HARDWARE FEATURES & CONCEPTS

A computer is an electronic digital machine that takes data and performs a task upon an instruction in a predetermined manner and provides the output.

The computer is a managerial tool capable of processing large quantities of data very rapidly and accurately. It can perform arithmetic and logical operations and can disperse results in a variety of formats. Computers can repeat programmed instructions almost endlessly without errors, can hold large quantities of information in storage and can be used to stimulate decision, modeling situations.

COMPONENTS OF A COMPUTER

Computer mainly has the Central Processing Unit (CPU) and the Peripheral devices which are connected to and controlled by the CPU.

CENTRAL PROCESSING UNIT (CPU)

The CPU comprises of three parts, they are:
  (i) Memory Unit (the Primary Storage Section)
  (ii) Control Unit
  (iii) Arithmetic and Logic Unit (ALU)

The CPU controls the execution of programs and performs the calculations. It is called the brain of the computer because, execution of any task by a computer is controlled entirely by the CPU. The CPU activities include ensuring – all instructions for a program are executed, and in the proper sequence, the calculations and logical operations are performed correctly and the instructions and data are available for successfully executing a task. For executing its job, the CPU mainly uses three main interactive components-

- Memory Unit,
- Control Unit
- Arithmetic and logic unit (ALU)

- The Memory Unit (Primary Storage Section/Main memory)

This is the portion where data and instructions get stored when a program is being executed. It is the storage place where data and instructions can be stored into and retrieved from, whenever required by other functional blocks of a computer. The main memory is used

- Temporarily hold data received from the input devices and keep them ready for processing.
- Hold data being processed and the intermediate results being generated therein.
- Hold the finished results of processing until released to the output devices.
- Hold the system and application software in use.

A computer memory is provided with locations where data can be stored.Each memory location is identified by unique address. The locations store information in bits. Normally each location can keep or store 8 bits (Binary digits). The memory location addresses start from 0. A group of 8 bits is a byte. The total capacity of memory is expressed in terms of bytes. For example, a 256 byte memory would mean – a memory with 256 locations numbered from 0 to 255, and each location capable of storing a byte (8 bits). The memory inside a computer is normally very big.

To be in tune with the binary system, a kilo in computer terminology means 2^{10} to 1024. So a memory of 655360 may be expressed as 640*1024 bytes or 640 kilobytes.

1024 bytes is 1 Kilo Byte(KB) 1024KB is 1 Mega Byte (MB) 1024MB is 1 Giga Byte (GB) 1024GB is 1 Tera Byte (TB)

The specification of a computer is often expressed in by the size of the primary storage. Each computer has its own way of defining the instruction syntax which can be obtained from the machine manual. **An instruction in binary form with a series of 0s and 1s is called Machine Code Instruction.**

There are two operations involved with the Memory. Storing operation is termed as Write Operating or writing in the memory and the retrieval operation is termed as the read operation or reading from the memory. Memory is broadly classified in two types Random Access Memory (RAM) and Read Only Memory (ROM).

RAM: The memory where both reading and writing can take place is called Random Access Memory. The drawback is that it is volatile, because if electricity fails, whatever is written on it gets deleted. Hence we have to copy our programs from RAM on to Secondary Storage Device. RAM is used as the work area where the user's instructions and data can be stored and read.

ROM: These are portions in the computer memory where no writing is allowed. The contents are prewritten and can only be read. Such memories are called Read Only Memory. The information from the memory can only be read out but fresh information cannot be written into it. All the information is written into it during its manufacturing. It does not lose its contents when power fails. It is non volatile Memory. ROM contains those instructions and data which will be required from the operation and is prewritten and would not change.

ROM can be classified into:
   (i) **PROM** – Programmable ROM, in which the user can insert the contents of his choice only once. Once written, it can only be read and never be rewritten. It is also nonvolatile and can be written electrically by the supplier or the customer using a special device.
   (ii) **EPROM** – Erasable Programmable ROM. It can be written many times by a special process. It can be written electrically, but requires the erasure of the whole storage area by exposing the chips to ultra violet rays.

(iii) **Control Unit (CU)** – this is the main processor chip, which has the capacity to understand the instructions fed into the memory unit. The control unit makes the other units perform the tasks by assigning work to the connected devices and parts according to the instructions fed into it. The capacity of a CU is measured in Hz (Hertz). There are Kilo Hz and MHz.

(iv)   Arithmetic and Logic Unit (ALU)

All the arithmetic and logical operations are performed here. The ALU does the operations on the data stored in the Memory. The data received by the Memory Unit is assigned to this unit by the Control Unit along with the instruction as to what ALU has to do with the data whether to logically evaluate or arithmetically calculate. Arithmetic operations +, *, /, - etc. and logical operation are <, >. = etc.

Once the activity is finished, the put, again on the instruction by the control Unit, is stored in the Memory Unit. From the Memory Unit, the out put is released into the output device based on the instruction from the Control Unit.