COMPUTER SYSTEM AND ORGANISATION
(MODULE 1/6)

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Computer Organisation

 **Computer Organisation** refers to logical structure of a computer. It defines the interconnection and interdependencies of various components to contribute overall performance of the computer.

 **Computer** is an electronic data processing machine which intakes data from the user, processes those data according to the instruction of user and gives desired output.

 Every task given to a computer follows an **Input- Process- Output Cycle (IPO cycle).** It needs certain input, processes those input and produces the desired output. The **input unit** takes the input, the **central processing unit** does the processing of data and the **output unit** produces the output. The **memory unit** holds the data and instructions during the processing.

 Any digital computer performs four basic functions.

 1.Take data as input

 2.Stores data/instructions

 3.Process those stored data

 4.Generate the output

1. CHARACTERISTICS OF COMPUTER
* Data and Information

 **What is Data?**

 Data is a raw and unorganized fact that required to be processed to make it meaningful Generally, data comprises facts, observations, numbers, characters, symbols, image, etc.Data is always interpreted, by a human or machine, to derive meaning.

 **What is Information?**

 Information is a set of data which is processed in a meaningful way according to the given requirement. Information is processed, structured, or presented in a given context to make it meaningful and useful.

 **Data** is utilized as input and the **information** is the output of this processing .Information is meaningful, ordered and processed form of data. It is extra important than data because decisions are made by using it. Data and information are interconnected and closely related to each other. Furthermore, Information cannot be compiled without data. Data is an unsystematic, unorganized and unrelated entity. While information is systematized, organized and understandable. Data is independent but the information is dependent.

 Ex. Students' names in a class are **Data**While names of students in alphabetic order are **Information.**

 A student's subject marks are **Data**While his percentage of marks, grade and position are **Information.**

1. BASIC ARCHITECTURE OF COMPUTER
2. Input Units

 **Input devices** connected to a computer system makes its input unit. The input unit is responsible for taking input and converting it into computer understandable form(the binary code).Since computer operates on electricity, it can understand only the language of electricity ON/OFF . i.e. the binary language 1(ON) or 0(OFF).

 So Input unit is responsible to accept input and to convert it into computer understandable format. Different input devices are used for different types of input.

 Some of the input devices are as under –

* + Mouse
	+ Keyboard
	+ Microphone
	+ Joy-stick
	+ OMR
	+ MICR
	+ Light Pen
	+ Scanner
	+ Camera

1. Central processing unit

 The **CPU** is called the brain of the computer because it controls the entire computing system. As the CPU is located on a small chip, it is also called the microprocessor. In the CPU, there are three primary components.

* **Arithmetic and Logic Unit (ALU)**

 The ALU, as its name suggests performs mathematical calculations and takes logical

 decisions. Arithmetic calculations include addition, subtraction, multiplication and

 division. Logical decisions involve comparison of two data items to see which one is

 larger or smaller or equal.

* **Control Unit**

 The Control unit coordinates and controls the data flow in and out of CPU and also

 controls all the operations of ALU, memory registers and also input/output units. It is

 also responsible for carrying out all the instructions stored in the program. It decodes

 the fetched instruction, interprets (understands) it and sends control signals to

 input/output devices until the required operation is done properly by ALU and

 memory.

* **Memory Registers**

 A register is a temporary unit of memory in the CPU. These receive data/information

 and then this data/information is held in them as per the requirement. Registers are small unit of data holding places inside CPU.The CPU uses registers to temporarily hold some data during processing.It can be of different sizes(16 bit , 32 bit , 64 bit and so on) and each register inside the CPU has a specific function like storing data, storing an instruction, storing address of a location in memory etc.

1. OUTPUT UNIT

**Output devices** connected to a computer system makes its output unit.The output coming from CPU is in the form of electronic binary signals which needs to be converted again to human understandable form.i.e. either textual or graphical or audio visual form.It is the responsibility of an Output unit to produce output after processing.Different output devices are used for different types of output.Some of the output devices are

* + Monitor(most common form of output .The screen on monitor is made up of thousands of tiny coloured dots called pixel)
	+ Projector
	+ Printer
	+ Plotter
	+ Speaker
	+ Headphone
1. MEMORY UNIT
2. **Units of Memory:**

The smallest unit is bit, which mean either 0 or 1.

1 bit = 0 or 1

1 Byte = 8 bit

1 Nibble = 4 bit

1 Kilo Byte = 1024 Byte= 210 Byte

1 Mega Byte = 1024 KB= 210 KB

1 Gega Byte = 1024 MB= 210 MB

1 Tera Byte = 1024 GB= 210 GB

1 Peta Byte =1024 TB= 210 TB

1 Exa Byte =1024 PB= 210 PB

1 Zetta Byte = 1024 EB= 210 EB

1. Yotta Byte = 1024 ZB= 210 ZB
2. Main Memory

 **Main Memory** is often known as **Primary memory.** Itis not like human memory because data stored in this memory, automatically flushes out with power cut off and can not be recovered later. So it is also known as **volatile** memory. It is the workplace of a computer system where data is to be kept on temporary basis for the purpose of processing. Every memory location has a definite address. The total time taken to access data from memory is called **Memory *Access Time .***

 **Characteristics of Main Memory**

* + These are semiconductor memories.
	+ Usually volatile memory.
	+ Data is lost in case power is switched off.
	+ It is the working memory of the computer.
	+ Faster than secondary memories.
	+ A computer cannot run without the primary memory.
1. Secondary Memory

 **Secondary Memory** is also known as external memory or non-volatile memory. It is slower than the main memory. These are used for storing data/information permanently. CPU directly does not access these memories, instead they are accessed via input-output routines. The contents of secondary memories are first transferred to the main memory, and then the CPU can access it. For example, disk, CD-ROM, DVD, etc.

 **Characteristics of Secondary Memory**

* + These are magnetic and optical memories.
	+ It is known as the backup memory.
	+ It is a non-volatile memory.
	+ Data is permanently stored even if power is switched off.
	+ It is used for storage of data in a computer.
	+ Computer may run without the secondary memory.
	+ Slower than primary memories.

Memory classification

1. DRAM AND SRAM
2. ROM

 **ROM (Read Only Memory)** stores crucial information essential to operate the system, like the program essential to boot the computer.It is not volatile as always it retains its data.ROM is further classified into 4 types- **ROM, PROM, EPROM, and EEPROM**. ROM is of following types -

 ROM (Read Only Memory)

 PROM (Programmable Read Only Memory)

 EPROM (Erasable Programmable Read Only Memory)

 EEPROM(Electrically Erasable Programmable Read Only Memory)

**Types of Read Only Memory (ROM) –**

* **PROM (Programmable read-only memory)** –PROM is different from as a ROM is programmed (i.e. has data written to it) during the manufacturing process, a PROM is manufactured in an empty state and then programmed later using a PROM programmer or user. Once programmed, the data and instructions in it cannot be changed.
* **EPROM (Erasable Programmable read only memory)** –as the name suggests, data stored in an EPROM can be erased and reprogrammed. Erasing an EPROM involves removing previous data from the computer and exposing it to ultraviolet light before re-burning/reprogramming it.
* **EEPROM (Electrically erasable programmable read only memory)** – The data can be erased by applying electric field, no need of ultra violet light. We can erase only portions of the chip.
* Difference between RAM and ROM
* Storage Unit

 A **secondary storage** device refers to any non-volatile **storage** device that is internal or external to the **computer**. It can be any **storage** device beyond the primary **storage** that enables permanent data **storage**. A **secondary storage** device is also known as an auxiliary **storage** device or external **storage.** It is required to store data in computer for the purpose of processing in future. Because Primary memory has its own limitations, secondary storage or storage unit is very much required. Secondary storage is used to store large amount of data. Various secondary storage devices are available in market now a days -

–Hard disk (Internal/External)

–Pen drive

–CD

–DVD

–Blue Ray Disks

–Memory Cards

–Magnetic Tapes

* Hard Disk
* **Hard Disk Drives** are commonly used as the main storage device in a computer. HDDs often store operating system, software programs and other files. It is a **non-volatile memory** hardware device that controls the positioning, reading and writing of the hard disk.
* A hard disk is a sealed unit containing a number of platters in a stack. It can be mounted in a horizontal or a vertical position and electromagnetic read/write heads are positioned above and below each platter. As the platters spin, the drive heads move in toward the center surface and out toward the edge. In this way, the drive heads can reach the entire surface of each platter.
* Each disk consists of platters, rings on each side of each platter called **tracks**, and sections within each track called **sectors**. A sector is the smallest physical storage unit on a disk, almost always 512 bytes in size.
* System bus

The group of wires used to connect main parts of Computer system is called System Bus which creates an electronic path for the transfer of data.

•System bus is used to transfer data and instructions between the various components of computer system.

•The part of System bus that carries data is called Data Bus.

•The part of System bus that carries instructions is called control bus.

•The part of System bus that carries memory address is called Address Bus.

•And the bus connected with input/output units is called I/O bus.