HeMantra EduTech

Computer Awareness

Introduction of Computer

Functioning of a Computer

A computer operates on the **Input-Process-Output** model:

- **Input**: Data is entered via input devices (keyboard, mouse).
- **Processing**: CPU processes the data using arithmetic and logical operations.
- **Storage**: Temporary (RAM) and permanent (HDD/SSD) storage.
- **Output**: Processed data is displayed (monitor, printer).
- **Feedback**: The user may provide further input based on the output.

Features of a Computer

- **Speed**: Processes millions of instructions per second.
- **Automation**: Performs tasks without manual intervention.
- **Accuracy**: Minimal errors unless input is incorrect.
- **Versatility**: Can perform multiple tasks simultaneously.
- **Storage**: Large memory for storing vast amounts of data.
- **Connectivity**: Can connect to networks and the internet.

History of Computers

- **Ancient Calculators**: Abacus, Pascal's calculator.
- **Mechanical Computers**: Charles Babbage's Analytical Engine (1837).
- **First Electronic Computer**: ENIAC (1945).
- **Modern Computers**: Transition from vacuum tubes to microprocessors.

Generations of Computers

1. **First Generation (1940-1956)**: Used vacuum tubes, slow and bulky (e.g., ENIAC).
2. **Second Generation (1956-1963)**: Used transistors, smaller and faster.
3. **Third Generation (1964-1971)**: Used ICs (Integrated Circuits), improved efficiency.
4. **Fourth Generation (1971-Present)**: Microprocessors, personal computers emerged.
5. **Fifth Generation (Future)**: AI, quantum computing advancements.

Classification of Computers

- **Based on Size**: Supercomputer, Mainframe, Minicomputer, Microcomputer.
- **Based on Purpose**: General-purpose (PCs, laptops) & Special-purpose (ATMs, medical devices).
- **Based on Processing**: Analog, Digital, Hybrid computers.

Special-Purpose Computers

Designed for specific tasks such as:

- **ATM Machines**: Banking transactions.
- **Embedded Systems**: In cars, microwaves, medical devices.
- **Supercomputers**: Weather forecasting, scientific simulations.

Applications of Computers

- **Government & Administration**: E-governance, record-keeping.
- **Education**: Online learning, research.
- **Banking**: Digital transactions, ATMs.
- **Healthcare**: Patient records, diagnostics.
- **Communication**: Emails, social media.
- **Business**: Data management, automation.
- **Entertainment**: Gaming, streaming.

Computer Architecture

Input Unit

- Devices that send data to the computer for processing.
- Examples: **Keyboard, Mouse, Scanner, Microphone, Touchscreen**.

Output Unit

- Displays or delivers processed data to the user.
- Examples: **Monitor, Printer, Speakers, Projector**.

Central Processing Unit (CPU)

- The **brain of the computer** that executes instructions.
- Consists of:
    - **Arithmetic Logic Unit (ALU)**
    - **Control Unit (CU)**
    - **Memory Unit**

Arithmetic Logic Unit (ALU)

- Performs **arithmetic operations** (addition, subtraction, multiplication, division).
- Handles **logical operations** (comparisons, decision-making).

Control Unit (CU)

- **Directs operations** of the computer by managing data flow.
- Fetches, decodes, and executes instructions.

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The _____ interprets and carries out the basic instructions that operate the computer.

(a) CPU

(b) Operating System

(c) Memory

(d) Hard Disk

Memory Unit

- **Stores data and instructions** temporarily or permanently.
- Types:
    - **Primary Memory**: RAM (temporary storage), ROM (permanent storage).
    - **Secondary Memory**: HDD, SSD, USB.
    - **Cache Memory**: High-speed memory for quick access.

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Which one of the following options lists all secondary storage devices?

(a) RAM, ROM, CD-ROM

(b) Cache, ROM, CD-ROM

(c) Hard Disk, Pendrive, CD-ROM

(d) Hard Disk, Cache, RAM

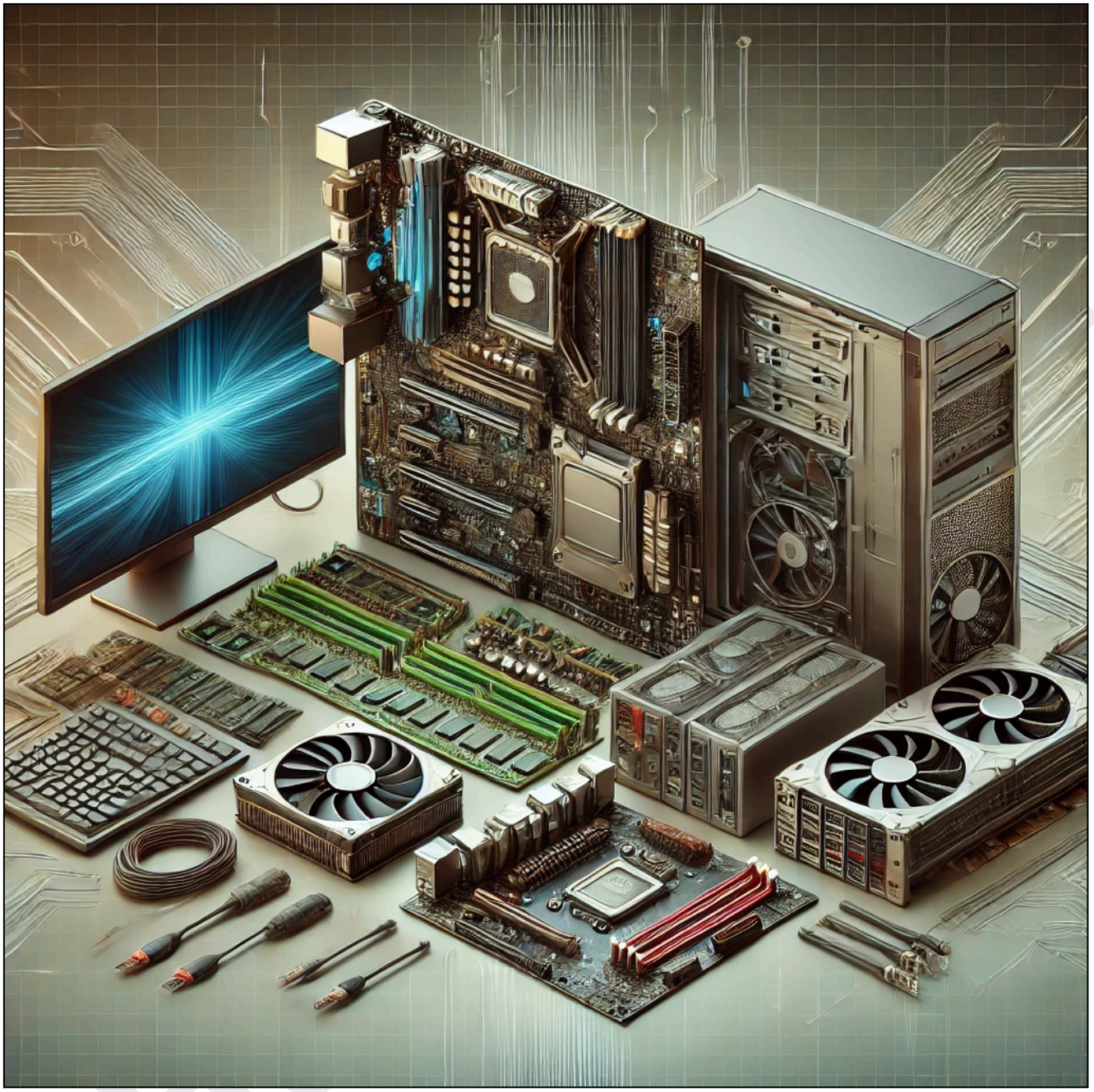
Motherboard

- **Main circuit board** connecting all components.
- Houses **CPU, RAM, storage, expansion slots, ports**.

Interconnection of Units

- **Bus System**: Transfers data between components.
    - **Data Bus**: Moves actual data.
    - **Address Bus**: Carries location addresses.
    - **Control Bus**: Manages signals for operations.
- **Communication between CPU, memory, and I/O devices** ensures smooth functioning.

Computer Hardware



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Physical parts of a computer are called _____ of the computer system.

(a) Operating System (b) Software

(c) Hardware (d) Files

Input Devices

- Input devices allow users to enter data and commands into a computer for processing.

Types of Input Devices:

Keyboard-Based Input

- **Keyboard**: Standard input device with alphanumeric keys, function keys, and control keys.

Pointing Devices

- **Mouse**: Controls cursor movement, has left & right buttons for selection.
- **Touchpad**: Used in laptops as a mouse alternative.
- **Joystick**: Used in gaming and simulations.
- **Trackball**: A stationary device with a rolling ball, often used in specialized applications.

Scanning & Imaging Devices

- **Scanner**: Converts physical documents into digital format.
- **Barcode Reader**: Reads barcodes to identify products (used in supermarkets).
- **QR Code Scanner**: Scans Quick Response (QR) codes for information access.
- **Optical Mark Reader (OMR)**: Reads marked answers in exams.
- **Optical Character Recognition (OCR)**: Converts printed text into digital text.
- **Magnetic Ink Character Recognition (MICR)**: Used in banking for processing cheques.

Audio & Video Input Devices

- **Microphone**: Captures audio input for recording or voice commands.
- **Webcam**: Captures video for video calls and streaming.

E. Touch & Biometric Devices

- **Touchscreen**: Combines input and display (used in smartphones, ATMs).
- **Biometric Devices**: Fingerprint scanner, iris scanner, face recognition for security authentication.

Output Devices

Output devices display or produce the processed data from a computer.

Types of Output Devices:

Visual Output Devices

- **Monitor (Display Screen)**: Displays visual information.
    - **CRT (Cathode Ray Tube)**: Older bulky monitors.
    - **LCD (Liquid Crystal Display)**: Thin, energy-efficient screens.
    - **LED (Light Emitting Diode)**: Improved version of LCD with better clarity.
    - **OLED (Organic LED)**: High-quality display used in premium devices.
- **Projector**: Displays content on a large screen for presentations.

Print Output Devices

- **Printer**: Converts digital documents into physical form.
    - **Impact Printers**: Dot Matrix Printer (slow, used for receipts).
    - **Non-Impact Printers**: Inkjet Printer (for home use), Laser Printer (fast, for offices).
- **Plotter**: Prints large-scale images like engineering drawings.

Audio Output Devices

- **Speakers**: Produce sound output from the computer.
- **Headphones**: Personal audio output.

Tactile & Other Output Devices

- **Braille Display**: Converts text to Braille for visually impaired users.
- **Haptic Devices**: Provide vibration feedback (used in gaming controllers, VR devices).

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Which of the following devices is NOT an Input device?

(a) Keyboard

(b) Scanner

(c) Printer

(d) Joystick

Computer Memory

Memory Hierarchy

Computer memory is organized in a hierarchy based on speed, cost, and capacity:

1. **Registers** – Fastest, inside CPU, stores temporary data.
2. **Cache Memory** – Stores frequently used data for quick access.It is a storage buffer that stores the data which is used more often, temporarily and makes, them available to CPU at a fast rate. Cache memory is a very high speed memory placed in between RAM and CPU. It increases the speed of processing. Cache memory is very expensive, so it is smaller in size. Generally, computers have cache memory of sizes 256 KB to 2 MB.
3. **Primary Memory (RAM, ROM)** – Main working memory for processing.
4. **Secondary Storage (HDD, SSD, CD)** – Stores data permanently.
5. **Tertiary Storage (CD, DVD, Tape)** – Used for backup and archival.

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Which of the following statements is correct?

1. Cache memory is used for storing data and instructions used during program execution.

2. Program and data files are not required immediately by the computer system which are stored on the hard disk.

3. Program and data files rarely required are stored in RAM.

Choose the correct answer from the options given below:

(a) Only (a) is true

(b) Only (b) is true

(c) Only (b) and (c) are true

(d) Only (a) and (b) are true

Parameters of Memory

- **Speed**: Access time (lower is better).
- **Capacity**: Amount of data it can store.
- **Cost**: Higher speed = more expensive.
- **Volatility**: Determines if data is retained after power loss.

Types of Memory

Primary Memory (Volatile Memory)

- **RAM (Random Access Memory)**: Temporary memory, loses data on power loss.
  - **SRAM (Static RAM)**: Faster but expensive, used in cache.
  - **DRAM (Dynamic RAM)**: Slower but cheaper, used as main memory.
- **ROM (Read-Only Memory)**: Permanent memory storing system firmware.
  - **PROM, EPROM, EEPROM** – Programmable ROM types.

Secondary Memory (Non-Volatile Storage)

- **Hard Disk Drive (HDD)**: Mechanical storage, large capacity.
- **Solid State Drive (SSD)**: Faster, no moving parts, used in modern computers.
- **USB Flash Drive**: Portable storage.
- **Memory Card (SD Card)**: Used in phones, cameras.

Tertiary & External Storage

- **CD/DVD/Blu-ray**: Optical storage for media and backup.
- **Magnetic Tape**: Used for large-scale backups.

Basic Units of Memory Measurement

1. **Bit** – Smallest unit (0 or 1).
2. **Nibble** – 4 bits.
3. **Byte** – 8 bits (stores one character).
4. **Kilobyte (KB)** – 1024 Bytes.
5. **Megabyte (MB)** – 1024 KB.
6. **Gigabyte (GB)** – 1024 MB.
7. **Terabyte (TB)** – 1024 GB.
8. **Petabyte (PB)** – 1024 TB.

Data Representation

Number System

- A number system represents numerical values using a set of symbols (digits). It is the foundation of computer operations.

Types of Number Systems:

1. **Decimal (Base 10)** – Uses digits 0-9 (e.g., 123, 456).
2. **Binary (Base 2)** – Uses digits 0 & 1, fundamental for computers (e.g., 1010_2).
3. **Octal (Base 8)** – Uses digits 0-7, often used in computing (e.g., 25_8).
4. **Hexadecimal (Base 16)** – Uses digits 0-9 and letters A-F (e.g., $3F_{16}$).

Definition of Binary Number System

- The **Binary System (Base-2)** consists of **only two digits: 0 and 1**.
- Computers store and process all data in **binary form**.
- Example:
    - Decimal 10 = **1010_2** in Binary.
    - Binary 1101_2 = **13_{10}** in Decimal.

Conversions:

- **Decimal to Binary**: Divide by 2 and write remainders in reverse.
- **Binary to Decimal**: Multiply each digit by 2^n (position value).

Computer Code (Data Representation)

Computers use codes to store and process data:

1. **ASCII (American Standard Code for Information Interchange)** – 7-bit code, represents characters (e.g., 'A' = 65).
2. **Unicode** – Supports multiple languages, 16-bit or more.
3. **BCD (Binary-Coded Decimal)** – Stores decimal numbers in binary.
4. **EBCDIC (Extended Binary Coded Decimal Interchange Code)** – Used in IBM systems.

Logic Gates

Logic gates are **electronic circuits** that perform Boolean operations (AND, OR, NOT).

Basic Logic Gates:

1. **AND Gate** – Outputs **1** only if both inputs are **1**.
   - **Truth Table:**

A	B	Output (A AND B)
0	0	0
0	1	0
1	0	0
1	1	1

2. **OR Gate** – Outputs **1** if at least one input is **1**.
   - **Truth Table:**

A	B	Output (A OR B)
0	0	0
0	1	1
1	0	1
1	1	1

3. **NOT Gate** – Inverts the input (0 → 1, 1 → 0).
   - **Truth Table:**

A	Output (NOT A)

0	1
1	0

Universal Gates:

- **NAND Gate** – Combination of AND + NOT (output is opposite of AND).
- **NOR Gate** – Combination of OR + NOT (output is opposite of OR).

Computer Software

Computer Software

- A set of **instructions** that tells a computer how to perform tasks.
- Software is **intangible** and works with hardware to execute programs.

Types of Software

System Software

- Controls and manages computer hardware.
- Examples: **Operating System, Utility Software, Firmware**.

Application Software

- Designed for specific user tasks.
- Examples: **MS Office, Web Browsers, Media Players**.

Specific Purpose Software

- Designed for specialized tasks.
- Examples:
    - **Banking Software** (Core Banking Solutions).
    - **Payroll Software** (Salary Processing).
    - **Inventory Management Software** (Stock Control).

Application Software

- **General-Purpose Software**: Used by multiple users for different tasks (MS Word, Excel).
- **Customized Software**: Designed for a specific user or organization (ERP, HRMS).
- **Mobile Applications**: Apps for smartphones (WhatsApp, Google Maps).

System Utilities (Utility Software)

- Enhances computer performance and ensures smooth functioning.
- **Examples:**
    - **Antivirus Software** – Protects from malware (Windows Defender, Quick Heal).
    - **Disk Cleanup** – Frees up storage space.
    - **File Compression** – Reduces file size (WinRAR, 7-Zip).
    - **Backup Software** – Creates data backups (Google Drive, OneDrive).

Operating System

Operating System (OS)

- A **system software** that manages hardware and software resources.
- Acts as an **interface** between the user and computer.

Functions of Operating System

1. **Process Management** – Controls execution of programs.
2. **Memory Management** – Allocates and deallocates memory.
3. **File System Management** – Organizes and manages files.
4. **Device Management** – Controls hardware devices (printers, keyboards).
5. **Security & Access Control** – Protects data using authentication.
6. **User Interface** – Provides interaction methods (GUI/CLI).

Types of Operating System

1. **Single-User OS** – Used on personal computers (Windows, macOS).
2. **Multi-User OS** – Allows multiple users to access the system (Unix, Linux).
3. **Real-Time OS (RTOS)** – Used in critical applications (aircraft, medical devices).
4. **Distributed OS** – Manages multiple computers as one system.
5. **Embedded OS** – Used in dedicated devices (ATMs, Smart TVs).
6. **Network OS** – Manages network resources (Windows Server, Linux Server).

User Interface

- **Graphical User Interface (GUI)** – Uses icons and windows (Windows, macOS).
- **Command-Line Interface (CLI)** – Uses text commands (MS-DOS, Linux Terminal).

Mobile Operating System

- Designed for smartphones and tablets.
- Examples: **Android, iOS, Windows Mobile**.
- Provides **touch-based interface** and app support.

Microsoft Disk Operating System (MS-DOS)

- **CLI-based OS** developed by Microsoft (1981).
- Used in early computers before Windows.
- Commands:
    - DIR – Displays files and folders.
    - COPY – Copies files.
    - DEL – Deletes files.

Programming concepts

Programming Concepts

- A **program** is a set of **instructions** given to a computer to perform a task.
- Programming follows **logic and syntax** to develop applications.
- Involves concepts like **variables, loops, conditions, functions, and data structures**.

Programming Languages

Languages used to write computer programs are categorized as:

Low-Level Language

- **Machine Language (1st Gen)** – Binary code (0s and 1s), difficult to write.
- **Assembly Language (2nd Gen)** – Uses mnemonics (MOV, ADD), requires an assembler.

Medium-Level Language

- Also called **"Middle-Level Language"**, combines features of low and high-level languages.
- Example: **C language** (used in system programming).

High-Level Language (HLL)

- **User-friendly** with English-like syntax (Python, Java, C++).
- Requires a **compiler/interpreter** for execution.

Terms Related to Programming

- **Variable** – Stores data (e.g., int age = 25;).
- **Loop** – Repeats instructions (for, while).
- **Condition** – Executes code based on a condition (if-else).
- **Function** – A reusable block of code.
- **Array** – Stores multiple values in a single variable.

Language Translator

Converts high-level code into machine language:

- **Compiler** – Translates entire code at once (C, Java).
- **Interpreter** – Translates and executes line-by-line (Python).
- **Assembler** – Converts assembly language to machine code.

Generation of Languages

1. **1st Generation (Machine Language)** – Binary code (0s & 1s).
2. **2nd Generation (Assembly Language)** – Uses mnemonics.
3. **3rd Generation (High-Level Language)** – Human-readable (C, Java).
4. **4th Generation (4GLs)** – Used in databases (SQL).
5. **5th Generation (5GLs)** – AI-based languages (Prolog, LISP).

Types of Errors in Programming

- **Syntax Error** – Due to incorrect grammar (e.g., missing semicolon).
- **Logical Error** – Incorrect logic, produces wrong output.
- **Runtime Error** – Occurs during execution (e.g., division by zero).

Algorithm

- **Step-by-step procedure** to solve a problem.
- **Example:** Algorithm to add two numbers:
    1. Start
    2. Input two numbers
    3. Add the numbers
    4. Display the sum
    5. Stop

Microsoft Windows

Microsoft Windows

- Microsoft Windows is a **Graphical User Interface (GUI)-based Operating System** developed by **Microsoft Corporation**.
- It provides **multi-tasking, security, and user-friendly interface** for personal and business use.
- The first version, **Windows 1.0**, was released in **1985**.

Versions of Microsoft Windows

Early Versions:

- **Windows 1.0 (1985)** – First GUI-based OS.
- **Windows 3.0 (1990)** – Introduced icons and better graphics.
- **Windows 95 (1995)** – First with the **Start Menu** and **Taskbar**.

Modern Versions:

- **Windows XP (2001)** – User-friendly, stable, and widely used.
- **Windows 7 (2009)** – Improved performance, new taskbar.
- **Windows 8 (2012)** – Introduced Start Screen with tiles.
- **Windows 10 (2015)** – Unified OS with Cortana, virtual desktops.
- **Windows 11 (2021)** – Redesigned UI, better multitasking, new Start Menu.

Desktop in Windows

- The **desktop** is the **main screen** that appears after logging in.
- It contains **icons, taskbar, start menu**, and other graphical elements.

Icons of Desktop

- **Icons** are small graphical representations of programs, files, or functions.
- **Common Desktop Icons:**
    - **My Computer (This PC)** – Access to storage drives and system files.
    - **Recycle Bin** – Stores deleted files temporarily.
    - **Network** – Displays connected networks.
    - **Shortcut Icons** – Quick access to software (e.g., MS Word).

Taskbar

- The **taskbar** is a horizontal bar at the bottom of the screen.
- **Components of Taskbar:**
    - **Start Button** – Opens the Start Menu.
    - **Search Bar** – Helps find files, apps, and settings.
    - **Quick Launch Icons** – Shortcuts to pinned programs.
    - **System Tray** – Shows date, time, volume, and notifications.

Start Menu

- Provides **access to installed programs, settings, and power options**.
- Includes:

- **All Programs** – List of installed applications.
- **Search Bar** – Quick search for apps and files.
- **Power Options** – Sleep, restart, shutdown.

Title Bar

- Found at the **top of every open window**.
- Displays the **name of the open application or file**.
- Has **Minimize, Maximize, and Close** buttons.

Scroll Bar

- Used to navigate vertically or horizontally in a window.
- Found in **browsers, documents, and file explorers**.

Menu Bar

- Located below the **title bar** in some applications.
- Contains **drop-down menus** like **File, Edit, View, Tools, Help**.
- Common in programs like **Notepad, MS Word**.

Dialog Box

- A **pop-up window** that appears when the system requires input or displays information.
- **Examples:**
  - Save As / Open File Dialog
  - Print Dialog Box
  - Error/Warning Messages

Main Programs Inside Windows

- **Microsoft Paint** – Basic image editing tool.
- **Notepad** – Simple text editor.
- **WordPad** – Advanced text editor with formatting options.
- **Windows Explorer (File Explorer)** – Manages files and folders.
- **Control Panel** – Manages system settings.
- **Command Prompt** – Text-based interface for system commands.

Extension Names of Files

File extensions indicate **file type** and associated programs.

File Type	Extension	Associated Program
Text File	.txt	Notepad, WordPad
Document	.docx, .pdf	MS Word, Adobe Reader
Image	.jpg, .png	MS Paint, Photoshop
Video	.mp4, .avi	VLC Media Player
Audio	.mp3, .wav	Windows Media Player
Spreadsheet	.xls, .xlsx	MS Excel
Executable File	.exe	Runs programs
Compressed File	.zip, .rar	WinRAR, 7-Zip

General Windows Shortcuts

Shortcut Key	Function
Ctrl + C	Copy selected item/text
Ctrl + X	Cut selected item/text
Ctrl + V	Paste copied/cut item
Ctrl + Z	Undo last action
Ctrl + Y	Redo last action
Ctrl + A	Select all items in a window/document
Ctrl + P	Print the current document
Alt + Tab	Switch between open applications
Alt + F4	Close the active window or program
Windows + D	Show desktop (Minimize all windows)
Windows + L	Lock the computer

File Explorer Shortcuts

Shortcut Key	Function
Windows + E	Open File Explorer
Ctrl + N	Open a new File Explorer window
Ctrl + Shift + N	Create a new folder
Alt + Enter	Open Properties of selected file/folder
F2	Rename selected file/folder
F5	Refresh the current window
Delete	Move file to Recycle Bin
Shift + Delete	Permanently delete file (bypasses Recycle Bin)

Taskbar and Window Management

Shortcut Key	Function
Windows + Tab	Open Task View (show all open windows)
Windows + ↑	Maximize active window
Windows + ↓	Minimize active window
Windows + ←	Snap window to the left
Windows + →	Snap window to the right
Windows + Shift + ←/→	Move window between multiple monitors
Windows + Number (1-9)	Open app pinned on the taskbar (position-wise)

Run Command & System Shortcuts

Shortcut Key	Function
Windows + R	Open **Run** dialog box
Windows + S	Open **Search** bar
Windows + I	Open **Settings**
Windows + Pause	Open **System Properties**
Windows + U	Open **Ease of Access Center**
Windows + P	Open **Project (Display options for external screen)**
Windows + X	Open **Quick Access Menu (Power User Menu)**

Text Editing and Document Shortcuts

Shortcut Key	Function
Ctrl + B	Bold text (in Word, Notepad, etc.)
Ctrl + I	Italicize text
Ctrl + U	Underline text
Ctrl + S	Save document
Ctrl + O	Open document
Ctrl + F	Find text in document/browser
Ctrl + H	Replace text in document

Browser Shortcuts (Chrome, Edge, Firefox, etc.)

Shortcut Key	Function
Ctrl + T	Open new tab
Ctrl + W	Close current tab
Ctrl + Shift + T	Reopen last closed tab
Ctrl + L	Select address bar
Ctrl + D	Bookmark current page
Ctrl + J	Open downloads page
Ctrl + H	Open browser history

Command Prompt Shortcuts

Shortcut Key	Function
Ctrl + C	Copy selected text
Ctrl + V	Paste text
Up Arrow	Recall previous command
Ctrl + A	Select all text in command prompt
Alt + Enter	Toggle full-screen mode

Microsoft Office

- A suite of productivity software developed by **Microsoft**.
- Includes **Word, Excel, PowerPoint, Access, Outlook, and more**.
- Used for **document creation, data management, presentations, and emails**.

Microsoft Word

- A word processing application used for **creating, editing, formatting, and printing documents**.

Features of Microsoft Word

- **Text Formatting** – Font, size, color, bold, italics, underline.
- **Page Layout** – Margins, orientation, columns, borders.
- **Table Creation** – Insert, modify, and format tables.
- **Spell Check & Grammar** – Auto-correction feature.
- **Mail Merge** – For mass mailings.
- **Header & Footer** – Add document titles and page numbers.

Shortcut Keys in Microsoft Word

Shortcut Key	Function
Ctrl + N	Create a new document
Ctrl + O	Open an existing document
Ctrl + S	Save document
Ctrl + P	Print document
Ctrl + C	Copy text
Ctrl + X	Cut text
Ctrl + V	Paste text
Ctrl + B	Bold text
Ctrl + I	Italicize text

Ctrl + U	Underline text
Ctrl + Z	Undo last action
Ctrl + Y	Redo last action
Ctrl + A	Select all text

Microsoft Excel

- A **spreadsheet program** used for **data analysis, calculations, and chart creation**.

Components of Microsoft Excel

- **Workbook** – A file containing multiple sheets.
- **Worksheet** – A grid of rows and columns for data entry.
- **Cell** – An intersection of a row and a column (e.g., A1).
- **Formula Bar** – Displays the formula used in a selected cell.
- **Ribbon** – Contains commands grouped under different tabs.

Functions of Microsoft Excel

- **Mathematical Functions** – SUM(), AVERAGE(), ROUND().
- **Logical Functions** – IF(), AND(), OR().
- **Lookup Functions** – VLOOKUP(), HLOOKUP().
- **Text Functions** – LEFT(), RIGHT(), CONCATENATE().
- **Date & Time Functions** – TODAY(), NOW().

Basics of Spreadsheet

- **Rows** – Horizontal lines (1, 2, 3...).
- **Columns** – Vertical lines (A, B, C...).
- **Cell Address** – Defined by column and row (e.g., B2).
- **Formulas** – Begin with = (e.g., =A1+B1).

Types of Charts in Excel

- **Column Chart** – Compare data across categories.
- **Line Chart** – Show trends over time.
- **Pie Chart** – Represent proportions.
- **Bar Chart** – Horizontal bars for comparisons.
- **Scatter Chart** – Display relationships between values.

Shortcut Keys in Microsoft Excel

Shortcut Key	Function
Ctrl + N	Create a new workbook
Ctrl + O	Open an existing workbook
Ctrl + S	Save workbook
Ctrl + P	Print workbook
Ctrl + C	Copy selected data
Ctrl + X	Cut selected data
Ctrl + V	Paste copied/cut data
Ctrl + Z	Undo last action
Ctrl + Y	Redo last action
Ctrl + A	Select all data
Ctrl + F	Find data
F2	Edit selected cell
Alt + =	AutoSum function

Microsoft PowerPoint

- A **presentation software** used to create **slideshows with text, images, animations, and videos**.

Shortcut Keys in Microsoft PowerPoint

Shortcut Key	Function
Ctrl + N	Create a new presentation
Ctrl + O	Open an existing presentation
Ctrl + S	Save presentation
Ctrl + P	Print presentation
Ctrl + M	Insert a new slide
Ctrl + C	Copy slide/text/object
Ctrl + X	Cut slide/text/object
Ctrl + V	Paste copied/cut item
Ctrl + Z	Undo last action
Ctrl + Y	Redo last action
F5	Start slide show from the beginning
Shift + F5	Start slide show from the current slide

Microsoft Access

- **A database management system (DBMS)** used to store, manage, and retrieve structured data.

Shortcut Keys in Microsoft Access

Shortcut Key	Function
Ctrl + N	Create a new database
Ctrl + O	Open an existing database
Ctrl + S	Save database object
Ctrl + P	Print database object
Ctrl + C	Copy record
Ctrl + X	Cut record
Ctrl + V	Paste record
Ctrl + Z	Undo last action
Ctrl + A	Select all records
F2	Edit the selected field

Microsoft Outlook

- A personal information manager used for **emails, calendars, contacts, and tasks**.

Features of Microsoft Outlook

- **Email Management** – Send, receive, and organize emails.
- **Calendar** – Schedule and manage appointments.
- **Contacts** – Store and manage contact details.
- **Task Manager** – Set and track tasks.
- **Integration** – Sync with Microsoft Teams and SharePoint.

Database Concept

Database Concept

- A **database** is a **structured collection of data** stored electronically.
- Used to **store, retrieve, manage, and manipulate** data efficiently.
- Example: Bank records, student data, inventory management.

Fundamentals of Database

- **Data**: Raw facts and figures (e.g., Name, Age).
- **Information**: Processed data that makes sense.
- **Database System**: Combination of data and software to manage it.
- **Database Management System (DBMS)**: Software used to create and manage databases.

Types of Database

- **Hierarchical Database**: Data stored in a tree-like structure.
- **Network Database**: Data has multiple parent-child relationships.
- **Relational Database (RDBMS)**: Data stored in tables with relationships.
- **Object-Oriented Database**: Stores data in the form of objects.
- **Distributed Database**: Data stored across multiple locations.

Components of Database

- **Data** – The actual information stored.
- **Hardware** – Physical devices (servers, storage).
- **Software** – DBMS, operating system.
- **Users** – Database administrators, developers, end-users.
- **Procedures** – Rules for database operation.

Database Management System (DBMS)

- A **software** that manages and controls access to databases.
- Examples: **MySQL, Oracle, SQL Server, PostgreSQL**.

Architecture of DBMS

- **1-Tier Architecture**: User interacts directly with the database.
- **2-Tier Architecture**: Client-Server model (User ↔ Server).
- **3-Tier Architecture**: Client ↔ Application Server ↔ Database Server.

Advantages of DBMS

✔ **Data Consistency** – Reduces redundancy.
✔ **Data Security** – Controlled access.
✔ **Backup & Recovery** – Prevents data loss.
✔ **Multi-user Access** – Multiple users can access data.
✔ **Data Integrity** – Ensures accuracy of data.

Disadvantages of DBMS

- **Complex Setup** – Requires technical expertise.
- **High Cost** – Expensive software and maintenance.
- **Performance Issues** – Large databases require powerful hardware.
- **Security Risks** – If hacked, data can be lost or misused.

Applications of DBMS

- **Banking** – Customer accounts, transactions.
- **E-commerce** – Product catalogs, orders.
- **Healthcare** – Patient records, hospital management.
- **Education** – Student records, results.
- **Government** – Aadhaar, tax records.

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Unauthorized access to a bank account for carrying online transactions is an example of _____.

(a) Phishing (b) Intellectual property theft

(c) Virus attack (d) Hacking

Relational Database (RDBMS)

- Stores data in **tables (relations)**.
- **Uses SQL** (Structured Query Language) for querying data.
- **Example**: MySQL, Oracle, SQL Server.

Terms Related to Database

- **Table** – Collection of rows and columns.
- **Row (Tuple)** – Single record in a table.
- **Column (Attribute)** – Single field in a table.
- **Schema** – Structure of a database.
- **Index** – Speeds up search operations.

Keys in Database

- **Primary Key** – Uniquely identifies a record (e.g., Student ID).
- **Foreign Key** – Establishes relationships between tables.
- **Candidate Key** – Potential primary key.
- **Super Key** – Any key that uniquely identifies a record.
- **Composite Key** – Two or more fields combined as a key.

Database Languages

- **Data Definition Language (DDL)** – Defines structure (CREATE, ALTER).
- **Data Manipulation Language (DML)** – Modifies data (INSERT, UPDATE, DELETE).
- **Data Control Language (DCL)** – Controls access (GRANT, REVOKE).
- **Transaction Control Language (TCL)** – Manages transactions (COMMIT, ROLLBACK).

Entity-Relationship (E-R) Model

- **Entity** – Object in the database (e.g., Student, Employee).
- **Attributes** – Characteristics of an entity (e.g., Name, Age).
- **Relationships** – Connections between entities (e.g., Student enrolls in Course).

Data communication and networking

Data Communication

- **Definition**: The process of **transmitting data** between devices using a communication medium.
- **Components**:
  - **Sender** – The device that sends data.
  - **Topology**

    Topology in computer networks refers to the **arrangement of devices, nodes, and connections** in a network that defines how data flows between them.

    Types of Network Topology:
    1. **Bus Topology** – A single central cable connects all devices.
    2. **Star Topology** – All devices connect to a central hub or switch.
    3. **Ring Topology** – Devices are connected in a circular path.
    4. **Mesh Topology** – Every device connects to every other device.
    5. **Tree Topology** – A hierarchical structure combining bus and star topology.
    6. **Hybrid Topology** – A combination of two or more topologies.
  - **Receiver** – The device that receives data.
  - **Transmission Medium** – The pathway for data.
  - **Protocol** – Rules for data transfer.
  - **Message** – The actual data being transmitted.

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The arrangement of computers and other peripherals in a network is called its:

(a) Host (b) Topology

(c) Structure (d) Protocol

PYQ 2022 JCA

A _____ is a set of rules that governs the communication between computers on a network.

(a) Webpage (b) Protocol

(c) Server (d) Blog

Communication Channel

- **Definition**: The **pathway** through which data is transferred between sender and receiver.
- **Types**:
    - **Simplex** – One-way communication (e.g., TV broadcast).
    - **Half-Duplex** – Two-way but one at a time (e.g., Walkie-Talkie).
    - **Full-Duplex** – Two-way simultaneously (e.g., Telephone).

Communication Media

- **Definition**: The physical or wireless means used to transfer data.
- **Categories**:
    - **Guided Media (Wired)** – Uses cables.
    - **Unguided Media (Wireless)** – Uses radio waves.

Guided Media (Wired Technologies)

- **Twisted Pair Cable** – Used in telephone lines, LANs.
- **Coaxial Cable** – Used in cable TV, high-speed networks.
- **Fiber Optic Cable** – High-speed, used in internet backbone.

Unguided Media (Wireless Technologies)

- **Radio Waves** – Used in mobile networks.
- **Microwaves** – Used in satellite communication.
- **Infrared** – Used in remote controls.
- **Bluetooth** – Used for short-range communication.

Computer Network

- **Definition**: A system of interconnected computers for **data sharing**.
- **Uses**: File sharing, communication, internet access.

Benefits of Computer Networks

✔ **Resource Sharing** – Printers, storage, etc.
✔ **File Sharing** – Easy access to files across devices.
✔ **Communication** – Email, messaging, video calls.
✔ **Cost Efficiency** – Reduces hardware and software costs.
✔ **Security & Backup** – Centralized control and data recovery.

Types of Computer Networks

Type	Coverage Area	Example
Personal Area Network (PAN)	Few meters	Bluetooth, Smartwatch
Local Area Network (LAN)	Within a building	Office, School
Metropolitan Area Network (MAN)	City-wide	Cable TV, ISP
Wide Area Network (WAN)	Country/Global	Internet

Network Devices

- **Modem** – Converts digital signals to analog and vice versa.
- **Router** – Connects multiple networks (e.g., internet).
- **Switch** – Directs data between devices in a LAN.
- **Hub** – Broadcasts data to all devices in a network.
- **Repeater** – Boosts weak signals over long distances.
- **Gateway** – Connects different network protocols.

Network Topology

- **Definition**: The arrangement of devices in a network.
- **Types**:
    - **Bus Topology** – Single cable for all devices.
    - **Star Topology** – Devices connected to a central hub.
    - **Ring Topology** – Devices connected in a circular path.
    - **Mesh Topology** – Every device connects to every other device.

- **Hybrid Topology** – Combination of two or more topologies.

Models of Computer Networking

- **OSI Model** – 7-layer theoretical framework for communication.
- **TCP/IP Model** – 4-layer practical model for internet communication.

OSI Model (7 Layers)

Layer	Function
1. Physical	Transmits raw bits over a medium.
2. Data Link	Error detection, MAC address handling.
3. Network	IP addressing, routing.
4. Transport	Ensures complete data transfer (TCP/UDP).
5. Session	Manages sessions between devices.
6. Presentation	Data encryption and compression.
7. Application	User interaction (email, web browsing).

Terms Related to Networks

- **IP Address** – Unique address for devices on a network.
- **MAC Address** – Physical address of a network device.
- **Subnet Mask** – Used to divide networks.
- **Firewall** – Security system to filter network traffic.
- **Bandwidth** – The data transfer capacity of a network.

Internet and its service

Internet

Definition:

The Internet is a **global network** that connects millions of computers worldwide, enabling **communication, information sharing, and data exchange**.

Key Characteristics:

✔ **Decentralized Network** – No single authority controls the entire internet.
✔ **Uses TCP/IP Protocol** – Ensures seamless data transmission.
✔ **Supports Multiple Services** – Web browsing, email, cloud computing, etc.

History of the Internet

Year	Development
1969	ARPANET (Advanced Research Projects Agency Network) was created by the **US Department of Defense**.
1973	First international ARPANET connection (UK & Norway).
1983	TCP/IP became the **standard protocol** for communication.
1991	**The World Wide Web (WWW)** was invented by **Tim Berners-Lee**.
1995	The **Internet became commercialized**, and companies started using it widely.
2000s	Growth of **social media, cloud computing, e-commerce**.
2020s	Advancement in **AI, IoT, and 5G technology**.

Advantages of the Internet

✔ **Global Connectivity** – Communication from any part of the world.
✔ **Fast Information Access** – Search engines provide instant information.
✔ **Online Education & E-learning** – Remote education through platforms like **Coursera, Udemy, and BYJU'S**.
✔ **E-commerce & Online Banking** – Secure transactions via **UPI, PayPal, Net Banking**.
✔ **Work from Home & Remote Jobs** – Companies offer **freelancing & remote jobs** globally.
✔ **Social Networking** – Platforms like **Facebook, Twitter, Instagram** connect people.
✔ **Cloud Computing** – Access and store data on cloud servers like **Google Drive & Dropbox**.

Disadvantages of the Internet

✖ **Cybersecurity Threats** – Hacking, viruses, phishing attacks.
✖ **Misinformation & Fake News** – False information spreads quickly.
✖ **Privacy Issues** – Personal data leaks and surveillance risks.
✖ **Health Issues** – Internet addiction, screen time strain.
✖ **Dark Web & Illegal Activities** – Cybercrime, identity theft.

Internet Connections

Type	Description	Speed
Dial-Up Connection	Uses telephone lines, slow & outdated.	56 Kbps
DSL (Digital Subscriber Line)	High-speed internet using phone lines.	1 Mbps – 100 Mbps
Fiber-Optic Connection	Uses optical fibers for ultra-fast speed.	100 Mbps – 10 Gbps
Satellite Connection	Used in remote areas, weather-dependent.	25 Mbps – 100 Mbps
Mobile Networks (3G, 4G, 5G)	Internet via SIM cards, used in smartphones.	10 Mbps – 10 Gbps
Wi-Fi (Wireless Fidelity)	Wireless internet access in homes/offices.	100 Mbps – 1 Gbps

Interconnecting Protocols

Protocol	Function
TCP/IP (Transmission Control Protocol/Internet Protocol)	Ensures reliable data transmission.
HTTP (HyperText Transfer Protocol)	Transfers web pages.
HTTPS (Secure HTTP)	Secure version of HTTP with encryption.
FTP (File Transfer Protocol)	Used for uploading/downloading files.
SMTP (Simple Mail Transfer Protocol)	Send emails.
POP3/IMAP	Retrieves emails from a mail server.

PYQ 2022 JCA

HTTP is the acronym for _____.

(a) HyperText Transfer Promise (b) Hyper Transfer Text Promise

(c) HyperText Transfer Protocol (d) Hyper Transfer Text Protocol

Terms Related to the Internet

Term	Definition
Webpage	A single document on the internet (e.g., homepage).
Website	A collection of web pages under one domain.
Web Browser	Software to access the internet (e.g., Chrome, Firefox, Edge).
Web Server	A computer that stores and delivers websites.
Web Address (URL)	A unique address for a webpage (e.g., https://www.google.com).
Domain Name	A human-readable website address (e.g., google.com).

Domain

Abbreviations

- **.com** – Commercial
- **.org** – Organization
- **.edu** – Educational
- **.gov** – Government

| **Blogs** | Personal or professional online journals. |

| **Newsgroups** | Online discussion forums. |

| **Search Engine** | A tool to find information online. |

Popular Search Engines

✔ **Google** (Most widely used)
✔ **Bing** (Microsoft's search engine)
✔ **Yahoo** (Oldest search engine)
✔ **DuckDuckGo** (Privacy-focused search engine)

Internet Services

Service	Description	Example
Chatting	Real-time text communication.	WhatsApp, Telegram
E-Mail	Sending and receiving messages.	Gmail, Yahoo Mail
Video Conferencing	Online meetings via video.	Zoom, Skype, Google Meet
E-Learning	Online education platforms.	Udemy, Coursera, BYJU'S
E-Banking	Online financial transactions.	PayPal, Net Banking
E-Shopping	Buying goods/services online.	Amazon, Flipkart
E-Reservation	Booking tickets online.	IRCTC, MakeMyTrip
Social Networking	Platforms for communication.	Facebook, Twitter
E-Commerce	Online business transactions.	Amazon, eBay
M-Commerce	Mobile-based commerce.	Paytm, Google Pay

Key Differences Between E-Commerce & M-Commerce

Feature	E-Commerce	M-Commerce
Definition	Buying/selling via internet.	Buying/selling via mobile devices.
Devices Used	Desktop, laptop.	Smartphones, tablets.
Example	Amazon, Flipkart.	Paytm, Google Pay.

Security Issues in Internet Usage

✔ **Phishing** – Fraud emails trick users into sharing passwords.
✔ **Hacking** – Unauthorized access to data.
✔ **Malware** – Viruses, spyware, trojans.
✔ **Data Privacy** – Tracking of user activity.
✔ **Cyberbullying** – Online harassment.

Computer Security

Definition:

Computer security refers to **protecting computer systems, networks, and data** from unauthorized access, cyberattacks, and data breaches.

Objectives of Computer Security:

✔ **Confidentiality** – Prevent unauthorized access to data.
✔ **Integrity** – Protect data from modification or corruption.
✔ **Availability** – Ensure resources are accessible when needed.

Methods to Provide Protection

✔ **Authentication** – Verifying user identity (e.g., passwords, biometrics).
✔ **Encryption** – Securing data through coding.
✔ **Firewalls** – Blocking unauthorized access.
✔ **Antivirus Software** – Detecting and removing malware.
✔ **Backup & Recovery** – Storing duplicate copies of data.
✔ **Access Control** – Restricting data access based on user roles.

Components of Computer Security

Component	Description
Hardware Security	Protection of physical devices (e.g., biometric locks).
Software Security	Protection of applications (e.g., antivirus, updates).
Network Security	Prevents unauthorized access to networks (e.g., firewalls).
Data Security	Ensures data privacy & encryption.

Sources of Cyber Attacks

✔ **Hackers** – Unauthorized individuals breaking into systems.
✔ **Insiders** – Employees misusing access privileges.
✔ **Phishing** – Fraudulent emails tricking users into sharing credentials.
✔ **Denial of Service (DoS) Attacks** – Overloading a system to make it unavailable.
✔ **Malware** – Software designed to harm computers.

Malware: Threats to Computer Security

Malware (Malicious Software) is any software designed to harm, exploit, or steal data.

Malware Type	Description
Virus	Attaches to files and spreads.
Worms	Self-replicating programs that slow down systems.
Trojan Horse	Disguised as legitimate software but harms the system.
Spyware	Secretly collects user data.
Ransomware	Encrypts files and demands ransom for access.
Adware	Displays unwanted ads to generate revenue.

Types of Viruses

✔ **Boot Sector Virus** – Infects the boot sector of storage devices.
✔ **File Infector Virus** – Attaches to executable files.
✔ **Macro Virus** – Targets applications like MS Word & Excel.
✔ **Polymorphic Virus** – Changes its code to avoid detection.
✔ **Resident Virus** – Hides in system memory.

Effects of Viruses

✖ **Slow Performance** – System lags due to excessive processing.
✖ **Data Corruption** – Files become unreadable.
✖ **Unauthorized Access** – Hackers steal personal information.
✖ **Frequent Crashes** – System repeatedly restarts.

Symptoms of Malware Attack

✔ Slow computer performance.
✔ Frequent system crashes.
✔ Unwanted pop-up ads.
✔ Automatic redirection to unknown websites.
✔ Unauthorized data access.

Solutions to Computer Security Threats

✔ **Install Antivirus Software** – Regularly scan for threats.
✔ **Keep Software Updated** – Apply security patches.
✔ **Use Strong Passwords** – Avoid common passwords.
✔ **Enable Firewalls** – Block unauthorized access.
✔ **Avoid Clicking Suspicious Links** – Prevent phishing attacks.
✔ **Regular Backups** – Prevent data loss.

Security Measures & Tools

Anti-Malware Software

✔ Detects & removes malware (e.g., Windows Defender, McAfee).

Digital Certificate

✔ **Issued by a Certificate Authority (CA)** to verify the authenticity of websites & software.

Digital Signature

✔ **Electronic signature** that ensures the authenticity of a document.

Firewall

✔ Filters incoming and outgoing network traffic to block threats.

Password Protection

✔ Uses **strong, unique passwords** for account security.

File Access Permissions

✔ Restricts access to files based on user roles (**Read, Write, Execute**).

Terms Related to Security

Term	Definition
Encryption	Converting data into unreadable format.
Decryption	Converting encrypted data back to normal form.
Hacking	Unauthorized access to a system.
Phishing	Cybercriminals trick users into revealing credentials.
Two-Factor Authentication (2FA)	Extra layer of security beyond passwords.
Cybercrime	Illegal activities using computers.

Computer security is essential to protect systems from malware, hacking, and cyber threats. Using **strong passwords, antivirus software, firewalls, and encryption** can prevent security breaches.

-Thanks-