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## Chapter - 1

### Computer System Organization

#### → Computer :-

A computer is an electronic device that accepts a set of instructions in the form of a program, executes it and displays the output to the user.

#### • Information :-

Information is defined as a collection of data which is organized in particular manner to generate meaningful or processed data. For ex:- "Shawrya is a Class 11 Student with Enrolment no. 106". This is processed data which gives some meaningful information.

#### \* Basic components of a Computer System

Computer is a combination of :-

- Hardware
- Software

→ Hardware :- It is the physical combination components of a computer like motherboard, memory device, monitor, etc.

→ Software :- It is a set of programs or instructions.

★ Every task given to a computer follows an Input → Process → Output cycle (IPO cycle). It accepts certain input, processes that input and produces the desired output. The input unit takes the input, the CPU processes the data and the Output unit processes output. The memory unit holds the data and instructions during the processing.

• Input Unit:-

An input unit takes/accepts input and converts it into binary form so that it can be understood by the computer.

1. Keyboard:-

- (i) It helps in entering the data in the form of letters, digits and commands into the computer.
- (ii) It possesses additional keys in contrast to a typewriter, such as function keys, alphanumeric keys, etc.

2. Mouse:-

- (i) It is a pointing device with a roller at its base, used for moving a pointer on a computer monitor.
- (ii) It converts the movements of the user's hand into a unique set of binary digits representing the position of the mouse at a particular instant.

3. Light pen:- A light pen is a pointing device that can be used to select anything on the computer screen by simply pointing at it or for drawing figures directly on the screen.

- (iii) It consist of a photocell mounted on a pen-shaped tube called stylus

#### 4. Optical Mark Reader (OMR):-

- (i) An OMR is capable of recognizing a pre-specified type of mark made with a dark pencil or ink.
- (ii) Special pre-printed forms are designed with the boxes that can be marked with a dark pencil or ink. Such a document is read by an OMR, which transcribes the marks into electrical pulses that are transmitted to the computer.

#### 5. Smart Card Reader:-

- (i) A smart card is embedded with a microprocessor that can hold a certain amount of personal data in its memory.
- (ii) The special reader machine that is used to read this microprocessor is known as smart card reader. The card is made of plastic, generally PVC. Smart cards are used as ATM cards, ID-card, credit cards and debit cards.

#### 6. Barcode Reader:-

- (i) It is a collection or a sequence of lines of different heights and widths that are printed on various type of products.
- (ii) It consists of a light source, a lens and a light sensor which translates optical impulses into electrical signals.

#### 7. QR Code Reader:-

- (i) QR code is an abbreviation for Quick Response code. It is a special kind of barcode that nobody can scan with a Smartphone App that usually directs the user to a website.
- (ii) Rather than typing in a entire web address, the user merely

scans the code and further directs for processing to a website, SMS and more.

### 8. Biometric Sensor:-

- (i) It is an input device that is used to uniquely identify a person on the basis of his physical or behavioural traits.
- (ii) Biometric sensors can scan human characteristics, such as eyes, fingerprints, and DNA with the help of sensors.

### 9. Touch Screen:-

- (i) It is a type of display screen which allows interaction with computer through a touch-sensitive transparent panel covering the entire screen without any intermediate devices.
- (ii) The touch screen uses a technology that enables the user to touch the screen with his fingers to select objects.

### 10. Microphone:-

- (i) A microphone is an output device used to provide audio data to a computer.
- (ii) It works with a sound card and is mainly used for sound recording.

### 11. Webcam:-

- (i) A webcam is a camera that is connected to a computer. It captures still pictures as well as videos and, with the help of software, can transmit them in real time.
- (ii) Unlike a digital camera and digital camcorder, a webcam does not have any built-in storage. Instead, it always uses the computer hard drive as its storage.

## 12. Magnetic Ink Character Reader (MICR)

- (i) MICR detects the numbers printed with magnetically charged ink at the bottom of bank cheques and converts them into digital data.
- (ii) These digital numbers represent the bank account number, bank branch and cheque number.

## 13. Optical Character Reader (OCR)

- (i) An OCR allows to recognize scanned images, PDF, documents, into machine - encoded text.
- (ii) These digitized texts, can be electronically edited, searched or stored compactly and used in machine translation, text-to-speech and other fields of artificial intelligence.

## \* Central Processing Unit (CPU)

The CPU is the control centre of a computer. It guides, directs, controls and governs all the processing that takes place inside the computer.

The CPU consists of three components - ALU, CU and MU

### A. Arithmetic Logic Unit (ALU)

- (i) The ALU performs the arithmetic (+, -, \*, /) and logical (AND, OR, NOT) operations, sent from the memory, performs specific operations and the result is returned to the memory.
- (ii) The result of the logical operations is either true or false and helps the computer in decision-making.

### B. Control Unit (CU)

- (i) CU controls the flow of data from input devices to memory and from memory to output devices. It controls and guides the interpretation flow and manipulation of all data and information.

- (ii) Registers are high-speed temporary storage areas found in the CPU. Registers work as per the instructions given by the control unit, storing instructions and data, immediately required for performing an operation.

### C. Memory Unit (MU)

- (i) Memory unit (main memory) is used as a storage unit for program as well as data. It is the computer memory that is accessed directly by the CPU.
- (ii) The memory can be both primary and secondary depending upon its location in the computer system.

The memory unit is divided into:-

#### (a) Random Access Memory (RAM):-

- (i) It is a read/write memory as it is possible to both read from and write to a location within a RAM. It is used for primary storage in computers to hold active information of data and instructions.
- (ii) The RAM is a volatile memory as it does not store data and instructions permanently and loses its contents when the power is switched off or interrupted.

#### (b) Read-Only Memory (ROM)

- (i) It is a read-only memory, i.e., the data and instructions in the ROM at the time of its manufacturing and can't be change thereafter.
- (ii) It is a permanent and non-volatile memory as it does not lose its contents when the power is switched off or interrupted.

### → Cache memory

Cache memory is a small memory that operates much faster than the primary memory or RAM. When the CPU requires certain data present in RAM, it first sends the request to the cache, which stores recently-used values.

\* Cache Memory, also called CPU memory, is a high-speed memory available inside the CPU in order to speed up access to data and instructions stored in RAM.

### • Units of Memory

The elementary unit of memory is a bit. A bit stands for binary digit i.e. either 0 or 1, which is an elementary unit of computer memory. Combinations of these bits together are used to store the data and instructions.

→ Eight bits together form 1 byte.

→ A group of four bits is called a Nibble.

### \* Output Unit

Output Unit is formed by the output devices attached to the computer. Output devices produce the output generated by the CPU in human readable form.

The commonly used output devices are explained as under:

#### 1. Visual display Unit (VDU) / Monitor:-

The monitor, popularly known as screen or digital projector, is the most common device for displaying the output of the computer-processed information.

→ The monitor is also called Visual Display Terminal (VDT) or Visual Display Unit (VDU).

→ The different types of monitors are:-

- CRT (Cathode Ray Tube)
- LCD (Liquid Crystal display)
- LED (Light - Emitting Diode)
- OLED (Organic Light - Emitting Diode)

• LCD Screen:- A Liquid Crystal Display (LCD) is smaller and lighter in weight as compared to a CRT monitor and, hence, ideal for use in laptops, palmtops and other portable devices.

• LED Screen:- A Light - Emitting Diode (LED) is a light weight flat-panel display and uses light - emitting diodes to create pixels on the screen. LED monitors use less power as compared to CRTs and LCDs, and are considered environment - friendly.

• OLED Screen:- This technology is more advanced than LED. Organic Light - Emitting Diode (OLED) uses an organic substance which glows when an electric current is passed. This revolutionary material reduces the thickness and weight of the display unit.

2. Printer:- A printer is an output device which is used to generate hard copies (printout) of the output generated by the computer system. The printer can generate both text and images on paper.



→ Printers are classified as:-

- Impact - There is a mechanical contact between printer head and paper.
- Non-Impact printers - No mechanical contact between printer head and paper.

→ ~~The~~ The various type of printers are as follows:-

- Dot Matrix Printer:- A dot matrix printer, also known as serial printer, prints one character at a time. It uses dots to create an image. This printer prints characters by striking an ink-soaked ribbon against the paper, which produces sound and, hence, is termed as impact printer.
  - Inkjet / Deskjet / Bubble Jet Printer:- An Inkjet printer is the most common type of low-cost printer. It uses the technique of spreading quick dry ink on paper. The ink is stored in the form of cartridges of different colours.
  - Laser Printer:- These printers use laser technology to produce printed documents. These are very fast printers and are used for high quality prints.
3. Speakers:- A speaker is a type of output device that generates sound as an output. For a speaker to produce sound, a special device called sound card is required to be installed in the computer system.

4. Plotters: - Plotters are the output devices that are used for producing good quality images and drawings. Unlike printers, they support printing of large-sized papers. They are mainly used in computer-aided designing (CAD).

### Secondary Memory COMPUTER MEMORY UNITS

S.No.	Unit	Description
1.	Binary Digit	1 Bit
2.	Byte	1 Byte = 8 bits
3.	Kilobyte (KB)	1 KB = 1024 bytes
4.	Megabyte (MB)	1 MB = 1024 KB
5.	Gigabyte (GB)	1 GB = 1024 MB
6.	Terrabyte (TB)	1 TB = 1024 GB
7.	Petabyte (PB)	1 PB = 1024 TB
8.	Exabyte (EB)	1 EB = 1024 PB
9.	Zettabyte (ZB)	1 ZB = 1024 EB
10.	Yottabyte (YB)	1 YB = 1024 ZB
11.	Bronto byte	1 Bronto byte = 1024 YB
12.	Geopbyte	1 Geop byte = 1024 Brontobytes

## \* Secondary Memory

Secondary storage devices are used to store a large amount of data permanently, which is not possible by using the primary or main memory.

(a) Hard disk: - A Hard disk is a non-volatile, high-capacity storage device ranging from 1 Gigabyte to several Terabyte. It consist of solid rounded disks, packed on one another made up of a magnetic material and sealed inside a case.

- Track: - Each platter is divided into concentric rings called "Tracks". There are thousand of tracks in each platter. A track is divided into segments of sectors which is the basic unit of storage.

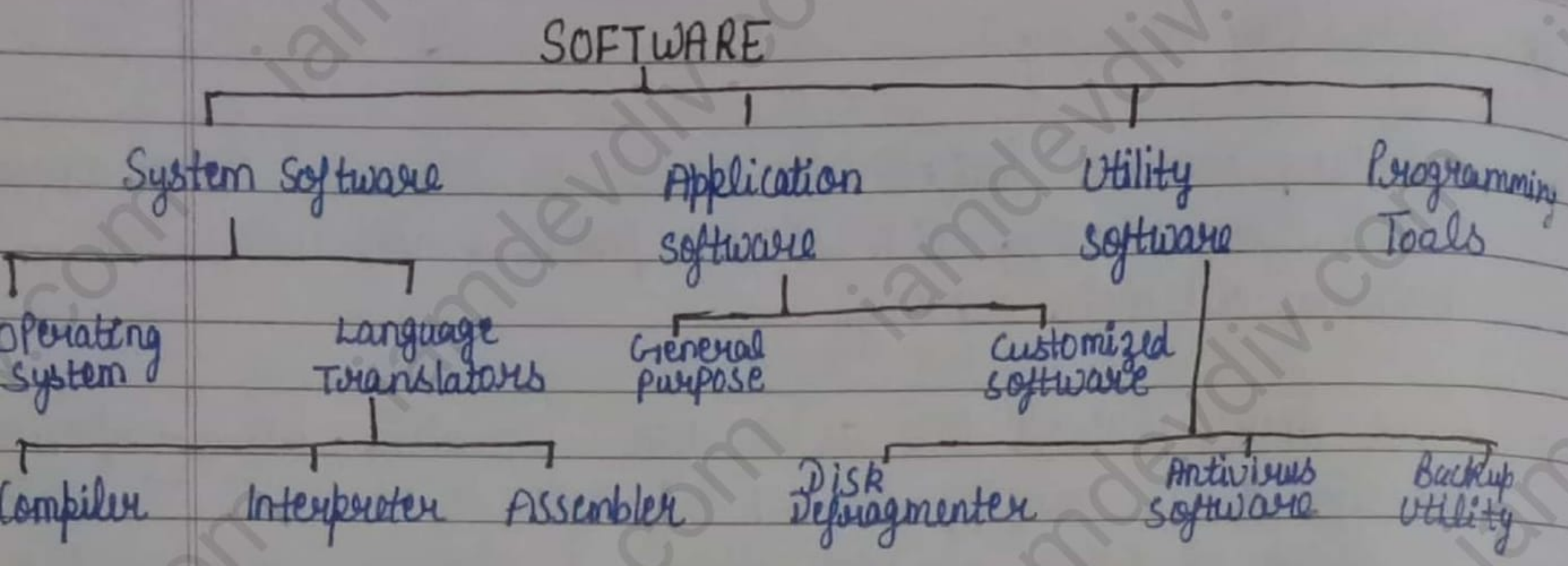
- Sector: - Each sector is divided into sectors that actually store the data. A sector, as a rule, holds 512 bytes of data.

## \* Software Concepts

Software is a set of programs which is designed to perform a well-defined function.

### → Types of Software

1. System Software
2. Application Software
3. Utility Software



### System Software:-

The software that controls internal computer operations is called system software.

- The different functions of system software are:-
1. Reading data and receiving information.
  2. Translating data and instructions.
  3. Controlling all the peripheral devices.
  4. Processing and generating output.

→ System software can be further categorized into:-

1. Operating system
2. Language Translators

1. Operating System:- An operating system is an integrated set of specialized programs that is used to manage the overall operations of a computer. It acts like an interface between the user, computer hardware and software.

## 2. Language Translators:-

The special translator system software that is used to translate the program written in high-level language into machine code is called language processor or translator program.

→ The language processors can be of any of the following three types:-

### • Assembler:-

Assembler is used to translate the program written in assembly language into machine code. The input of assembler is a source program that assembly language instructions. The output generated by the assembler is the object code or machine code which is understandable by the computer.

### • Compiler:-

The language processor that translates the complete source program as a whole in one go into machine code, is called compiler. Some of the examples are C and C++ compilers.

### • Interpreter:-

The language processor that translates a single statement of source program into machine code and executes it immediately before moving on to the next line is called an Interpreter.

\* Utility Software:- Utility software are those programs that assist the computers by performing housekeeping functions like scanning, data backup, removing viruses, etc.

## Fill in the Blanks

- a. A program which acts as an interface between a user and hardware is called operating system.
- b. A collection of 4 bits is called a Nibble.
- c. Binary number system has digit as 0 and 1.
- d. A collection of 8 bits is called a Byte.
- e. Joystick is a pointing device used for playing game on a computer.
- f. ROM is read-only memory that stores some pre-written instruction.
- (g) The ALU in computers is capable of performing arithmetic and logical operations.
- (h) Control unit controls all the hardware operations of a computer system.
- (i) A Hard disk is a non-volatile high-capacity storage device ranging from 1 GB to several terabytes.
- (j) Cache memory speeds up access to data and instructions stored in RAM.
- (k) Process is the term used for a program being run by the computer.

## Multiple Choice Questions

- (a) What is the full form of IPO?  
Input process Output (i)
- (b) Which is the fastest memory device?  
Register (ii)
- (c) What is the full-form of RAM?  
Random Access Memory (ii)
- (d) ROM is a  
Non-volatile Memory (ii)
- (e) What is information?  
Ans- Processed data (i)
- (f) Which of the following falls under utilities?  
Disk defragmenter (iii)
- (g) Which of the following are the sub-units that make the CPU?  
(i) Control unit (ii) Both (i) and (ii)  
(ii) ALU (iii) None of these
- (h) Which is/are a type of OS?  
Time-sharing OS (iii)
- (i) 1TB is equivalent to:  
 $2^{10}$  GB (iii)

(j) Storage of 1 KB means the following number of bytes:  
1024 (iii)

(k) One megabyte is equivalent to  
 $2^{20}$  bytes (ii)

(l) Identify the input device  
Keyboard

(m) Which of the following is referred to as the brain of computer?  
Processor (i)

(n) OMR is capable of recognizing a pre-specified type of mark made with dark pencil or ink.

(o) Barcode Reader reads a sequence of lines of different heights and widths that are printed on various type of products

(p) Biometric sensors uniquely identifies a person on the basis of physical or behavioural traits such as fingerprints, DNA, etc.

(q) Which smaller unit of CPU directs and coordinates all activities within it and determines the sequence in which instructions are executed, sending instruction sequence to other smaller units?  
CU (i)

(r) Which of the following memory types will store data or information permanently?  
Hard disk (iii)



- (s) Convert the following into kilobytes:  
 $2.7 \text{ GB} = 2831155.2 \text{ Kilobytes}$ .
- (t) Spreadsheet is an example of Application Software
- (u) An operating system with a touch-based interface is Android and IOS

Question / Answer

Ques 1 - How does the computer understand a program written in high-level language?

Ans - Humans are able to write programs in high-level language while computers can understand only machine language. So, with the help of language translators, program written in high-level language can be converted into machine language which is understood by the computer.

Ques 2 - Expand the following terms:

- CPU - Central processing unit
- I/O - Input process unit Output
- VDU - Visual display unit
- HDD - Hard disk drive
- ALU - Arithmetic Logic Unit
- HLL - High level language
- MICR - Magnetic Ink Character Recognition

Ques 3 - Name the input or Output device used to do the following

- (a) To output audio - Speaker / earphones / headphones
- (b) To enter textual data - Keyboard
- (c) To make hard copy of a text file - Printer
- (d) To display the data or information - Monitor
- (e) To enter audio-based commands - Microphone
- (f) To build 3D models - 3D Printer
- (g) To assist a visually-impaired individual in entering data - Braille Keyboard

Ques - Given below are some features of two types of computer memories - RAM and ROM. List each feature under RAM or ROM.

Ans RAM - Volatile memory, stores data or files the user is currently working on, Can be written to and read from

ROM - Non-volatile memory, contents can't be changed

Ques - Name the two categories of application software.

Ans - (a) General purpose software  
(b) Customized (tailor-made) software

Ques - Give examples of application software and System software.

Ans - Ex Examples of application software :- Word processors (MS Word, Open office Writer), spreadsheet program (Open office Calc, MS Excel), database programs (MS Access, Open office Base)

Examples of System software :- operating system, device drivers, utility software such as antivirus software, disk cleaner, disk compression, etc.

Ques - Identify the category (system or application) of the following software:

- Ans - (a) Interpreter - System software (Language processor)
- (b) Backup software - System software (Utility software)
- (c) Powerpoint - Application Software
- (d) Linux - System Software (OS)
- (e) Compiler - System software (Language processor)
- (f) Antivirus - System software (Utility software)
- (g) WinRAR - System software (File compression Utility software)

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