

# *Computer System*

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# *Introduction to Computer*

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The word "computer" comes from the Latin word "computare"(compute in english), which means to **calculate**.

- A computer can be defined as a multipurpose, electronic data processing device that is capable of accepting input, processing it and produce output.

# *IPO(Input-Process-Output) Model*



# *Characteristics Of a Computer*

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- **Speed:** The Computer is very high speed electronic device. It can perform millions of operations on the data within a second.
- **Accuracy:** Accuracy of a computer is very high. Almost the accuracy of a computer is 100% accurate or correct in every tasks.
- **Storage:** A Computer can store a huge amount of data.
- **Reliability:** The electronic components in modern computer have very low failure rate. That's why computer are used everywhere.
- **Versatility:** Computer Can be used everywhere.

# *Characteristics Of a Computer (continue)*

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- **Diligence:** A computer can work continuously for many hours without creating errors.
  - **Communications:** Today's Computer is mostly used to exchange messages and data through networks or internet.
  - **Word Length:** Computer operates on binary digits which are 0 & 1. All data and information are kept in a computer or its memory in the terms of 0's and 1's.  
**The number of bits that a computer can process at a time in parallel is called its word length.**

NOTE: 8 bits = 1 byte.

# *Application Of Computers*

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- **EDUCATION** : Computer is used in school & colleges for teaching purpose mainly.
- **ENTERTAINMENT**: It is used in movie-making, storage, editing ,Playing video-games, etc
- **E-Commerce**: E-commerce is an electronic commerce or e-business done electronically through the use of computer and network. example : Daraz , Amazon, etc
- **Health Care** : Every area of the medical field uses Computers, such as Lab, research, pharmacy etc.

# *Application Of Computers (Continue)*

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- **Health Care (Continue)**

**1. Maintain patient History & Records :** To store information

**2.Patient Monitoring :** Tracking patients heart rate , tracking their information etc.

**3.Computer-Aided Surgery(CAS):** CAS provides some useful information to the doctors during their trainings.

# *Application Of Computers (Continue)*

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- **Science & Engineering:** Computers are used by scientists for weather forecasting, collecting information around the world, etc
- **Government**
- **Home**



# ***MEMORY***

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- **Memory** is a location or space where we can keep data, information, and programs temporarily as well as permanently. It is one of the major component of a computer system.

# *Types of memory*

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Memory can be basically classified into two types.

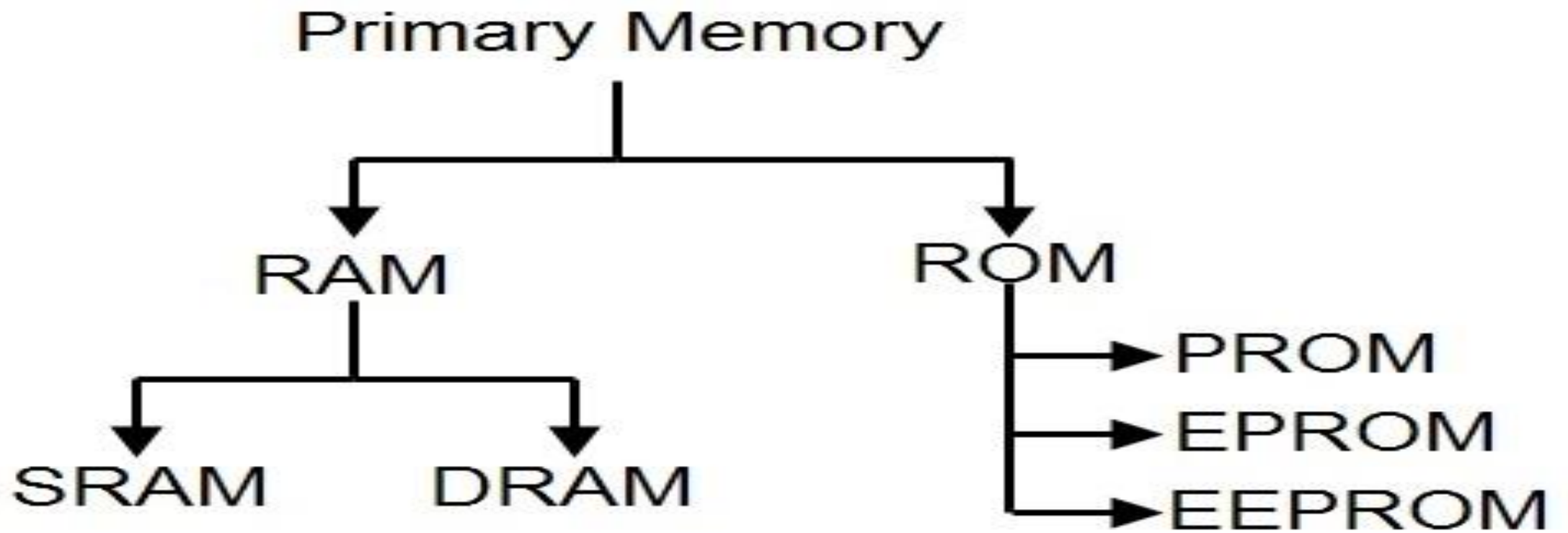
- Primary Memory or Main Memory or Internal Memory
- Secondary Memory or Auxiliary Memory Or External memory.

# *Primary Memory*

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**Primary memory** is also known as **main memory** or may also refer to "*Internal memory.*" and primary storage. All those types of computer memories that are directly accessed by the processor using data bus are called primary memory. That allows a processor to access stores running programs and currently processed data that stored in a memory location. Primary memory can be volatile or non-volatile. RAM is a volatile memory and ROM is a non-volatile memory.

# *Primary Memory*



# *Types Of Primary Memory*

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- **RAM :** The Word "**RAM**" stands for "random access memory" or may also refer to short-term memory. It's called "random" because you can read store data randomly at any time and from any physical location. It is a temporal storage memory. RAM is volatile that only retains all the data as long as the computer powered. It is the fastest type of memory. RAM stores the currently processed data from the CPU and sends them to the graphics unit.

# *RAM (continue)*

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**There are generally two broad subcategories of RAM:**

- **Static RAM:** Static RAM(SRAM) is the form of RAM and made with flip flops and used for primary storage are volatile. It retains data in latch(flip flop) as long as the computer powered. **SRAM** is more expensive and consumes more power than DRAM. It used as Cache Memory in a computer system. As technically, SRAM uses more transistors as compared to DRAM. It is faster compared to DRAM due to the latching arrangement, and they use 6 transistors per data bit as compared to DRAM, which uses one transistor per bit.

# *RAM (continue)*

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**There are generally two broad subcategories of RAM:**

- **Dynamic Random Access Memory (DRAM):** It is another form of RAM used as Main Memory, it retains information in Capacitors for a short period (a few milliseconds) even though the computer is powered. The Data is Refreshed Periodically to maintain it. The DRAM is cheaper, but it can store much more information. Moreover, it is also slower and consumes less power than SRAM. It is the most common type of RAM.

# ROM (Read Only Memory)

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ROM is the long-term internal memory. ROM is “Non-Volatile Memory” that retains data without the flow of electricity. ROM is an essential chip with permanently written data or programs. It is similar to the RAM that is accessed by the CPU. ROM comes with pre-written by the computer manufacturer to hold the instructions for booting-up the computer.



## ***ROM (continue)***

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**There is generally Three broad type of ROM:**

- **PROM:** PROM stands for programmable Read Only Memory. It can be programmed only be done once and read many. Unlike ROM, PROMs retain their contents without the flow of electricity. PROM is also nonvolatile memory. The significant difference between a ROM and a PROM is that a ROM comes with pre-written by the computer manufacturer whereas PROM manufactured as blank memory. PROM can be programmed by PROM burner and by blowing internal fuses permanently.

## ***ROM (continue)***

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- **EPROM:** Once the ROM and PROM is programmed its content cannot be changed. However, there is another type of memory chip called EPROM that overcomes this problem. EPROM stands for Erasable Programmable Read Only Memory. Like PROM, it is initially blank and the user or manufacturer can write his own program or data. Unlike PROM, the data written in EPROM can be erased and reprogrammed by exposing the chip into high intensity ultraviolet light for 10 to 20 minutes. So we can update our programs or data when needed.

## ***ROM (continue)***

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- **EEPROM:** EEPROM means Electrically Erasable Programmable Read Only Memory. It is a special type of PROM that can be erased by exposing it to a high voltage of an electrical charge without the necessity of chip being removed from computer. Erasing requires much short time in millisecond range. It can be programmed up to 10000 times.

# *Cache Memory*

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The cache is also kind of primary memory. Cache memory is a high-speed memory, which is small in size but faster than the main memory (RAM). The CPU can access it more quickly than the primary memory. So, it is used to synchronize with high-speed CPU and to improve its performance. In between the CPU and RAM there is a small cache memory of high speed SRAM for accessing the frequently used data by CPU.

# *Types of cache memory*

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- **L1:** It is the first level of cache memory, which is called Level 1 cache or L1 cache. In this type of cache memory, a small amount of memory is present inside the CPU itself. If a CPU has four cores (quad core cpu), then each core will have its own level 1 cache. As this memory is present in the CPU, it can work at the same speed as of the CPU. The size of this memory ranges from 2KB to 64 KB. The L1 cache further has two types of caches: Instruction cache, which stores instructions required by the CPU, and the data cache that stores the data required by the CPU.

# *Types of cache memory*

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- **L2:** This cache is known as Level 2 cache or L2 cache. This level 2 cache may be inside the CPU or outside the CPU. All the cores of a CPU can have their own separate level 2 cache, or they can share one L2 cache among themselves. In case it is outside the CPU, it is connected with the CPU with a very high-speed bus. The memory size of this cache is in the range of 256 KB to the 512 KB. In terms of speed, they are slower than the L1 cache.

# *Buffer*

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Buffer is used for an uninterrupted flow of information. When there is faster device is transferring the data to a slower device. Due to the mismatch between the processing speeds of two devices, some data need to be stored into a memory called buffer.

- Explain more about buffer by yourself. (Homework)

# *Secondary Memory*

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Secondary Memory can store large amount of data and it can store permanently.



# *Types of Secondary Memory*

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- Based on the type of data access.
- 1. **Sequential Access**: In sequential access devices, the data is written or read in sequence one after another. We can't go directly to desired location. Example, tape or cassette.
- 2. **Random Access**: In random access data can be written or read to any location. Example, Disks, CD, DVD, Magnetic(Hard) Disk. etc

Random access also known as direct access

# *Types of Secondary Memory*

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- Based on the technology.
- 1. **Semiconductor Storage** : The semiconductor memory is built of from the semiconductor devices like transistors and gates, RAM , ROM , Cache memory . They are fast in nature.
- 2. **Magnetic Storage Memory**: Magnetic storage refers to a system that keeps information or data on a magnetized material. They are non-volatile memory. The information stored in this memory can be read many times without any errors. But it is slower in comparision to semiconductor storage.

Example of magnetic storage memory are , Magnetic(Hard) disk, Floppy disk, ZIP disk, Magnetic Tape.

# *Types of Secondary Memory*

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- Based on the technology.
- 3. **Optical Storage memory**: In the case of optical storage , the read write process uses optical properties like laser beams.
- Example CD-ROM, DVD-R ,Blu-Ray Disc etc

# *External Storage Devices*

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The storage devices which can be connected to the system externally are called external storage devices.

Examples : Online Storage, Smart Cards, Flash Memory, Memory Cards etc

# *INPUT and OUTPUT devices*

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**Input Device:** The devices that are used to enter data and instructions into a computer .

Examples, Keyboard , mouse ,Digital Scanner, Microphone

# *INPUT and OUTPUT devices*

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**Output Device:** The devices that are used to get output from a computer in readable form are called output device . Output devices are of two type

1. Soft copy output device
2. Hard copy output device

Examples, printer, Monitor, Speaker

# Soft copy output device



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The output received on the display screen or in the audio or video form is called softcopy output. It is stored in computer.

They are Monitors and speakers.



# *Types of Monitors*

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**CRT Monitors:** A CRT monitor is similar to standard television. It contains a cathode ray tube(CRT). A cathode ray tube is a large, scaled glass tube. The front of the tube is the screen. The back of the screen is coated with phosphor (chemical material) that glows when electron beam falls on it.

A CRT monitor contains millions of tiny red, green, and blue phosphor dots that glow when struck by an electron beam that travels across the screen to create a visible image.

CRT Monitor contains an electronic gun . The electronic gun shoots a beam of electrons through magnetic coil, this causes the dots of phosphor on the screen to glow , which produces image on the screen. The smallest number of phosphor dots that the electronic gun can focus on is called **pixel**.



# *LCD Monitor*



# LED Monitor (Light Emitting Diode)



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Disadvantages OF LED monitor

1. it is an expensive monitor
2. it has low brightness as compared to CRT monitor.
3. it is difficult to maintain.



# Gas-plasma Display

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## **Advantages of Plasma display**

It consumes low power than CRT but more than LCD & LED

It has larger viewing angle more than 180 deg.

It is better for human eye similar to LCD & LED

## **Dis-advantages of Plasma display**

It is the most Expensive monitor

Gas filled inside the monitor can be leaked which may be harmful for us.

# Characteristics of the monitor

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1. Size
2. Resolution: it means the number of the pixels on the screen.
3. Bandwidth
4. Dot pitch: it is the amount of space between each pixel.
5. Refresh Rate : it means the number of times the screen is refreshed per second.
6. Convergence : It is the sharpness of the each pixel.

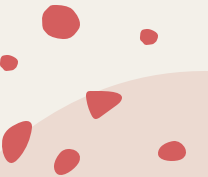
# Video Standard

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1. VGA (Visual Graphics Array): upto 16 to 256 colors, 640 x 480 resolution
2. SVGA (Super Visual Graphics Array) : 800 x 600 resolution upto 256 colors.
3. XGA (extended graphics array): 1024 x 768 resolution.

# Voice Output Device

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# Hard copy output device:

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**Printer:** it is a peripheral device used to print text, pictures, images , figures etc.

1. **Impact Printer:** it forms character or image by striking a mechanism such as print hammer or wheel against an inked ribbon leaving an image on paper.
2. **Non- impact Printer:** it is faster and quieter than impact printer. it forms texts and images by spraying liquid or powder ink.

## *Continue...*

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The printer also can be classified by how they print and how fast they operate, they are:

- 1.Character printer: prints 30- 600 character per second.
- 2.Line printer: prints 1 line at a time
3. Page printer: prints 1 page at a time.



# **The quality of the printer depends on following factors.(Factors affecting quality of the printer).**

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- 1.printing speed of the printer
2. printing quality (resolution of the images)
- 3.color used in the printer.
- 4color of the images.
- 5.cost of the printer and ink.

# *Types Of printer*

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- **Dot Matrix Printer:** It is a common impact printer. It contains a print head of small pins that strikes and inked ribbon forming character and images.
- **Daisy Wheel Printer:** It is older type of impact printer used with micro computers(Computer), which has a removable print wheel the flower-like daisy wheel consisting of spokes. Each spokes ends with the raised character, which is turned to align the desired letter and then struck with a hammer.
- **Line Printer:** It is also another type of impact printer. It can print upto 3000 lines a minute. It is mainly used for continuous printing like marksheet printing, bank statements, bill etc

## *Types Of printer (continue)*

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- **Inkjet Printer:** It is a Non- impact character printer. These printers work by propelling droplets of ink onto paper. Yellow, magenta (red), cyan (blue), and black are the commonly used ink colors in an inkjet printer. Used together, these can reproduce most colors.
- Most consumer printers use the thermal drop-on-demand (DOD) method to dispense the ink. In this process, ink is pumped from the cartridge to a tiny reservoir sitting directly behind a nozzle. A small electric heating element is located in the reservoir. When a pulse of electrical current passes through, the ink's solvent vaporizes, causing an increase in pressure, which propels a drop of ink out of the nozzle.

## *Types Of printer (continue)*

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- **Laser Printer:** It is a Non- impact page printer. An entire page is processed at a time. Once the pattern has been created on the drum, it is coated with toner from a toner cartridge. The toner is black in most cartridges, but may be cyan, magenta, and yellow in color laser printers.
- laser printers do not use ink, they have less image smearing problems than inkjet printers and are able to print pages faster.
- It is more expensive than other printers.

## *Types Of printer (continue)*

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**Thermal Printer:** A thermal printer is a printer that makes use of heat in order to produce the image on paper. Due to quality of print, speed, and technological advances it has become increasingly popular and is mostly used in airline, banking, entertainment, retail, grocery, and healthcare industries. Thermal printing does not make use of ink or toner unlike many other printing forms but largely depends on thermal papers for producing the images

# *Plotter*

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A plotter is a specialized output device designed to produce high-quality graphics in a variety of colors and size. It uses ink or inkjet mechanism to draw graphics or drawings.

A plotter is a special output device used to produce hard copies of large graphs and designs on paper, such as construction maps, engineering drawings, architectural plans and business charts.

# *Types Of Plotter*

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- **Flat-Bed Plotter:** A flat-bed plotter is a mechanical drafting device used with many CAD programs for designers. The paper remains fixed on a flat surface while a pen moves across it horizontally and vertically.
- **Drum Plotter:** A drum plotter is a pen plotter that wraps the paper around a drum with a pin feed attachment. The drum then rotates the paper as pens move across it and draw the image. It was the first output device used to print graphics and large engineering drawings. Both pen and paper rotates to print graphics.
- **Electrostatic Plotter:** it is technologically different than others . It use electrostatic charges to create images out of very small dots on specially treated paper. Liquid Toner models use toner that is positively charged and thus becomes attracted to paper's negative charge

# Generation of computer

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## **first Generation computers (1946-1956 AD)**

vacuum tubes & valves are used as a major memory.

punched card for input

printout display for output

large in size

slow and expensive

Generated large amount of heat

Machine language are used as a major programming language.

example: ENIAC, EDVAC, IBM-650



# Generation of computer

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## **Second Generation computers (1956-1965 AD)**

Transistors are used for electric circuit

- Magnetic Tape for storage or memory.
- At beginning, assembly language were used and at ending period high level language were used like COBOL, FORTRAN.
- Reduced Size and cost .
- Larger Storage Capacity.
- example: IBM 1401, 7030, 7050, 200 series.

# Generation of computer

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## **Third Generation computers (1965-1973 AD)**

IC (Integrated Cricuit) (SSI & MSI) is used for memory and processing units(CPU).

- Semiconductor memory for internal storage.
- keyboard for input.
- Monitor for output.
- Started to use operating system(OS)
- Reduced size and increased speed
- Used High level language.
- Mini computer introduced.
- Magnetic disk for external storage.
- Example: Intel 4004 chip developed, IBM 360 & 370 series.

# Generation of computer

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## **Fourth Generation computers (1973-2020 AD)**

Microprocessor(CPU) having LSI & VLSI with multi-processor based system.

- Semiconductor memory.
- Storage Capacity drastically increased(TB's).
- Versatile input and output devices used.
- Smaller in size, and more reliable and reduced cost.
- Very User friendly to use computer.
- microcomputer introduced (Laptop, Notebook and palmtop, etc)
- High level languages used widely.

examples: IBM pcs, Intel PCS, macintosh PCS, etc

# Generation of computer

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## **Fifth Generation computers (2020-till now AD)**

Use of ULSI (millions of transistors in chip) technology.

- AI(Artificial Intelligence) programming used.
- knowledge based problem solving technique.
- High Performance multiprocessor system.
- input and output in the form of speech(voice) & graphs.
- Able to understand natural language, like english, hindi etc
- Future Vision in computer.
- Having their own thinking power.
- This type of computer are still in research phase.


# Computer speed & Measurement unit.



1.Bit Width: How many bits the buses can transfer simultaneously.

it is usually expressed in multiple of 8 bits.

2. Clock Cycles: It is how many times per second a charge of electricity is passes through chip.



# Computer speed & Measurement unit.

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3. Execution Cores: More execution core means you can get more work done at a same time or more multiprocessing.

4.CPU Speed Measurement: It is mainly measured in hertz.it is the clock speed of a chip measured in hertz.

# Computer speed & Measurement unit.

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5. Bandwidth: It is the capacity of any communication link (Network) to transmit the maximum amount of data from one point to another over a computer network.

They are: bps, Kbps, Mbps, Gbps etc

6. Storage Unit: They are Bit, byte, KB, MB, GB, PB, TB etc and so on. (Page no: 24 Book)

# ***CPU***

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Central Processing Unit(CPU): CPU is the major component of any computer System. It is the brain of the computer. It performs all the processing related activities, that's why it is called central processing unit.



# *Components of CPU*

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It Consists of 3 major components.

**1.Arithmetic Logic Unit(ALU):**It contains electronic circuits necessary to perform all the arithmetic and logical operations.

**2.Control Unit(CU):** It controls all other units in the computer. It instructs the input unit where to store the data after receiving it from the users. It also controls the flow of data and instructions from storage unit to ALU.

**3.Register Array:**It is the memory of a processor. it is used by processor only for at the time of execution(process) and storing the processed data temporarily.

# Output Unit:

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An Output unit of a computer is a peripheral device that provides the information and results of a computation to the outside world or users.

# MICROPROCESSOR

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MICROPROCESSOR: Microprocessor is an entire CPU built in a single chip. ALL the ALU, CU and Register Array are fabricated on a single chip to form a complete Computation system.

# Characteristics of microprocessor:

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1. Instruction Set: The instruction that microprocessor can execute(process) can vary(different) depending on models.
2. Bandwidth: The number of bits processed in a single instruction also can be vary. such as 8bit processor, 16bit processor.
3. Clock Speed: It determines how many instructions per second the processor can execute. it is measured in Mega Hertz(MHZ) or Giga Hertz(GHZ)

# functions of microprocessor

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Microprocessor is the central component of a computer, and the functions of microprocessor are:

- Receives instructions and data from input units.
- Read instructions and data from memory.
- Decodes the instructions and generates control signals for different components to control their operations.
- Process Data.
- Provide output.

# *Application of microprocessor*

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## **microprocessor can be used in(Applications of Micro Processor)**

- Turning traffic lights(street light) on & off
- Computing mathematical functions
- Automating and controlling systems in industries.
- Making decisions etc

# System Buses or Bus

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System Buses: A bus is a data communication path over which bits of information are transmitted between the various components of a computer. The CPU has to be able to send various data, instructions, and information to all components. These path over which data is transmittes between components are called 'system Bus' or simply 'Bus'. These path are simply, tiny wires that carry information, data and different signals throughout the computer from one component to another.

# Types of system bus are:

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1. Control Bus: The control Bus is used By CPU to direct and monitor the actions of other functional areas of the computer. it is used to transmit a variety of individual signals(read, write, interrupt, etc)necessary to control the Computer. It is also unidirectional from CPU to other components.



# Types of system bus are:

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2.Address Bus : The address Bus consists of all the signals necessary to define any of the possible memory address locations within the computer.Address bus only connects CPU and the memory and carries only memory addresses. It is also unidirectional from CPU to Memory.

3.Data Bus: The **bidirectional** data bus, sometimes called the memory bus, handles the transfer of all data and instructions between functional areas of the computer.The data bus is also used to transfer data between memory and I/O(input-output)during input/output operations.

# *Computer Peripherals*

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They are the computer devices that are connected to the computer externally.  
Example, printers, scanner, keyboard etc

# *Interfaces (Mainly Hardware Interface)*

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Hardware Interface is the wires , plugs and sockets that hardware devices use to communicate with each other.

They are :

- Serial Port, Parallel Port, Universal Serial Port(USB), Network Interface Cards(NIC), Personal System 2(PS/2), HDMI, IEEE 1394, Expansion Slots.

# *Interfaces (Mainly Hardware Interface)*

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- **IEEE 1394**

IEEE 1394, High Performance Serial Bus, is an electronics standard for connecting devices to your personal computer. IEEE 1394 provides a single plug-and-socket connection on which up to 63 devices can be attached with data transfer speeds up to 400 Mbps ( megabit s per second).

## **Features:**

- Real-time Data transfer
- A very high-speed rate of data transfer.
- Hot-plug and play capability without disrupting your computer

# *Classification of Computer*

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On the basis of Working Principal: (Not included in your syllabus)

1. Analog Computer
2. Digital Computer
3. Hybrid Computer.

# *Classification of Computer*

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On the basis of Size :

1. **Super Computer** : A Super Computer is fastest, Powerful and expensive computer. It is especially used for weather forecasting, biomedical research, remote sensing, aircraft design, Automotive design, Space engineering etc.

The primary use of supercomputers is in scientific computing which requires high powered computers to perform complex calculation, rendering complex formulas.

Examples: CRAY 3, NEC-205 etc

# *Classification of Computer*

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On the basis of Size :

**2.Mainframe Computer :** Mainframes are large powerful and expensive computers used mainly by large companies for bulk data processing , commercial data processing, and other large scale operations such as bank transactions.

The mainframe computer specially requires a very large clean room with AC. It can support multiple equipments and has multiple processors(CPU).

USE: Industries, bank, Airplanes, Census etc

Examples: IBM ES000 etc

# *Classification of Computer*

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On the basis of Size :

**3. Mini Computer :** Mini computer is also multi user computer like mainframe computer. These are smaller in size , have lower processing speed and are cheaper than mainframe. It is also a multi user or multi tasking time sharing system because it can handles more than 100 workstation at a time. They are also known as midrange computers.

USE: Industries, web servers, research, University etc

Examples: IBM 8000 series , PDP 11 etc



# *Classification of Computer*

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On the basis of Size :

**4. Micro Computer :** Micro Computer is a small sized personal computer(PC) that designed for an individual having a microprocessor inside it. They are also known as personal computers or simply PC. They are very small , portable and low costs.it requires small space and placed on table or suitcase.

USE: Entertainment, Business, personal, Education sector etc

Examples: IBM PC, Apple, Dell, Laptop, Palmtop, Tablet etc

# *Mobile Computing*

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Mobile Computing is a technology that allows transmission of data, voice and video via a computer or any other wireless enabled device without having to be connected to a fixed physical link.

**Features:** Easy to handle and carry.

Data can be easily transmitted between users.

No Time constraints.

No place constraints.

Reduced Cost and time.

# *Applications of Mobile Computing*

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Traffic Control.

Emergency Situation

Use in Business

Entertainment

Airlines Industry

Medical

News Reporting

Banking etc

# *Limitations of Mobile Computing*

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Insufficient Bandwidth

Security Threats

Battery Power

Small Interface devices

Network Stability.

# *Computer Architecture*

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**Computer architecture** can be defined as a set of rules and methods that describe the functionality, management and implementation of computers. To be precise, it is nothing but rules by which a system performs and operates

Like, How many registers or transistors should be there ?

What machine instructions should be there ?

How should be memory organized ?

# *Levels within the Computer Architecture*

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- **Physical Device Layer(1st level)** : Almost all the modern computer devices are built from a simple electric components such as transistors, capacitors, a resistor which works on suitable power supply.
- **Digital logic Layer(2nd level):** All the basic operations of the machine are provided at this level. The basic element at this level can store , manipulate and transmit data in the simple binary form. These digital logic elements are called gates which are normally constructed from a small number of transistors and other electronic components.

Digital logic devices are combined together to form computer processor or computer memory.

# *Levels within the Computer Architecture*

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- **Microprogramming Layer(3rd level) :** In this level, a sequence of microinstruction constitutes the microprogramming, which we called firmware, which is permanently stored in ROM.
- **Machine Layer(4th level):** It is the level at which program can be written and indeed it is only machine language instructions , which can be directly interpreted by the hardware.
- They are processor, input-output device, main memory.

# *Levels within the Computer Architecture*

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- **Operating System Layer(5th level)** : The program that directs the internal operation of a computer system is called Operating System.
- **Higher Order Software Layer(6th level)**: It covers all the programs in language other than machine language, which require translation into machine language(code) before execution.
- **Application Layer(7th level)**: It is the layer where we used to communicate with the system. It is seen by users on a computer screen and interacts with the system.



# *Computer Organization*

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Computer organization refers to the level of abstraction above the digital logic level but below the operating system level. Computer Organization refers to the operational units and their interconnections that realize the architectural specification.

It is concerned with the way the hardware components operate and the way they are connected to form a computer system.

The **Von Neumann model** has five major subsystems :

1. Input, 2. Arithmetic-logic-unit(ALU), 3. Control Unit(CU), 4. Memory and 5. Output

# *Evolution Of computer*

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## **Pre-History Era / Pre-Mechanical Era(500BC-1642):**

**Abacus:** The Abacus is the earliest and the simplest calculating device. It was a very simple computing device used for simple addition and subtraction. It consists of rectangular wooden frame having parallel wires(strings). Each wire supports a number of **beads**.

The beads across the wires are free to move along the length of the wires and represents a digit.

# *Evolution Of computer*

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## **Pre-History Era / Pre-Mechanical Era(500BC-1642):**

**Calculating Device Of John Napier(1550-1617):** In the early 17th century the famous logarithms idea was developed by **John Napier**, a Scottish mathematician.

It is the better calculating device invented at that time period. It is the type of operating device which is operated manually for the purpose of calculations of quotients and products of the given numbers. It looks like a board game that contains a rim into it. And the various rods are placed inside the rims for the purpose of calculations where the numbers are printed on them

# Calculating Device Of John Napier(continue)

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The commonly used calculating device known as "Slide Rule" was also developed using the concept of Napier's idea of logarithms. With the modern slide rule, we can perform simple arithmetic calculations as well as calculate square roots, logs, sin, cos and tangent etc.

# ***Mechanical Era(1642-1890)***

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This period is called mechanical because the machines were based on moving parts, operated by machines and they didn't have any logical control in operation.

**Calculating Device of Blaise Pascal(1642-1662):** In 1642, reputed mathematician Blaise pascal of france, at the age of 19 invented the mathematical calculating machine called **Pascaline** as an aid for his father who was a tax collector it used arithmetic calculations like addition, subtraction, multiplication and division and displayed the numbers by rotating the different wheels or gears. It can perform addition and subtraction directly but multiply and division is performed by repeated additions and subtractions.

# ***Mechanical Era(1642-1890)***

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**Calculating Device of Gottfried Von Leibniz(1646-1716):** In 1671, a German Mathematician Gottfred von Leibniz developed first calculator for multiplication as well as for other simple arithmetic calculations. It is similar to pascal calculating machine but more accurate.

# ***Mechanical Era(1642-1890)***

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**Punched Board system of Joseph Marie Jacquard (1752-1834):** Joseph Marie Jacquard, an engineer of france invented a machine called **Jacquard loom** used in weaving. It was a programmable manufacturing device. It was the first machine that used punched cards which stored information.

# ***Mechanical Era(1642-1890)***

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**Calculating Devices Of Charles Xavier (1785-1870):** In 1820, a scientist of france, Charles Xavier invented a calculating machine that could perform a simple arithmetic calculations such as addition , subtraction, multiplication and division and it is called **Arithmometer.**



# *Mechanical Era(1642-1890)*

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## **Calculating Machines Of Charles Babbage(1791-1871):**

- Difference Engine:** Room sized machine use to calculate logarithms,tables,etc
- Analytical Engine:** Huge size machine as large as house powered by six steam engines. Implemented punched card for input.(problem statement).

# ***Mechanical Era(1642-1890)***

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**Lady Augusta Ada(1816-1852):** First Computer Programmer, also build programs for charles babbage Analytical engine.

# *Electro-mechanical Era (1890-1945)*

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In this era, electricity was used in the operation of computers for the 1st time.

Beads of the abacus were replaced by bits etc.

**Punched Card By Herman Hollerith (1860-1929):** In 1890, an American scientist Herman Hollerith used the idea of punched board system and introduced the punched cards as input media in computer. The computer can read instruction that had been punched into cards. This machine also can perform sorting.

# ***Electro-mechanical Era(1890-1945)***

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**Atanasoff Berry Computer(ABC):** In 1939, Dr. John Atanasoff a professor of Iowa state university and his assistant, Clifford Berry designed an electronic machine to solve mathematical problems hence called ABC. The Boolean Algebra was applied for designing the circuit of this computer. And also Vacuum tubes were used for performing internal logic operations and capacitors used for internal data storage.

# *Electro-mechanical Era (1890-1945)*

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**Boolean Algebra:** Used for internal designing or circuit designing of the computers developed by English Mathematician George Boole in 1847.

# *Electro-mechanical Era(1890-1945)*

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**Mark-1 or ASCC:** In 1944, an American Dr. Howard Aiken, a professor of Harvard University designed first fully automatic calculating Machine. It was named Mark-1. Also known as ASCC(Automatic Sequence Controlled Calculator). Input are given through punched paper tape.

# ***Electronic Era(1946-present)***

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This era begins with the invention of the first real computers. This era is fully driven by electronic devices as components of computer. This era has divided into six generations i.e Zero Gen(Electro-mechanical), First Gen, Second Gen, Third Gen, Fourth Gen and Fifth Gen.

Some of the machines developed under this era are as follows:

**ENIAC(Electronic Numerical Integrator And Calculator)(1943-1946):** it was the first all electronic computer. It was developed in 1943 by J.P Eckert and John Mauchly. ENIAC was programmed by physically connecting electrical wires in the proper order. It can store limited amount of data.

# *Electronic Era (1946-present)*

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**EDVAC(Electronic Discrete Variable Automatic Computer)(1946-1952):** EDVAC was programmed by physically connecting electrical wires in the proper order. The operations of ENIAC was very difficult due to its wiring boards. This problem was overcome by new concept of storage program presented by John Von Neumann gave an idea that computer should have simple fixed, physical structure. This computer uses binary form to store data & instructions for fast execution too.



# *Electronic Era (1946-present)*

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## **EDSAC(Electronic Delayed Storage Automatic Computer)(1947-1949):**

Developed in 1949 at Cambridge University.

**UNIVAC-1(1951):** It stands for Universal Automatic Computer. Developed by J.P. Eckert & John Mauchly (designers of ENIAC). It was the first digital computer where data were fed in this computer through magnetic tape.



*Thank You*

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