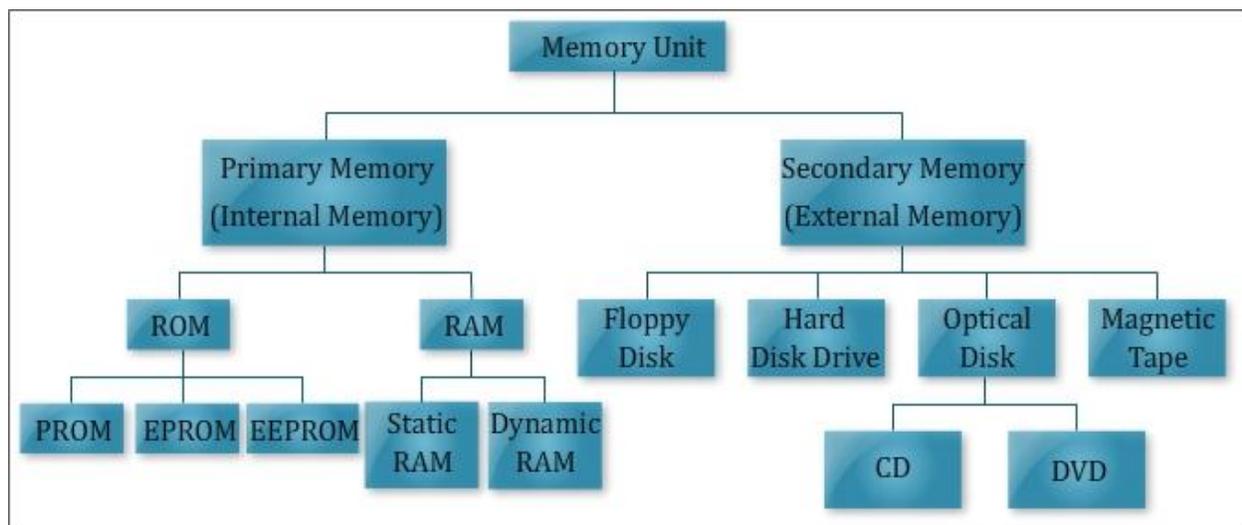


FIG 2.8: Types of Memory

Primary memory

- Primary Memory is used for immediate access of data by the processor.
- Most computer systems around the world use primary memory.
- Primary memory can be divided into two types.
 - RAM (Random Access Memory)
 - ROM (Read Only Memory)
- **RAM (Random Access Memory)**
 - Random Access Memory is the central storage unit in a computer system.
 - The information stored in the RAM is typically loaded from the computer's hard disk, and includes data related to the operating system and certain applications.



FIG 2.9: RAM

- There are primarily two forms of RAM
 - ❖ Static RAM (SRAM)
 - ❖ Dynamic RAM (DRAM)
- **Static RAM (SRAM)**
 - ❖ In SRAM, a bit of data is stored using the state of a flip-flop. This is most expensive among other forms of RAMs, but is generally faster and requires less power than DRAM and, in modern computers, is often used as cache memory for the CPU.
- **Dynamic RAM (DRAM)**

- ❖ Widely used in modern computers as primary memory, DRAM is slower than SRAM, but is inexpensive due to its one transistor-one capacitor paired assembly of memory storage.

- **ROM (Read Only Memory)**

- ROM stands for Read Only Memory.
- The CPU can only fetch or read instructions from ROM.
- ROM comes with instructions permanently stored inside.



FIG 2.10: ROM

- And these instructions cannot be over-written by the computer's CPU.

- **Types of ROM**

- PROM – Programmable Read Only Memory
- EPROM – Erasable Programmable Read Only Memory
- EEPROM – Electrically Erasable Programmable Read Only Memory

- **PROM**

- PROM Stands for "**Programmable Read-Only Memory**," and is pronounced "p-rom," not "prom".
- PROM is a type of **ROM** that is programmed after the memory is constructed.
- PROM chips have several different applications, including cell phones, video game consoles, medical devices, and other electronics.
- They provide a simple means of programming electronic devices.