COMPUTER

A computer is an electronic device that processes data and performs tasks based on instructions. It consists of hardware components, such as the central processing unit (CPU), memory, and storage devices, and software components, including the operating system and applications.

A computer works in three steps. These are Input, Process, and Output. This process is also known as the IPO Cycle.

- ✛ **Input:-** Input refers to the data and instructions that we enter into the computer.

- ✛ **Input Devices:-** Parts of the computer that give input to it are called input devices. Ex- Keyboard, Mouse, Scanner, Web Camera, Joystick, etc.

- ✛ **Process:-** Processing refers to process or working on data. The CPU works on data. CPU is the processing device of the computer.

- ✛ **Output:-** Output refers to the result.

- ✛ **Output Device:-** Output devices are those that help in getting an output from the computer. Ex- Monitor, Printer, Speaker, plotter, projector, etc.

HARDWARE AND SOFTWARE

Generally, a computer has two main parts – hardware and software.

Computer System = Hardware + Software

HARDWARE:- All the physical parts of the computer that we can touch, feel and see is called computer hardware. Hardware components are also known as computer peripherals. For example, input and output devices, Central Processing Unit, and storage devices.

Hardware = Internal Devices + Peripheral Devices

SOFTWARE:- A program is defined as a sequence of instructions given to a computer to perform a specific task. A software is a set of computer programs that are required for effective running of a computer system.

Software is classified into two main categories- system software and application software.

- ✚ **System Software:-** System software is a collection of programs that are designed to operate hardware and application programs in a computer. We can say that system software controls the operation of a computer system. Ex- Operating System.

Application Software:- An application software is a program that allows users to perform a specific task. Application software may consist of a single program or series of programs to execute even bigger application. Ex- MS Word, MS Excel, Skype, Zoom etc.

OPERATING SYSTEM

An Operating System (OS) is an interface between a computer user and computer hardware. It acts like software that performs all the basic tasks like file management, memory management, process management, handling input and output, and controlling peripheral devices such as disk drives and printers. It is a system software.

Functions of an Operating System

a) Process management
b) Memory management
c) File management
d) Security
e) Command interpretation
f) Input/Output or device management
g) Job Control

Types of Operating System

a) Single-user operating system
b) Multi-user operating system
c) Multiprocessing operating system
d) Real-time operating system
e) Distributed operating
f) Batch operating system

Commonly used operating system

Windows: Developed by Microsoft, widely used for personal computers.

macOS: Developed by Apple, designed for Macintosh computers.

Linux: An open-source OS kernel used in various distributions (distros). Unix: A powerful, multi-user, multitasking OS used in servers and workstations

Components of an Operating System:
- o **Kernel:** The core component, managing system resources. o **User Interface:** Allows interaction between the user and the computer. o **Device Drivers:** Enable communication between the OS and hardware devices.
- o **Utilities:** System management tools for tasks like file management and system diagnostics.

Evolution of Operating Systems:
- o **Batch Processing Systems:** Early systems processed jobs in batches without user interaction.
- o **Time-Sharing Systems:** Introduced interactive computing, allowing multiple users to share the computer simultaneously.
- o **Personal Computer Operating Systems:** Windows, macOS, and Linux adapted for personal use.
- o **Mobile Operating Systems:** iOS, Android, and others designed for smartphones and tablets.

Digital Computers:
- o **Definition:** Digital computers operate using discrete data and the binary number system (0s and 1s).
- o **Processing:** Perform operations by manipulating discrete elements of information, like numbers and symbols.

- o **Examples:** Personal computers, laptops, servers, and most modern computing devices.
- **Analog Computers:**
  - o **Definition:** Analog computers process continuous data using physical quantities like voltage, current, or resistance. o **Processing:** Represent and manipulate information through continuously variable physical quantities.
  - o **Examples:** Analog computers were historically used for scientific and engineering applications, such as simulating physical processes. They have become less common with the rise of digital computing.
- **Hybrid Computers:**
  - o **Definition:** Hybrid computers combine features of both digital and analog computers to optimize processing capabilities.
  - o **Processing:** Use digital and analog components to perform specific tasks efficiently.
  - o **Examples:** Systems that involve both digital and analog signals, like control systems in industrial processes, - time simulations, and certain scientific applications.

TYPES OF COMPUTERS BASED ON SIZE

1. Microcomputer:

	• **Size:**
	• Typically small and designed for individual use.
	• **Characteristics:**
	• Affordable, compact, and suitable for personal or office use.
	• Examples include desktop computers, laptops, tablets, and smartphones.
	• **Purpose:**
	• General-purpose computing for individuals, businesses, and educational institutions.
	• Used for tasks such as word processing, internet browsing, and basic applications.

2. Minicomputer:

	• **Size:**
	• Larger than microcomputers but smaller than mainframes.
	• **Characteristics:**
	• More processing power and storage capacity than microcomputers.
	• Used in mid-sized businesses and research institutions.
	• **Purpose:**
	• Handle more complex tasks and support multiple users simultaneously.
	• Used for scientific simulations, data processing, and business applications.

3. Mainframe Computer:

	• **Size:**
	• Larger than minicomputers.
	• **Characteristics:**
	• High processing power, large memory, and extensive storage capacity.
	• Designed to support multiple users and handle large-scale transactions.
	• **Purpose:**
	• Critical for enterprises, banks, and organizations requiring centralized data processing.
	• Used for tasks such as financial transactions, database management, and large-scale processing.

4. Supercomputer:

- **Size:**
- Can be massive in size and require special facilities.
- **Characteristics:**
- Extremely powerful in terms of processing speed and computational capabilities.
- Often used for scientific research, simulations, and complex calculations.
- **Purpose:**
- Solve complex problems that require massive computational power.
- Applications include weather forecasting, nuclear simulations, and scientific research.

EVOLUTION OF COMPUTER AND DIFFERENT GENERATIONS

1. First Generation (1940-1956): Vacuum Tubes

- **Main Technology:** Vacuum tubes were used for electronic components.
- **Characteristics:**
  - Large, cumbersome machines.
  - High power consumption and heat generation.
  - Limited memory and processing speed.
- **Example Computers:** ENIAC(Electronic Numerical Integrator and Calculator), UNIVAC I(Universal 1). Automatic Computer

2. Second Generation (1956-1963): Transistors

- **Main Technology:** Transistors replaced vacuum tubes, reducing size and power consumption.
- **Characteristics**
  :
  - Smaller, more reliable, and faster than first-generation computers.
  - Assembly language and early high-level programming languages introduced.
- **Example Computers:** IBM 1401, UNIVAC 1108.

3. Third Generation (1964-1971): Integrated Circuits

- **Main Technology:** Integrated circuits (ICs) replaced discrete transistors, leading to increased speed and efficiency.
- **Characteristics**
  :
  - Smaller size, reduced cost, and improved performance.
  - Introduction of operating systems and multiprogramming.
- **Example Computers:** IBM System/360, DEC PDP-11.

4. Fourth Generation (1971- Present): Microprocessors

- **Main Technology:** Microprocessors, combining CPU functions on a single chip.
- **Characteristics**
  :

- • Personal computers emerged, making computing accessible to individuals.
  - • Rise of microcomputers and home computing.
- • **Example Computers:** Apple II, IBM PC.

5. Fifth Generation (Present and Beyond): VLSI and Beyond

- • **Main Technology:** Ultra Large Scale Integration (ULSI) and Artificial Intelligence(AI).
- • **Characteristics:**
- • High-speed, powerful computers with advanced capabilities.
  - • Parallel processing, artificial intelligence, and graphical user interfaces.
- • **Example Computers:** IBM Deep Blue (for AI), modern desktops/laptops.

DIFFERENT TYPES OF NUMBER SYSTEM

1. **Decimal Number System (Base-10):**
   - • **Definition:** The most common number system, using 10 digits (0-9).
   - • **Example:** 5489
2. **Binary Number System (Base-2):**
   - • **Definition:** Uses only two digits, 0 and 1.
   - • **Example:** 1101 (in binary) = 13 (in decimal)
3. **Octal Number System (Base-8):**
   - • **Definition:** Uses eight digits (0-7).
   - • **Example:** 235 (in octal) = 157 (in decimal)
4. **Hexadecimal Number System (Base-16):**
   - • **Definition:** Uses 16 digits (0-9 and A-F where A=10, B=11, ..., F=15).
   - • **Example:** 1A3 (in hexadecimal) = 419 (in decimal)

WHAT IS NETWORK AND ITS TYPES?

A computer network is a connection of resources and computer systems which may be within a office or at a long distance. The main purpose behind this connectivity is to share data and resources.

Node:- A node is any computer which is connected to the network.

TYPES OF COMPUTER NETWORKS

- • **Personal Area Network (PAN):**
  - • **Scope:** Small, typically within an individual's workspace.
  - • **Example:** Bluetooth connections between devices.
- • **Local Area Network (LAN):**
  - • **Scope:** Limited geographic area, like a single building or campus.
  - • **Example:** Office or school networks.
- • **Metropolitan Area Network (MAN):**
  - • **Scope:** Covers a larger geographic area, like a city.
  - • **Example:** Municipal networks connecting multiple LANs.
- • **Wide Area Network (WAN):**
  - • **Scope:** Spans a large geographic area, possibly a country or continent.
  - • **Example:** Internet, connecting multiple MANs or LANs

TOPOLOGY AND ITS TYPES

Topology:- The term topology refers to the different formats of the arrangement of computer in a network. It is configuration of cables, computers, and other peripherals.

- **Bus Topology:**
  - Devices share a common communication line.
  - Simple, but can be slow and problematic with heavy traffic.
- **Star Topology:**
  - Devices connect to a central hub or switch.
  - Reliable but depends on the central point.
- **Ring Topology:**
  - Devices form a closed loop.
  - Data travels in one direction, efficient but can be disrupted if one device fails.
- **Mesh Topology:**
  - Devices are interconnected, providing multiple paths.
  - Highly reliable but complex and expensive.
- **Tree Topology:**
  - Relates to the connectivity of machines in a hierarchical manner.
  - Hybrid topology combining elements of star and bus topologies.
  - Scalable for network expansion and centralized control enhances reliability.
- **Hybrid Topology:**
  - Combination of two or more topologies.
  - Offers flexibility and scalability.

INTERNET, INTRANET, AND EXTRANET

Internet:

The Internet is a global network of interconnected computers and networks, allowing
tion and information exchange worldwide.

Intranet:

An intranet is a private network within an organization, using internet technologies for internal
ion and collaboration.

- **Characteristics:**
- Restricted access to employees or members.
- Commonly includes internal websites, file sharing, and communication tools.
- **Use Cases:**
- Internal document sharing, employee communication, project collaboration.

Extranet:

An extranet is an extension of an intranet, allowing limited access to external users, such as
ners, or suppliers.

- **Characteristics:**
  - Controlled access to specific external users.
  - Enables collaboration beyond oanizational boundarie.
- **Use Cases:**
  - Shared project spaces with external partners, and client access to specific information.

What are IP and MAC Address, DNS, and Protocols that are used over the Internet?

IP Address (Internet Protocol Address):

device participating in a computer network that us An IP address is a numerical label assigned to each communication.

- **Types:**
- **IPv4 (Internet Protocol version 4):** The most widely used addressing scheme, expressed as four sets of numbers separated by dots (e.g., 192.168.0.1).
- **IPv6 (Internet Protocol version 6):** Developed to address the exhaustion of IPv4 addresses, expressed as eight groups of hexadecimal numbers (e.g., 2001:0db8:85a3:0000:0000:8a2e:0370:7334).

MAC Address (Media Access Control Address):
A MAC address is a unique identifier assigned

to a network interface controller (NIC) for use as a network ad

- **Format:** Expressed as six groups of two hexadecimal digits, separated by colons (e.g.,

  00:1A:2B:3C:4D:5E).

DNS (Domain Name System):
DNS is a hierarchical decentralized naming system for computers, d to the Internet or a private network.

- **Function:** Translates user-friendly domain names www.example.com) into IP addresses that (like
  puters use to identify each other on the s corresponding IP a
- **Example:** network.
  172.217.3.206). Resolving the domain www.google.com '

Internet Protocols:

1. **HTTP (Hypertext Transfer Protocol):**
   - **Function:** Used for transferring hypertext (web) documents on the World Wide Web.
   - **Example:** http://www.example.com
2. **HTTPS (Hypertext Transfer Protocol Secure):**
   - **Function:** Secured version of HTTP, encrypting data for secure communication.
   - **Example:** https://www.example.com 3. **FTP (File Transfer Protocol):**
   - **Function:** Used to transfer files between computers on a network.
   - **Example:** ftp://ftp.example.com
4. **SMTP (Simple Mail Transfer Protocol):**
   - **Function:** Handles the sending of emails.
   - **Example:** Used when sending an email.
5. **POP3 (Post Office Protocol version 3):**
   - **Function:** Retrieves emails from a server.
   - **Example:** Used when receiving emails.
6. **IMAP (Internet Message Access Protocol):**

- **Function:** Similar to POP3 but allows multiple devices to manage the same mailbox.
- **Example:** Used for accessing and managing emails on a mail server.

7. **TCP/IP (Transmission Control Protocol/Internet Protocol):**
   - **Function:** The fundamental suite of protocols governing the Internet.
   - **Example:** Includes protocols like TCP, IP, ICMP, and more.

8. **UDP (User Datagram Protocol):**
   - **Function:** Provides a connectionless and lightweight communication method.
   - **Example:** Used in real-time applications like online gaming and streaming.

These components work together to ensure smooth communication and data transfer over the internet.