Be YOUnique

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[COMPUTER FUNDAMENTALS]
& EMERGING TECHNOLOGIES

This pdf is useful for the students of B.C.A. / B.Sc.I.T. / B.E. Computer / CCC and also for all the Beginners.

What is COMPUTER?

A Computer is an electronic device that takes data as input, stores or processes on it and generates output.

Computer word comes from the word **"Compute",** which means **to calculate.**

Characteristics of COMPUTER

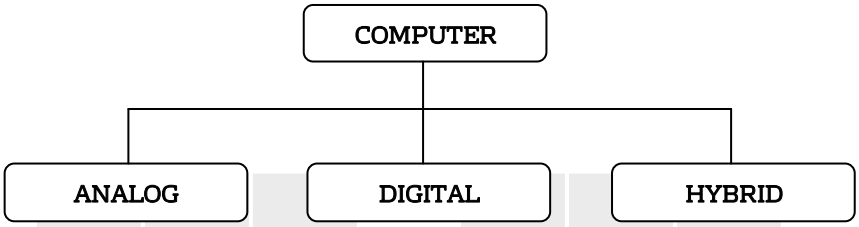
Computer Characteristics can be categorized in to two parts.

1. Advantages 2. Disadvantages

- **Advantages:**
  1. **Speed**
     - Computer can perform the amount of work in few seconds for that a human can take an entire day or week...
  2. **Accuracy**
     - As an electronic device, computer is highly accurate about the results. Wrong outputs are only possible if the data input is wrong.
  3. **Storage**
     - Every piece of information can be retained as long as required by the user. Any amount of data can be recalled as and when required even after several years. Computer deletes or removes any data only as per the command given by the user.
  4. **Diligence**
     - Unlike human beings, a computer is free from tiredness and lack of concentration. It can work without any error for several hours. Although, the speed and accuracy remains same.
  5. **Versatility**
     - Computer can work on more than one task simultaneously with the same accuracy of results.
  6. **Reliability**
     - As it is a machine, it cannot make mistakes in results, and also the lifespan of a device is increased day-by-day.
- **Disadvantages:**
  1. **No I.Q.**
     - Computer doesn't have any intelligent quotient itself. It can perform any work only as per the command given by the user.
  2. **Dependency**
     - As a dumb terminal, computer is dependent on commands given by the end user, without which it cannot work itself.
  3. **No Feeling**
     - As we all know, computer is a machine. Therefore it can harm anyone as per the order given by the user.

Data Processing Cycle

- **Data processing cycle consists of three parts:**
  - Data: data is a raw material inserted by the user.
  - Process: process is a bunch of instruction which is going to be performed on raw material to get required result.
  - Information: information is the result derived after the process on raw material.
- **Data processing cycle can also be defined as given below**
  - Input: Input is a raw material inserted by the user.
  - Process: process is a bunch of instruction which is going to be performed on raw material to get required result.
  - Output: output is the result derived after the process on raw material.



- **Analog:** In analog computer, data is represented as continuously varying voltage and operate essentially by measuring rather counting. As the data is continuously variable, the results obtained are estimated and not exactly repeatable. Voltages, temperature and pressure are measured using analog devices.
- **Digital:** A Digital computer is an electronic computing machine that uses the binary digits 0 and 1 to represent all forms of information internally in digital form. In digital computer, data is represented as discrete unites of electrical pulses. The data is measured in quantities represented as either the 'on' or 'off' state. Therefore, the results obtained from a digital computer are measurable and precise. Virtually all of today's computers are based on digital technology.
- **Hybrid:** Hybrid computer is the combination of analog and digital technology. This type of computers can handle analog works as well as digital work. For example: ECG machine can display the vibration of Heart as well as it shows the pulses of heart. Now a day, most of the computers come in a hybrid form.

- **Digital Computers can be classified into 4(four) sub-categories**
  - **Micro Computers**
    - Commonly known as personal computers, refer to computer that makes use of microprocessors as the central processor unit. Micro computers are small enough to fit onto the desktop.

- *IBM-PC (International Business Machines – PC)*
- *IBM-PC/XT (Extended Technology)*
- *IBM-PC/AT (Advanced Technology)*
- *Desktops:*

Micro computers can be found in the form of notebook, workstations or pc as well.

Mini Computers

- Now a day, the difference between mini computers and microcomputers is blurred because of the technological advances in micro computers technologies. Traditionally mini computers are medium size computes designed to support multi-users access, this type of computer can support from 4 to 400 users at the same time. While micro computers are used by end-users. The mini computers are meant for medium size business operations.
  - *Hewlett-Packard HP3000, HP2100 and HP1000 series.*

Mainframe Computers

- Mainframe computers are characterized by features like large internal storage capacity and high processing speed. These computers are large computer systems usually supporting hundreds or thousands of users simultaneously. They are usually used in large scale operations like government offices and tertiary institutions.
  - *IBM CICS*
  - *System-360, System-370*
  - *IBM System z9, IBM System z10*

Super Computers

- Super computers are the fastest and most expensive of modern computers. They are designed for high precision based application and are not usually used for data processing but for intense mathematical calculations like in government agencies, Research centers with scientific or engineering functions make use of super computers. Super computers are very much efficient in solving all the problems that are complex and are scientific in nature. The most popular supercomputer was invented by IBM which is the Roadrunner.
  - *Param Padma (this is the first super computer manufactured in India)*
  - *Cray XK6, XE6, Eureka*
  - *MEENIAC, MINEIAC, MOENIAC*
  - *IBM Blue Gene*

History of Computer

- As we all know that the word **"computer"** came from greek work **"compute"** that means **"To Calculate"**
- Human used many things for calculation like fingers, sticks, stones etc...
- Then after, human made "Abacus" for calculation, which was treated as first computer in the world.
- In 1642, **Blaise Pascal** invented the first mechanical adding machine. (Only used for Addition)
- In **1671**, **Baron Gottfried** invented the first calculator for multiplication.
- In **1822**, **Charles Babbage** designed **first "Difference Engine"** used for subtraction. Then, in **1842, he designed first fully automatic "Analytical Engine"** for basic arithmetic functions. His efforts provided many principles which became fundamental to design the digital computer. And therefore He is known as **"The Father of Computer."**

Generations of Computer

First Generation (1942-1955)

- First Generation computers were made up of **Vaccume Tubes.**
- They were very **big in size** so that large rooms were required to manage.
- Very expensive and consumes lots of **electricity**.
- Thousands of Vaccume tubes were used which produces large amount of **heat**. So that air conditioning was required.
- Vaccume tubes have a short time of **life**. Therefore the **maintenance and production cost** was very high.
- They were **non-portable.**
- Limited Programming capacity, (comparatively) law in speed.
- High level programming languages or assembly languages were used.
- *UNIVAC, EDSAC, EDVAC, ENIAC are the examples of First generation computers.*

Second Generation (1955-1964)

- In second generation computer, transistors were used instead of Vaccume tubes.
- Transistors have more lifespan and small in size.
- Second generation computers were 10 times faster than first generation.
- They consumed less electricity that first generation.
- They were **non-portable** like first generation.
- Limited Programming capacity, (comparatively) law in speed.
- High level programming languages or assembly languages were used.

Third Generation (1965-1975)

- These computers were smaller in size.
- More reliable than second generation computers.
- Generated less heat.
- These computers were faster that second generation.
- Maintenance const is low because of hardware failure was not frequent.
- They were portable, therefore widely used for commercial applications and was easier and cheaper.
- In Many cases Air conditioning required.
- *Burroughs 6700, Control Data 3300-6600-7600, Honeywell 200*

Fourth Generation (1975-1989)

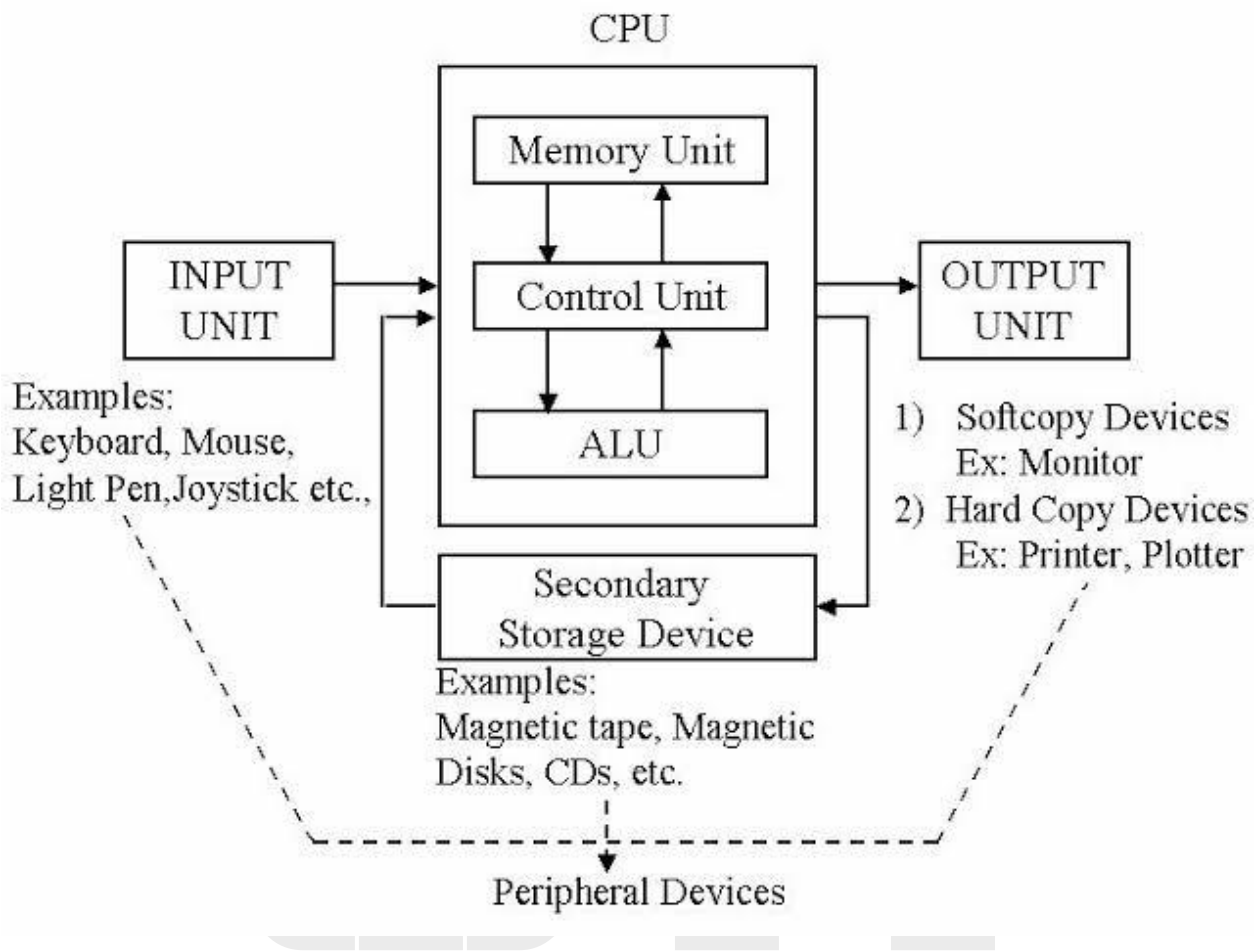
- Microprocessor (LSI, VLSI) technology is used.
- Smallest in size due to high component density.
- Very reliable as compare to any previous generations.
- Much faster in calculation than previous generations.
- Heat generation is negligible.
- Hardware failure is negligible, therefore minimum maintenance required.
- Easily portable.

Fifth Generation (Present days...)

- Based on Artificial Intelligence.
- Fifth generation computers were made up of ULSI (Ultra Large Scale Integration)
- Size of computers is very small.
- Speed of these computers is very fast than all generations.
- They consume less power than generations before.
- Problem of heat generation is mostly resolved.
- Easily portable and can be used while travelling.

Block Diagram of Computer

You need to INPUT something which gets PROCESSED inside CPU and after that you can have the desired OUTPUT. Now, let's have a look on computer block diagram. It will help you to understand how INFORMATION FLOWS within computer in which particular direction.



- **Input Devices:** Input Devices are the peripherals that allow data to be captured and transmitted to the computer system. Digital computers need to receive data and instruction in order to solve any problem so they need to input data and instructions. Input can be entered from a keyboard, a mouse, a usb stick or from any type of input devices.
- **Output Devices:** Output devices convert information from machine readable form to human readable form. The most common device used in computer system is the monitor, (like LED, LCD, CRT...) where information is displayed. This form of output is known as "Soft Copy" and the form of output which we get on the printer is known as "Hard Copy".

- **Storage Devices:** storage device can store data permanently without damaging the data even after many years. Storage can be classified in two categories like Primary Storage and Secondary Storage.
- **CPU: (Central Processing Unit):** This is the unit where all the processing is done. CPU is also known as "The Brain of Computer". Mainly there are three parts of CPU.
  - *ALU (Arithmetic & Logical Unit):* This unit is used to perform all the mathematical and logical processes.
  - *CU (Control Unit):* this unit controls the movement of data and program instructions into and out of the cpu, and to control the operations of the ALU. In short, it's main function is to manage all the activities within the computer system.
  - *MU (Memory Unit):* Mainly there are two types of memory. Primary memory and Secondary memory. Some examples are RAM, ROM, HDD Etc...