ព្រះរាជាណាចក្រកម្ពុជា

ជាតិ សាសនា ព្រះមហាក្សត្រ

វិទ្យាស្ថានបច្ចេកវិទ្យាកម្ពុជា

ដេប៉ាតឺម៉ង់ថ្នាក់ឆ្នាំសិក្សាមូលដ្ឋាន

TP2

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1. What are the main functions of the CPU in a computer system?

The **Central Processing Unit (CPU)** is the **brain of the computer**. It performs most of the processing and controls how the computer works.

Main Functions

1. Fetch

- The CPU **retrieves instructions** from memory (usually **RAM**).
- Instructions are stored in binary form.

2. Decode

- The CPU **interprets the instruction** to understand what action is required.

3. Execute

- The CPU performs the required operation such as:
  - Arithmetic calculation
  - Logical comparison
  - Data movement

4. Store

- The result of the execution is **stored back in memory or registers**.

This process is called the **Fetch–Decode–Execute cycle**, which repeats **millions or billions of times per second**.

2. How do the Control Unit and Arithmetic Logic Unit work together in a CPU?

Inside the CPU there are two main components:

1. Control Unit (CU)

The **Control Unit**:

- Directs all operations of the CPU
- Fetches instructions from memory
- Decodes instructions
- Sends control signals to other parts of the computer

2. Arithmetic Logic Unit (ALU)

The **ALU** performs:

- Arithmetic operations (addition, subtraction, multiplication, division)
- Logical operations (AND, OR, NOT, comparisons)

How They Work Together

1. **CU fetches an instruction** from memory.
2. **CU decodes the instruction**.
3. If a calculation is needed, the **CU sends data to the ALU**.
4. **ALU performs the operation**.
5. The result is **sent back to registers or memory**.

Example
Instruction: `5 + 3`

- CU fetches the instruction
- CU sends numbers to ALU
- ALU calculates **8**
- Result is stored in a register or memory

3. What is the role of registers in a CPU?

Registers are **very small and very fast memory locations inside the CPU**.

Roles of Registers

1. **Store temporary data**
    - Data currently being processed
2. **Store instructions**
    - The instruction currently being executed
3. **Hold memory addresses**
    - The location of data in memory
4. **Speed up CPU operations**
    - Registers are much faster than RAM

Examples of CPU Registers

- **Program Counter (PC)** – holds the address of the next instruction
- **Instruction Register (IR)** – stores the current instruction
- **Accumulator (ACC)** – stores arithmetic results
- **Memory Address Register (MAR)** – stores memory addresses
- **Memory Data Register (MDR)** – stores data from memory

Registers help the CPU **work very quickly and efficiently**.

4. What is the significance of cache in CPU performance?

Cache memory is a **small, high-speed memory located inside or very close to the CPU**.

Why Cache is Important

1. **Reduces memory access time**
    - CPU can access cache much faster than RAM.
2. **Stores frequently used data**
    - Instructions and data used often are stored in cache.
3. **Improves system performance**
    - CPU does not need to wait for slower main memory.

Types of Cache

- **L1 Cache** – fastest and smallest

- **L2 Cache** – larger but slower than L1
- **L3 Cache** – shared by multiple cores

Example:

CPU speed → **very fast**
RAM speed → **slower**

Cache acts as a **bridge between CPU and RAM** to increase performance.

5. What are the differences between input, output, and storage peripherals?

1. Input Peripherals

Input devices **send data to the computer**.

Examples:

- Keyboard
- Mouse
- Scanner
- Microphone

Purpose:
➞ Allow the user to **enter data and commands**.

2. Output Peripherals

Output devices **display or present data from the computer**.

Examples:

- Monitor
- Printer
- Speakers
- Projector

Purpose:
➞ Show **results of processing**.

3. Storage Peripherals

Storage devices **store data for future use**.

Examples:

- Hard disk
- USB flash drive
- SSD
- External drive

Purpose:
➞ **Save programs and files permanently**.

Comparison Table

Type	Function	Example
Input	Send data to computer	Keyboard
Output	Display results	Monitor
Storage	Save data	Hard Disk

6. What is the role of the input-output module in a computer system?

The **Input-Output (I/O) module** acts as a **bridge between the CPU and peripheral devices**.

Roles of I/O Module

1. **Communication**
    - Allows CPU to communicate with devices.
2. **Control**
    - Manages the operation of input and output devices.
3. **Data transfer**
    - Moves data between CPU, memory, and peripherals.
4. **Buffering**
    - Temporarily stores data during transfer.

Without the I/O module, the CPU **cannot directly communicate with hardware devices**.

7. How does an input-output module facilitate communication between the CPU and peripherals?

The **I/O module** enables communication through several steps.

Step-by-Step Process

1. **CPU sends command**
    - CPU instructs the I/O module to read or write data.
2. **I/O module communicates with the device**
    - It sends signals to the peripheral device.
3. **Data transfer occurs**
    - Data moves between the device and memory.
4. **Status reporting**
    - I/O module informs the CPU whether the operation is complete.

Example

Typing on a keyboard:

1. User presses a key.
2. Keyboard sends signal to the I/O module.
3. I/O module transfers the data to memory.
4. CPU processes the input.