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Components of Computer System

A computer system comprises various interdependent components that work collectively to execute tasks and process data. Understanding these components is crucial to understanding the functioning of a computer system.

Basic Components of a Computer

Following are the basic components of a computer system:

Central Processing Unit (CPU)

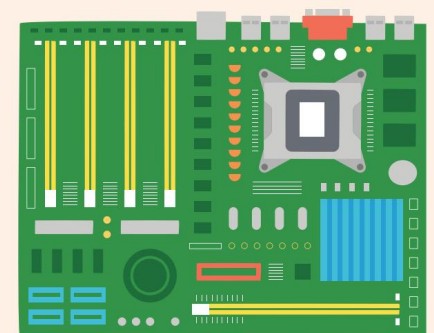
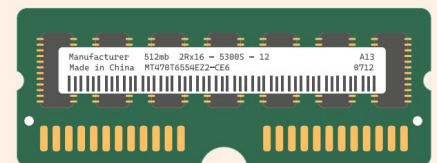
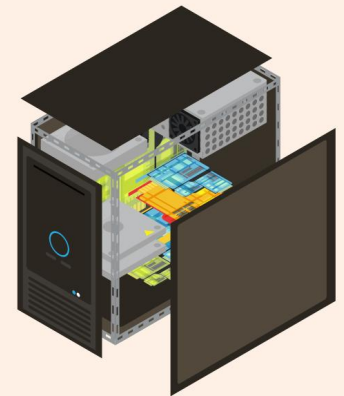
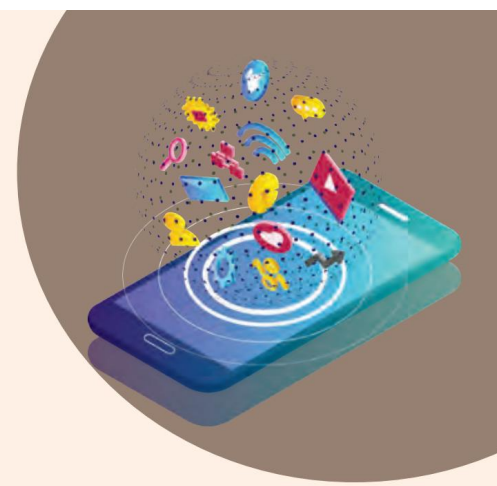
The Central Processing Unit (CPU) is known as the brain of the computer. It executes instructions and performs calculations. It consists of the Arithmetic Logic Unit (ALU), the Control Unit (CU), and the Memory Unit (MU). The ALU performs arithmetic and logical operations, while the Control Unit coordinates and manages the various components of the CPU.

Memory

Memory in a computer system is vital for storing and accessing data quickly. There are two types of memory: Random Access Memory (RAM) and Read-Only Memory (ROM). RAM is a type of computer memory that is used to store data and the machine code that is currently being used. It is a volatile memory, which means that data is stored temporarily in RAM and lost forever when the computer is turned off. On the other hand, ROM is a type of memory from which information can only be read. It is a non-volatile memory, as data is stored permanently in ROM and cannot be altered.

Motherboard

The motherboard is the primary circuit board that connects all the essential components of a computer system. It houses the CPU, memory, and the connectors for peripheral devices such as the hard drive, CD/DVD drive, and graphics card.



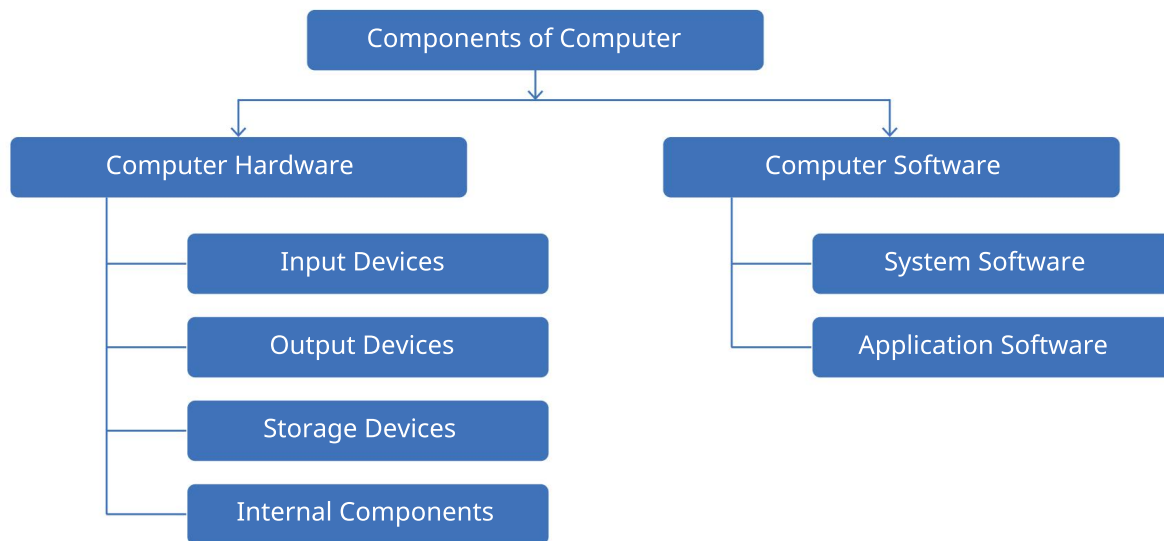
Storage Devices

Storage devices are used for long-term data storage. These can include Hard Disk Drives (HDDs), Solid-State Drives (SSDs), external storage devices like USB drives, and external hard drives.



Hardware and Software of a Computer System

Computer systems rely on both hardware and software components, which are integral for ensuring compatibility with the users.



Hardware

Hardware refers to the physical components of a computer system. These are physical devices that can be seen or touched. Computer hardware can be categorised into different types—input devices, output devices, storage devices, and internal components.

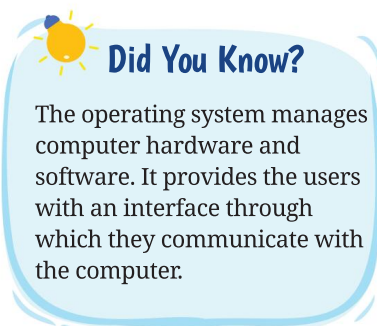
1. **Input Devices:** These devices enable the users to input data and communicate with the computer system. Some examples of input devices include the keyboard, a mouse, and a scanner.
2. **Output Devices:** These devices display the results of user-performed tasks. Some examples of output devices are monitors, printers, and speakers.
3. **Storage Devices:** These devices are used to store data and are often referred to as secondary storage. Some examples of storage devices include CDs, DVDs, and hard disks.
4. **Internal Components:** These critical hardware components are integral parts of the computer system. Some examples of internal components include the CPU and the motherboard.

Software

Software is a set of instructions or programs given to the computer to complete a task. It is a part of the computer that cannot be touched or felt. Some examples of software are Windows, OpenOffice Writer, Microsoft Excel, PowerPoint, Google Chrome, Photoshop, and MySQL.

There are two types of computer software—system software and application software:

1. **System Software:** System software controls the overall working of a computer. It manages all the input and output operations of the computer. For example, the operating system is a part of the system software that makes a computer run smoothly.
2. **Application Software:** Application software facilitates fundamental computer operations. It performs specific tasks for users. This category includes word processors, spreadsheets, and a variety of other task-specific programs. There are two types of application software: general-purpose software and customised software.



Role and Functions of RAM and ROM

In computer systems, the memory is a hardware component of the system that stores data and information. The computer memory can be classified into two main types—primary memory and secondary memory. The primary memory is further divided into two main types—RAM and ROM.

Random Access Memory (RAM)

RAM, or Random Access Memory, serves as the primary memory in a computer system. It temporarily holds data and instructions that the computer is currently processing. RAM allows the CPU to access data quickly, enabling efficient multitasking and the smooth execution of programs.

Since it is a volatile memory, RAM loses its data when the computer is powered off. RAM, also referred to as the main memory of the computer, enables the CPU to have direct access to all its memory cells. RAM is mainly composed of semiconductive materials and typically takes the form of integrated circuits (ICs).

Read Only Memory (ROM)

ROM, or Read Only Memory, constitutes a primary computer memory that is used to store instructions and programs that do not require any changes, such as the basic input/output system (BIOS). This storage aids in creating computer firmware, and data is generally stored during the manufacturing process. Similar to RAM, ROM is a type of semiconductor memory formed as integrated circuits (ICs).

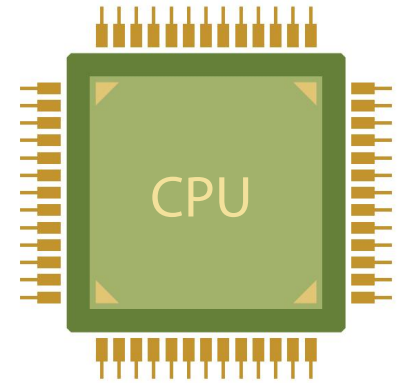
Data stored in ROM is permanent, signifying that it is non-volatile and retains its data even when the computer is powered off. Unlike RAM, the CPU can only read data from the memory cells of ROM but is unable to modify it.

Difference Between RAM and ROM

Parameter	RAM	ROM
Full form	RAM stands for Random Access Memory.	ROM stands for Read Only Memory.
Definition	RAM is a primary memory of the computer that temporarily stores data and instructions on which the CPU is currently working.	ROM is a primary memory of the computer that stores the computer instructions and programs that do not need to be altered in future, like BIOS.
Nature	RAM is a volatile memory, which means it stores data as long as the computer system is turned on.	ROM is a non-volatile memory. Which means it stores data permanently even when the computer system is turned off.
Data access	The CPU of the computer can read, write, or alter the data on RAM.	The CPU can only read data from ROM, but it cannot write or change.
Types	There are two types of RAM: <ul style="list-style-type: none">• SRAM (Static Random Access Memory).• DRAM (Dynamic Random Access Memory).	There are three types of ROM: <ul style="list-style-type: none">• PROM (Programmable ROM)• EPROM (Erasable PROM)• EEPROM (Electrically EPROM).
Speed	The speed of RAM is quite high.	The speed of ROM is slower than RAM.
Cost	RAM is costly.	ROM is not so expensive.

Role and Functions of the Central Processing Unit (CPU)

The Central Processing Unit (CPU) interprets and executes instructions, performs tasks such as arithmetic operations, logic comparisons, and data movement. It is responsible for coordinating and managing the various components of the computer system, ensuring that instructions are carried out accurately and efficiently. The CPU has three main components, which are responsible for different functions: Arithmetic Logic Unit (ALU), Control Unit (CU), and Memory Unit (MU).



1. The Arithmetic Logic Unit (ALU)

The Arithmetic and Logic Unit (ALU) is a crucial component of the CPU responsible for executing mathematical computations and logical decisions.

It conducts basic arithmetic functions such as addition, subtraction, multiplication, and division, alongside logical comparisons that determine whether data items are larger, smaller, or equal. The ALU is essentially a foundational building block of the CPU, constituting a digital circuit designed specifically for carrying out arithmetic and logical operations.

2. The Control Unit (CU)

The Control Unit (CU), a vital part of the computer's central processing unit, arranges and manages the flow of data to and from the CPU. It oversees the activities of the ALU, memory registers, and input/output units, and ensures the execution of all the instructions stored in the program. This unit decodes the fetched instructions, interprets them, and dispatches control signals to input/output devices, facilitating proper execution of operations by the ALU and the memory registers.

The Control Unit serves as the director of the processor's activities, guiding the computer's memory, ALU, and input and output devices in responding to the processor's instructions.

3. Memory Unit (MU)

A temporary memory unit within the CPU is in the form of memory registers. They serve the purpose of directly storing data utilised by the processor. They come in various sizes, such as 16-bit, 32-bit, 64-bit, and so forth. Each register in the CPU is designated for specific functions like data storage, instruction storage, and memory location addressing. Assembly language programmers can utilise user registers to store operands, intermediate results, and other essential data.



Did You Know?

The Accumulator (ACC), a pivotal register within the ALU, contains one of the operands required for the operation to be executed within the ALU.

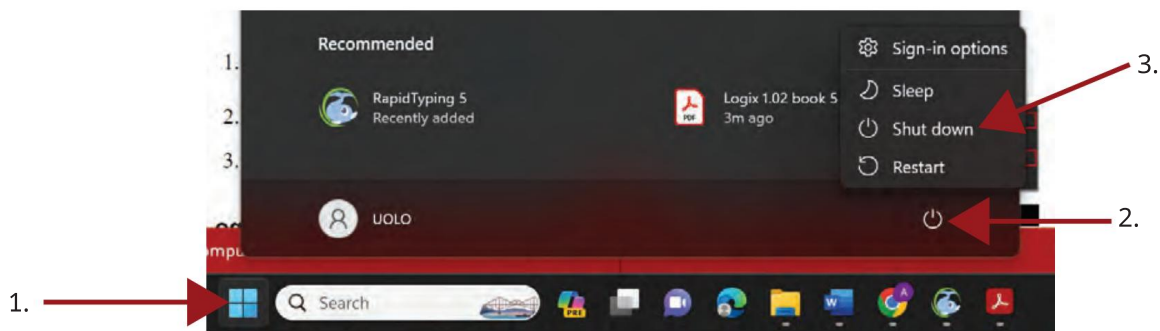
Procedure for Starting and Shutting Down a Computer

Starting Up

1. Connect the power cable and peripherals.
2. Press the **Power** button to start the computer.
3. Wait for the operating system to load.

Shutting Down

1. Save any open files and close running programs.
2. Click on the **Start** menu. Click on the **Power** button. Select **Shut down** option.
3. Wait for the computer to shut down completely before turning off the power.



Activity Time

Activity 1: Understanding Computer Parts

(Group Work)

Organise students into small groups and provide them with either computer setups or visual aids showcasing computer parts.

Activity 2: Recognising Computer Parts

(Individual Work)

Instruct students to recognise and name different hardware components, including the CPU, monitor, keyboard, mouse, and storage devices.

Activity 3: Group Discussion

(Group Work)

Create groups of 4–5 students and discuss the specific roles and contributions of each hardware element to the overall functioning of a computer system.

Chapter Checkup

A Select the correct option.

1. What is the primary function of the Control Unit in a CPU?
 - a. Execute mathematical computations
 - b. Manage data flow to and from the CPU
 - c. Store temporary data within the processor
 - d. Display results of user-performed tasks
2. _____ is a type of application software.

a. Device driver	b. Operating system
c. Word processor	d. BIOS
3. What is the role of the motherboard in a computer system?

a. Coordinates and manages the CPU	b. Displays the results of user-performed tasks
c. Connects all essential components	d. Executes instructions and calculations

B Fill in the blanks with the most suitable words.

1. The CPU consists of three main components, namely the _____, Control Unit, and Memory Unit.
2. _____ is a type of secondary memory used for long-term data storage.
3. The _____ is responsible for executing instructions and performing calculations in a computer system.
4. _____ devices enable users to input data and interact with the computer system.

C State whether the following is *True* or *False*. Correct the statements that are false.

- 1 The ALU performs arithmetic and logical operations within a CPU.
- 2 ROM is a volatile memory that loses data when the computer is powered off.
- 3 The motherboard houses the CPU, memory, and connectors for peripheral devices.
- 4 RAM is used for long-term data storage.

D Answer the following questions. (*Solved*)

Q1. What are the two main types of memory in a computer system and how do they differ in their functions?

A1. The two main types of memory are RAM (Random Access Memory) and ROM (Read-Only Memory). RAM is used for temporary data storage, allowing the CPU to access data quickly for current operations. It is volatile, which means it loses its data when the computer is powered off. On the other hand, ROM is used to store essential software and firmware that cannot be altered. It is non-volatile, retaining its data even when the power is off. Unlike RAM, the CPU can only read data from ROM but cannot modify it.

Q2. Explain the role of the Control Unit in a computer's CPU.

A2. The Control Unit is a vital part of the CPU that manages and coordinates the flow of data to and from the CPU. It oversees the activities of the Arithmetic Logic Unit (ALU), memory registers, and input/output units, ensuring the execution of all instructions stored in the program. It decodes the fetched instructions, interprets them, and dispatches control signals to input/output devices, facilitating the proper execution of operations by the ALU and memory. It serves as the director of the processor's activities, guiding the computer's memory, ALU, and input and output devices in responding to the processor's instructions.

Q3. Akshit wants to know about the hardware of a computer system and its different categories. Explain it to him.

A3. Hardware refers to the physical components of a computer system. These are tangible, physical devices that can be seen or touched. Computer hardware can be categorised into different types, including input devices, output devices, storage devices, and internal components.

- **Input Devices:** These devices enable users to input data and interact with the computer system. Examples of input devices include the keyboard, mouse, and scanner.
- **Output Devices:** These devices display the results of user-performed tasks. Examples of output devices are monitors, printers, and speakers.
- **Storage Devices:** These devices are used to store data and are often referred to as secondary storage. Examples of storage devices include CDs, DVDs, and hard disks.
- **Internal Components:** These critical hardware components are integral parts of the computer system. Examples of internal components include the CPU and motherboard.

Answer Key

A 1. b 2. c 3. c

B 1. Arithmetic Logic Unit (ALU) 2. Hard Disk Drive (HDD) 3. Central Processing Unit (CPU) 4. Input

C 1. True.

2. False. RAM is a volatile memory that loses data when the computer is powered off.

3. True.

4. False. ROM is used for long-term data storage.