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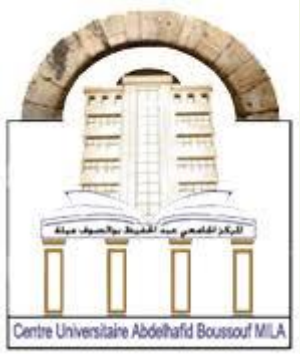

Structure of Computers and Applications

1st year ST – ENGINEERING

Part 1: Introduction to Computer Science

Course 03

By

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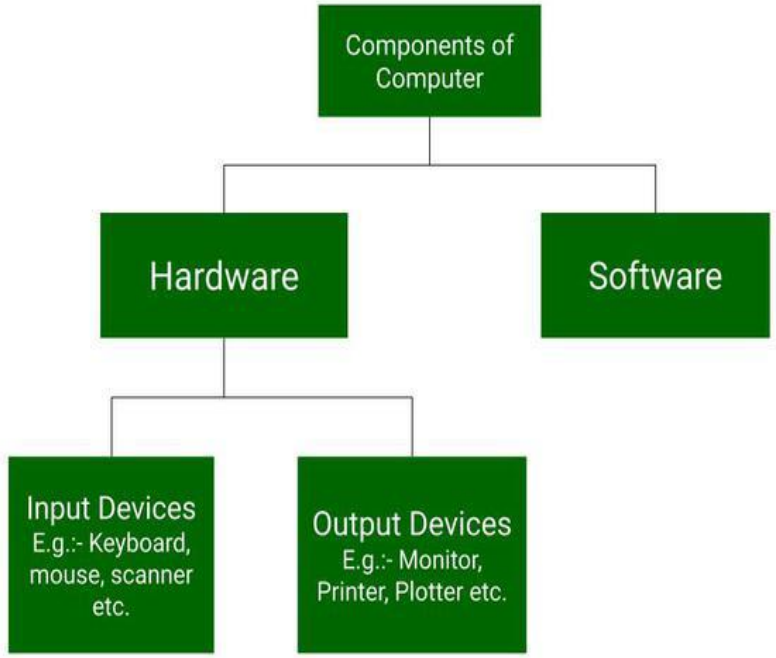
4- Computer Architecture

Itroduction

A computer is an electronic device, operating under the control of instructions **stored** in its own memory, that can **accept** data, **process** the data according to specified rules, **produce** results, and store the results for future use. It is composed of two main parts:

- **The Hardware** : is any part of the computer that has a **physical structure**, such as the keyboard, mouse, or all of the computer's internal parts.
- **The Software**: is any **set of instructions** that tells the hardware **what to do** and **how to do it**.



4- Computer Architecture

4- Computer Architecture

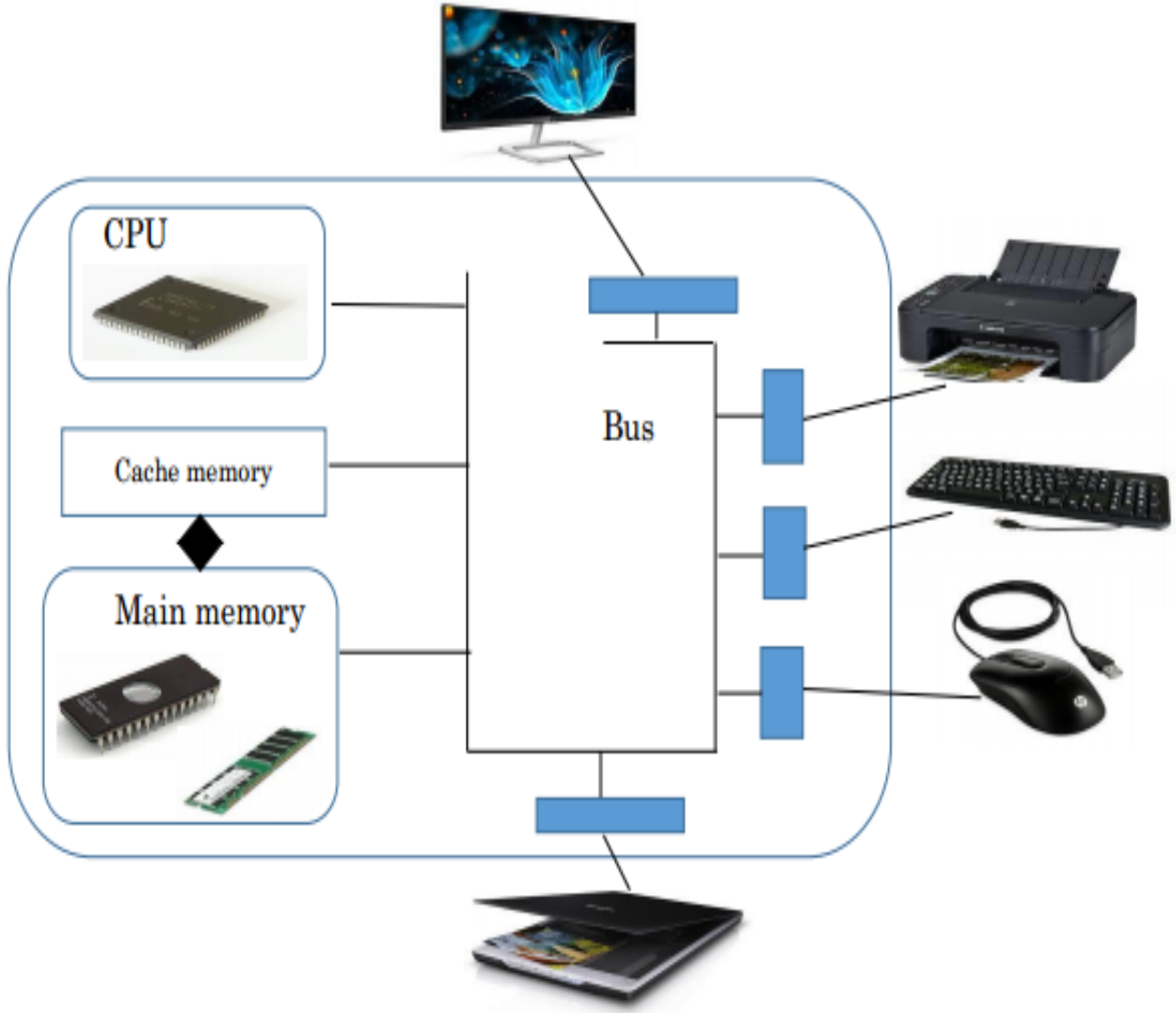
Main Components of Computer Architecture:

A. Central Processing Unit (CPU)

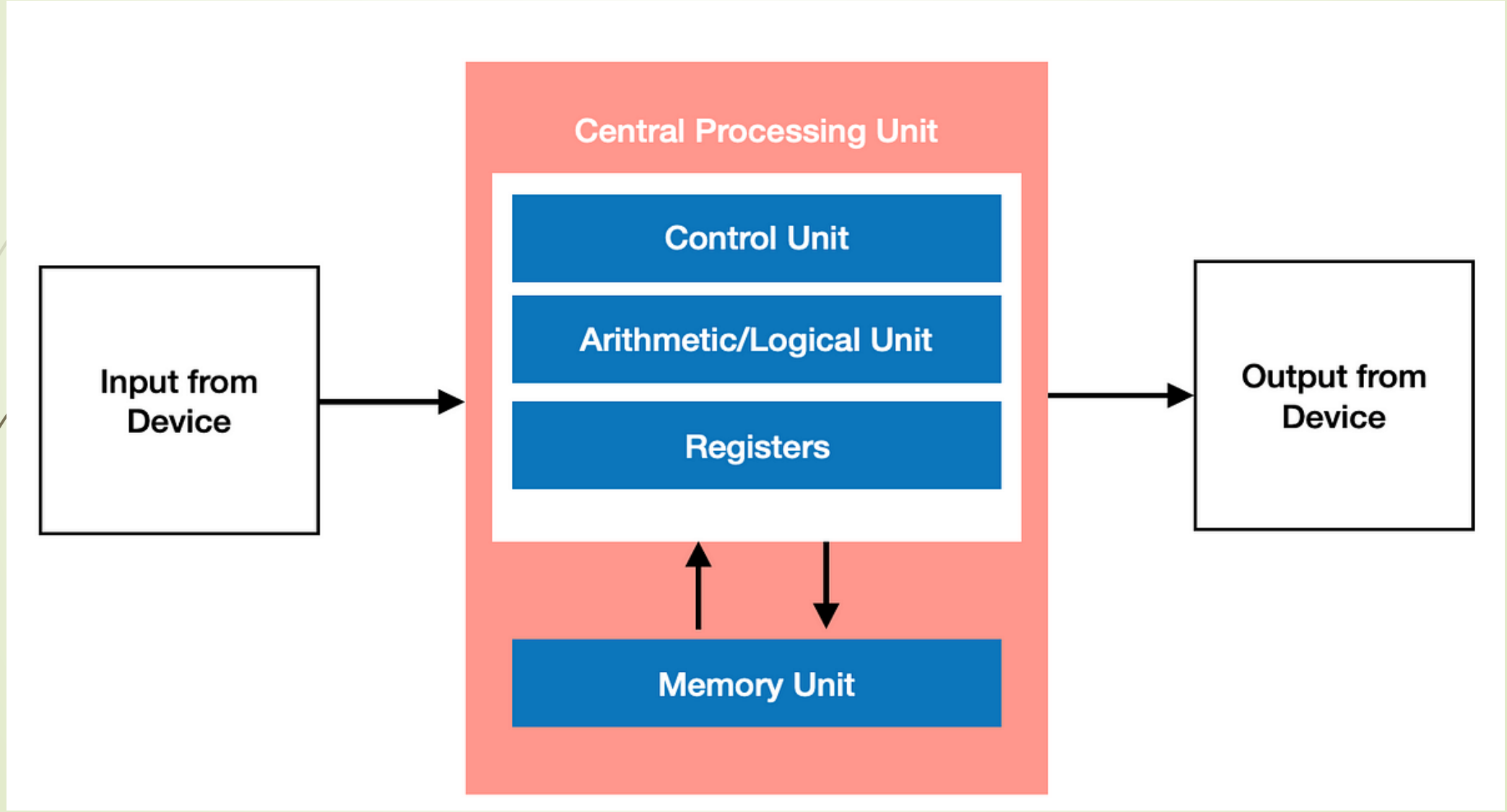
B. Memory (Storage)

C. Input and Output Devices (I/O)

D. Bus System



Central Processing Unit (CPU):



Main Components of Computer Architecture

A. Central Processing Unit (CPU):

- The "brain" of the computer, responsible for executing instructions and performing calculations.
- It includes arithmetic logic unit (ALU), control circuits and registers.
- Divided into three main components:

A.1. The Control Unit (CU):

- ✓ The control unit **Directs** and **coordinates** most operations of the processor and tells other components how to respond to instructions.
- ✓ It also aims to **arrange** data and instruction processing.

Main Components of Computer Architecture

A.2. Arithmetic Logic Unit (ALU):

- ✓ Performs any mathematical (**arithmetic**) operations (additions, subtractions, multiplication, division) and **logic** operations (AND, OR, NOT).

A.3. Registers:

- ✓ Small, high-speed storage locations that **store** temporary data and instructions for immediate use by the CPU.
- ✓ Contain **information**, **commands**, **addresses**, and **intermediate** processing results.

B. Memory (Storage):

The memory contains numerous computer parts that are employed **to store data**. It is typically separated into:

B.1. Primary Memory (main memory):

is the memory in a computer that temporarily stores data and instructions that the CPU (Central Processing Unit) needs while performing tasks.

Main Components of Computer Architecture

Primary memory is **volatile**, meaning it loses its contents when the computer is turned off, with the exception of certain types like **ROM**.

Types of Primary Memory:

- **Random Access Memory (RAM)**:
  - Used to store data and instructions temporarily while the computer is running.
  - It is volatile, meaning all data is lost when the computer is powered off.
- **Read Only Memory (ROM)**:
  - Stores critical **startup** instructions for the computer, like the BIOS (Basic Input/Output System).
  - It is **non-volatile**, meaning it retains its contents even when the computer is powered off.
  - ROM is used for **firmware** that does not need to be modified regularly.

Main Components of Computer Architecture

B.2. Secondary Memory (Hard Drives, SSDs):

Permanent storage that holds data, programs, and files. It is **non-volatile** and **retains** information even when the computer is **powered off**.

Memory capacity:

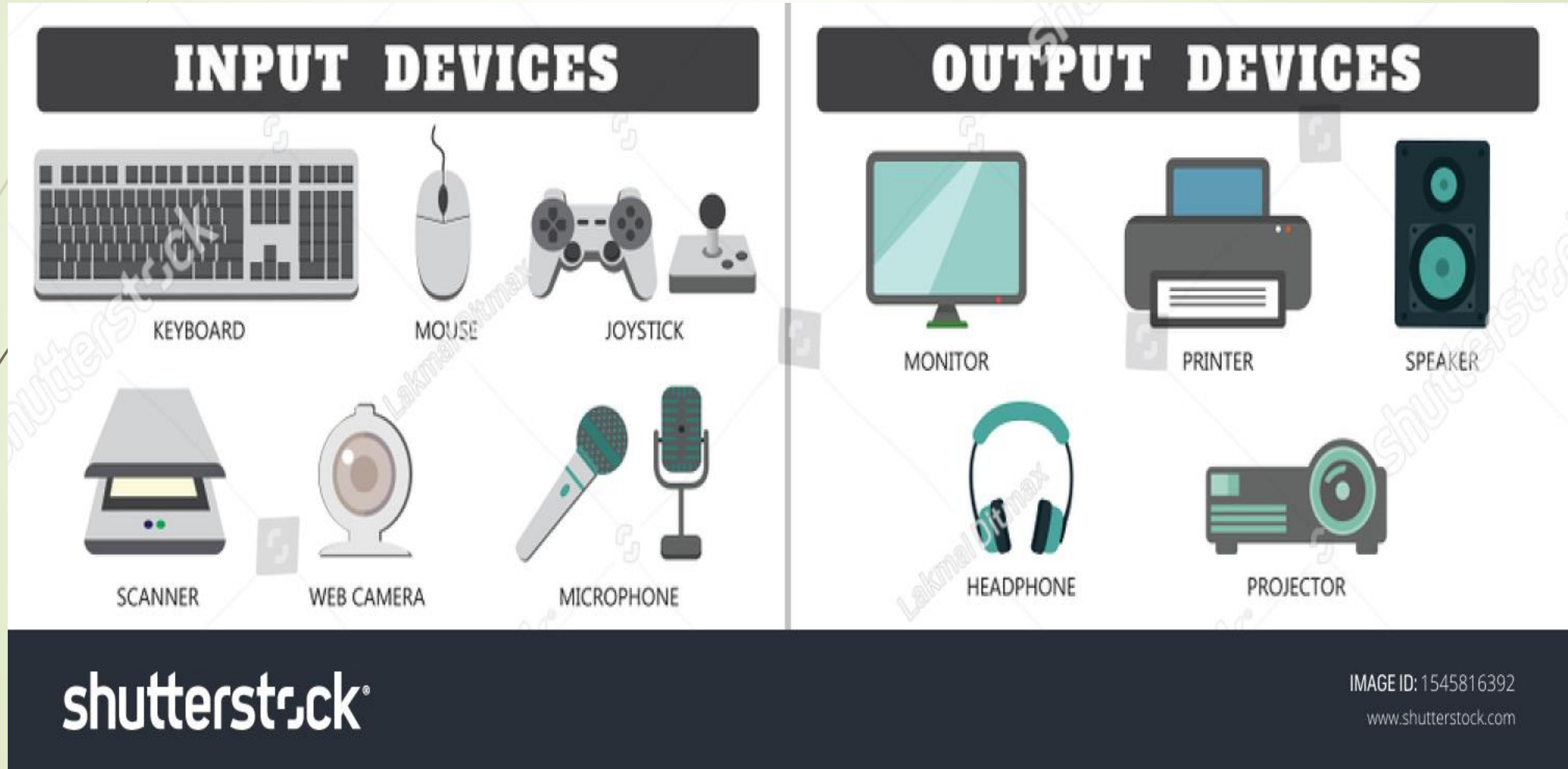
- Refers to the amount of data that a computer's memory can store.
- It is a crucial factor in determining the overall performance and efficiency of a computer system.
- Memory capacity is typically measured in bytes,

Different Units of Memory	
Data Measurement	**Size**
Bit	Single Binary Digit (1 or 0)
1 Byte	8 Bits
1 KiloByte (KB)	1,024 Bytes
1 MegaByte (MB)	1,024 KiloBytes
1 GigaByte (GB)	1,024 MegaBytes
1 TeraByte (TB)	1,024 GigaBytes
1 PetaByte (PB)	1,024 TeraBytes
1 ExaByte (EB)	1,024 PetaBytes

Table: 1 Different Units of Memory

Main Components of Computer Architecture

C. Input and Output Devices (I/O):



Main Components of Computer Architecture

C. Input and Output Devices (I/O):

- **Input devices:** are the devices that are used to send signals to the computer for performing tasks.
- Some of the classifications of Input devices are:

✓ **Keyboard**

✓ **Mouse**

✓ **Microphone**

✓ **Optical drive (CD or DVD drive)**

✓ **Scanner**

- **Output Devices:** are the devices that show us the result to the user after giving the input to a computer system.
- Output can be of many different forms like image, graphic audio, video, etc.