

3. COMPUTER ORGANIZATION

1) How are the human being and the computers are related?

Computers are often compared to human beings since both have the ability to accept data, store, work with it, retrieve and provide information. The main difference is that human beings have the ability to perform all of these actions independently. Human beings also think and control their own activities. The computer, however, requires a program (a predefined set of instructions) to perform an assigned task.

2) What are the components of the digital computer?

A computer system is the integration of physical entities called hardware and non-physical entities called software. The hardware components include input devices, processor, storage devices and output devices. The software items are programs and operating aids (Systems) so that the computer can process data.

3) What are the functional units of a computer system?

- ✓ The functionalities of the computer systems are Input Unit, Output Unit, Central Processing Unit, Memory Unit.
- ✓ These units are interconnected by minute electrical wires to permit communication between them. This allows the computer to function as a system.

4) Write the essentials of the stored program concept.

All modern computers use the stored program concept. This concept is known as the Von – Neumann concept due to the research paper published by the famous mathematician John Von Neuman.

- ✓ The program and data are stored in a primary memory (main memory)
- ✓ Once a program is in memory, the computer can execute it automatically without manual intervention.
- ✓ The control unit fetches and executes the instructions in sequence one by one.

5) Write the main functions of the central processing unit.

The CPU is the brain of the computer system. It performs arithmetic operations as well as controls the input, output and storage units.

- ✓ Co – ordinate all computer operations
- ✓ Perform arithmetic and logical operations on data

6) What are the different types of main memory?

There are different types of memory.

- ✓ They are Random Access Memory (RAM).
- ✓ Read Only Memory (ROM).
- ✓ Programmable Read- Only Memory (PROM).
- ✓ Erasable Programmable Read-Only Memory (EPROM).
- ✓ Electrically Erasable Programmable Read-Only Memory (EEPROM).

7) Define memory read and memory write operations.

Operations on memories are called *reads* and *writes*, defined from the perspective of a processor or other device that uses a memory: a write instruction transfer's information from other device to memory and a read instruction transfer's information from the memory to other devices. A memory that performs both reads and writes is often called a RAM, *random access memory*.

8) What do you mean by memory access time?

Access time, also known as *response time* or *latency*, refers to how quickly the memory can respond to a read or write request.

9) What is the advantage of EEPROM over EPROM?

EEPROM is a recently developed type of memory. This is equivalent to EPROM, but does not require ultraviolet light to erase its content. It can be erased by exposing it to an electrical charge.

10) When do we use ROM?

In ROM, the information is burnt (pre-recorded) into the ROM chip at manufacturing time. Once data has been written into a ROM chip, it cannot be erased but you can read it. When we switch off the computer, the contents of the ROM are not erased but remain stored permanently. ROM is a non-volatile memory. ROM stores critical programs such as the program that boots the computer.

11) What is an input device?

An input device is used to feed data into a computer. For example, a keyboard is an input device. It is also defined as a device that provides communication between the user

and the computer. Input devices are capable of converting data into a form which can be recognized by computer.

12) List few commonly used input devices.

- ✓ Keyboard
- ✓ Mouse
- ✓ Scanner
- ✓ Bar Code Reader
- ✓ Digital Camera
- ✓ Magnetic Ink Character Recognition (MICR)
- ✓ Optical Character Recognition (OCR)
- ✓ Optical Mark Reading and Recognition (OMR)
- ✓ Light Pen

13) What is an output device?

An output device is capable of presenting information from a computer. There are many output devices attached with the computers. But the monitors and printers are commonly used output devices.

14) List few commonly used output devices.

- ✓ Monitors
- ✓ Printers
- ✓ Speakers
- ✓ Plotters

15) What is a storage device?

The computer may need to store data, programs etc. in a computer readable medium. This is called the secondary storage. Secondary storage is also called backup storage. Secondary storage can be used to transmit data to another computer either immediately or a latter time.

16) List few commonly used storage devices.

- ✓ Hard Disk
- ✓ Magnetic Tape
- ✓ Floppy Disk

- ✓ Optical Disk

17) What is the role of ALU?

- ✓ The ALU is the computer's calculator.
- ✓ It executes arithmetic and logical operations.
- ✓ The arithmetic operations include addition, subtraction, multiplication and division.
- ✓ The logical operation compares numbers, letters and special characters.
- ✓ The ALU also performs logic functions such as AND, OR and NOT.
- ✓ The ALU functions are directly controlled by the control unit

18) What is a control unit?

The control unit directs and controls the activities of the computer system. It interprets the instructions fetched from the main memory of the computer, sends the control signals to the devices involved in the execution of the instructions.

19) What are registers?

Performing these operations the ALU takes data from the temporary storage area inside the CPU named **registers**. They are high-speed memories which hold data for immediate processing and results of the processing.

20) What is a bus?

A set of instruction to follow and perform a specific task. Between any two components of the computer system, there is a pathway called a **bus** which allows for the data transfer between them.

21. What is hardware?

The hardware components include input devices, processor, storage devices and output devices.

22. What is software?

The software items are programs and operating aids (systems) so that the computer can process data.

23. What is Logical Operations?

The importance of the logic unit is to make logical operations. These operations include logically comparing two data items and take different actions based on the results of the comparison.

24. Characteristics of Impact Printers?

- ✓ In impact printers, there is physical contact with the paper to produce an image.
- ✓ Due to being robust and low cost, they are useful for bulk printing.
- ✓ Due to its striking activity, impact printers are very noisy.
- ✓ Since they are mechanical in nature, they tend to be slow.
- ✓ Impact printers do not support transparencies.

25. Characteristics of Non-Impact Printers?

- ✓ Non-impact printers are faster than impact printers because they have fewer moving parts.
- ✓ They are quiet than impact printers because there is no striking mechanism involved.
- ✓ They possess the ability to change typefaces automatically.
- ✓ These printers produce high-quality graphics.
- ✓ These printers usually support the transparencies.

FIVE MARK QUESTION**1) Describe in detail the various units of the Central Processing Unit.**

- ✓ The CPU is the brain of the computer system.
- ✓ It performs arithmetic operations as well as controls the input, output and storage units.

The CPU has three major components.

1. Arithmetic and Logic Unit
 2. Control Unit
 3. Registers (internal memory)
- ✓ **The arithmetic and logic unit (ALU)** is the part of CPU where actual computations take place. It consists of circuits which perform arithmetic operations over data received from memory and are capable of comparing two numbers.
 - ✓ The **control unit** directs and controls the activities of the computer system.

- ✓ It interprets the instructions fetched from the main memory of the computer, sends the control signals to the devices involved in the execution of the instructions.
- ✓ While performing these operations the ALU takes data from the temporary storage area inside the CPU named **registers**.
- ✓ They are high-speed memories which hold data for immediate processing and results of the processing.

2) Explain the working principle of CPU with an example.

- ✓ The CPU is similar to a calculator, but much more powerful.
- ✓ The main function of the CPU is to perform arithmetic and logical operations on data taken from main memory.
- ✓ The CPU is controlled by a list of software instructions.
- ✓ Software instructions are initially stored in secondary memory storage device such as a hard disk, floppy disk, CD-ROM, or magnetic tape.
- ✓ These instructions are then loaded onto the computer's main memory.
- ✓ When a program is executed, instructions flow from the main memory to the CPU through the bus.
- ✓ The instructions are then decoded by a processing unit called the instruction decoder that interprets and implements the instructions.
- ✓ The ALU performs specific operations such as addition, multiplication, and conditional tests on
- ✓ the data in its registers, sending the resulting data back to the main memory or storing it in another register for further use.

To understand the working principles of CPU, let us go through the various tasks involved in executing a simple program. This program performs arithmetic addition on two numbers

- (i) Input the value of a
- (ii) Input the value of b
- (iii) $\text{Sum} = a + b$

(iv) Output the value of sum

This program accepts two values from the keyboard, sums it and displays the sum on the monitor.

1. The control unit recognizes that the program (set of instructions) has been loaded into the main memory. Then it begins to execute the program instructions one by one in a sequential manner.
2. The control unit signals the input device (say keyboard) to accept the input for the variable 'a'.
3. The user enters the value of 'a' on the keyboard.
4. The control unit recognizes and enables to route the data (value of a) to the pre-defined memory location (address of 'a').
5. The steps 2 to 4 will be repeated for the second input 'b'. The value of 'b' is stored in the memory location (address of 'b').
6. The next instruction is an arithmetic instruction. Before executing the arithmetic instruction, the control unit enables to send a copy of the values stored in address of 'a' and address of 'b' to the internal registers of the ALU and signals the ALU to perform the sum operation.
7. The ALU performs the addition. After the computation, the control unit enables to send the copy of the result back to the memory (address of 'sum').
8. Finally, the result is displayed on the monitor. The control unit enables to send the copy of the values of the address of 'sum' to the monitor (buffer) and signals it. The monitor displays the result.
9. Now this program execution is complete.

3) Briefly explain various types of memory.

- ✓ Memory units are the storage areas in a computer.
- ✓ The term "memory" usually refers to the main memory of the computer, whereas, the word "storage" is used for the memory that exists on disks, CDs, floppies or tapes.
- ✓ The main memory is usually called a physical memory which refers to the 'chip' (Integrated Circuit) capable of holding data and instruction.

There are different types of memory.

- ✓ Random Access Memory (RAM).
- ✓ Read Only Memory (ROM).
- ✓ Programmable Read- Only Memory (PROM).
- ✓ Erasable Programmable Read-Only Memory (EPROM).
- ✓ Electrically Erasable Programmable Read-Only Memory (EEPROM).

Random Access Memory (RAM).

- ✓ RAM is the most common type of memory found in the modern computers.
- ✓ This is really the main store and is the place where the program gets stored.
- ✓ When the CPU runs a program, it fetches the program instructions from the RAM and carries them out.
- ✓ If the CPU needs to store the results of the calculations it can store them in RAM.
- ✓ When we switch off a computer, whatever is stored in the RAM gets erased.

Read Only Memory - ROM

- ✓ In ROM, the information is burnt (pre-recorded) into the ROM chip at manufacturing time.
- ✓ Once data has been written into a ROM chip, it cannot be erased but you can read it.
- ✓ When we switch off the computer, the contents of the ROM are not erased but remain stored permanently.

Programmable Read Only Memory - PROM

- ✓ PROM is a memory on which data can be written only once.
- ✓ A variation of the PROM chip is that it is not burnt at the manufacturing time but can be programmed using PROM programmer or a PROM burner.

Erasable Programmable Read Only Memory - EPROM

- ✓ In EPROM, the information can be erased and reprogrammed using a special PROM – programmer.
- ✓ An EPROM differs from a PROM in that a PROM can be written to only once and cannot be erased.
- ✓ But an ultraviolet light is used to erase the contents of the EPROM.

Electrically Erasable Programmable Read Only Memory – EEPROM

- ✓ EEPROM is a recently developed type of memory.
- ✓ EEPROM is not as fast as RAM or other types of ROM.
- ✓ A flash memory is a special type of EEPROM that can be erased and reprogrammed.
- ✓ It is also non-volatile in nature

4) List a few commonly used inputs / output devices and explain them briefly?**Input devices.**

- Keyboard
- Mouse
- Scanner
- Bar Code Reader
- Digital Camera
- Magnetic Ink Character Recognition (MICR)
- Optical Character Recognition (OCR)
- Optical Mark Reading and Recognition (OMR)
- Light Pen

Keyboard

- ✓ The most common input device is the keyboard.
- ✓ Keyboard consists of a set of typewriter like keys that enable you to enter data into a computer.
- ✓ They have alphabetic keys to enter letters, numeric keys to enter numbers, punctuation keys to enter comma, period, semicolon, etc.

Mouse

- ✓ Mouse is an input device that controls the movement of the cursor on the display screen.
- ✓ Mouse is a small device, you can roll along a flat surface.
- ✓ This movement of the ball is converted into signals and sent to the computer.
- ✓ We will need to click the button at the top of the mouse to select an option.
- ✓ Mouse pad is a pad over which you can move a mouse.
- ✓ Mouse is very popular in modern computers.

Scanner

- ✓ Scanner is an input device that allows information such as an image or text to be input into a computer.
- ✓ It can read image or text printed on a paper and translate the information into a form that the computer can use.
- ✓ That is, it is used to convert images (photos) and text into a stream of data.

Bar Code Reader

- ✓ The barcode readers are used in places like supermarket, bookshops, etc.
- ✓ A bar code is a pattern printed in lines of different thickness.
- ✓ The bar-code reader scans the information on the barcodes and transmits to the computer for further processing.
- ✓ The system gives fast and error-free entry of information into the computer.

Magnetic Ink Character Recognition (MICR)

- ✓ MICR is widely used by banks to process cheques.
- ✓ Human readable numbers are printed on documents such as cheque using a special magnetic ink.
- ✓ The cheque can be read using a special input unit, which can recognize magnetic ink characters.
- ✓ This method eliminates the manual errors.
- ✓ It also saves time, ensures security and accuracy of data.

Optical Character Recognition (OCR)

- ✓ The OCR technique permits the direct reading of any printed character like MICR but no special ink is required.
- ✓ With OCR, a user can scan a page from a book.
- ✓ The computer will recognize the characters in the page as letters and punctuation marks, and stores.
- ✓ This can be edited using a word processor.

Output Devices

- ✓ Monitors
- ✓ Printers
- ✓ Speakers
- ✓ Plotters

Monitors

- ✓ Monitor is a commonly used output device, sometimes called as display screen.
- ✓ It provides a visual display of data.
- ✓ Monitors are connected with the computer and are similar in appearance to a television set.
- ✓ The number of pixels that can be displayed vertically and horizontally gives the resolution of the monitor.
- ✓ Some popular resolutions are 640 x 480 pixels, 800 x 600 pixels and 1024 x 768 pixels.
- ✓ A resolution of 1024 x 768 pixels will produce sharper image than 640 x 480 pixels.

Printers

- ✓ Printer is an output device that prints text or images on paper or other media .
- ✓ By printing you create what is known as a 'hard copy'.
- ✓ The two main types of printers are impact printers and non-impact printers.

Speakers

- ✓ The computer can also give produce voice output(audio data).
- ✓ Speaker serves as a voice output device.
- ✓ Using speakers along with speech synthesizer software, the computer can provide voice output.
- ✓ Voice output has become very common in many places like airlines, banks, automatic telephone enquiry system etc.
- ✓ Users can also hear music/songs using the voice output system.

Plotters

- ✓ Apart from the output devices like printers, plotters are also used to produce graphical output.
- ✓ Although printer output is very convenient for many purposes.
- ✓ The user needs to present the information graphically in order to understand its significance

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