2.1 Introduction to Operating System

An **Operating System (OS)** is a system software that acts as an interface between the user and computer hardware. It manages all hardware and software resources and provides common services for computer programs.

Key Points:

- It is the first software that runs when the computer is switched on (loaded from hard disk to RAM).
- Without OS, a computer cannot work.
- It controls the entire computer system and makes it user-friendly.
- Examples: Windows, Linux, macOS, Android, iOS, Unix.

Importance / Need of OS:

- Hides the complexity of hardware from the user.
- Makes efficient use of hardware resources.
- Provides a platform for application software to run.
- Manages user interaction through GUI or Command Line Interface.

2.2 Types of Operating System

Operating Systems are classified on the basis of **number of users**, **number of tasks**, and **processing method**.

Type of OS	Meaning	Example
Single User OS	Only one user can work at a time	MS-DOS, Windows 95
Multi-User OS	Multiple users can work simultaneously	Linux, Unix, Windows Server
Single Tasking OS	Can perform only one task at a time	MS-DOS
Multi-Tasking OS	Can perform multiple tasks simultaneously	Windows 10/11, Linux
Batch OS	Jobs are grouped and executed one after another without user interaction	Early mainframe OS
Time-Sharing OS	CPU time is divided among multiple users (each gets a small time slice)	Unix, Linux
Real-Time OS (RTOS)	Responds to input instantly (used in critical systems)	VxWorks, RTLinux
Distributed OS	Runs on multiple computers connected by network	Google Distributed OS
Network OS	Designed to run on servers and manage network resources	Windows Server, Novell

2.3 Functions of Operating Systems

The main functions of an Operating System are:

1. **Process Management**
   - Creates, schedules, and terminates processes.
   - Manages CPU time among different processes.
2. **Memory Management**
   - Allocates and de-allocates memory (RAM) to programs.
   - Uses techniques like paging, segmentation, and virtual memory.
3. **File Management**
   - Creates, deletes, copies, moves, and organizes files and folders.
   - Manages storage devices (Hard disk, SSD, etc.).
4. **Device Management** (I/O Management)
   - Controls all input/output devices (keyboard, mouse, printer, scanner).
   - Uses device drivers.
5. **Security and Protection**
   - Provides user authentication (username/password).
   - Protects data from unauthorized access and viruses.
6. **User Interface**
   - Provides GUI (Graphical User Interface) or CLI (Command Line Interface).
7. **Job Scheduling**
   - Decides the order of job execution.

2.4 Command Line Operation

Command Line Operation means giving instructions to the computer using **text commands** instead of mouse and icons. It is also called **CLI (Command Line Interface)**.
In Windows, it is done through **Command Prompt (CMD)**.
Important Commands (as per syllabus examples):

Command	Purpose	Syntax / Example	Description
copy	Copy file or folder	copy source destination	copy report.doc D:\Backup\
move	Move file or folder from one location to another	move source destination	move oldfile.txt C:\NewFolder\
rename	Rename a file	rename oldname newname	rename report.doc finalreport.doc
attrib	View and set file attributes (Read-only, Hidden, etc.)	attrib or attrib +r filename	attrib +r important.doc (makes read-only) attrib -r important.doc (removes read-only) attrib +h filename (makes hidden)
dir	View list of files and folders	dir	Shows all files with details
cd	Change directory	cd foldername	cd Documents
del	Delete file(s)	del filename	del oldfile.txt

How to open Command Prompt in Windows:

1. Press Win + R
2. Type cmd and press Enter.

2.5 Windows Operating System

2.5.1 Introduction to Graphical User Interface (GUI) Graphical User Interface (GUI) is a user-friendly way of interacting with the computer using **icons, menus, windows, buttons and mouse** instead of typing text commands.

- First introduced by Xerox and popularized by Apple Macintosh and Microsoft Windows.
- In Windows OS, GUI is provided by **Windows Explorer** and **Desktop Environment**.
- Advantages: Easy to learn and use, visual representation of files and programs, supports multitasking.
- Disadvantage: Consumes more memory and processing power than CLI.

2.5.2 Basic Windows Elements The main components visible after starting Windows are:

Element	Description	Function
Desktop	Background screen where icons and shortcuts are placed	Main working area
Taskbar	Horizontal bar at the bottom of the screen	Shows open programs, Start button, System tray
My Computer / This PC	Icon that gives access to all drives, folders and devices	View storage devices
Recycle Bin	Temporary storage for deleted files/folders	Restore or permanently delete files

Other important icons: Documents, Pictures, Downloads, Network.

2.5.3 Starting and Shutting Down Windows Starting (Booting):

1. Press the Power button on the CPU.
2. POST (Power On Self Test) is performed by BIOS.
3. Windows logo appears → Welcome screen → Login with password/PIN.

Shutting Down:

- Click **Start → Power → Shut down**
- Or press **Alt + F4** on Desktop → Select Shut down.
- **Restart**: Used when installing updates or fixing problems.
- **Sleep/Hibernate**: Saves current session and consumes very little power.

2.5.4 File Management with Windows Explorer Windows Explorer (now called **File Explorer**) is the main tool for managing files and folders.

- Open: Press Win + E or double-click **This PC**.
- Features:
  - Create new folder (Ctrl + Shift + N)
  - Copy (Ctrl + C), Cut (Ctrl + X), Paste (Ctrl + V)
  - Rename (F2)
  - Delete (Delete key)
  - View options: Extra Large Icons, Details, Tiles
  - Search box at the top right
  - Navigation pane (Quick Access, OneDrive, This PC)

2.5.5 Windows Applications

1. **Control Panel**
   - Central place to change system settings.
   - Open: Search "Control Panel" in Start menu.
   - Important items: System and Security, Programs and Features, Appearance and Personalization, Clock and Region, Devices and Printers.
2. **Character Map**
   - Tool to insert special characters and symbols not available on keyboard.
   - Open: Search "Character Map".
   - Useful for Devanagari fonts and symbols (©, ®, ™, ₹, etc.).
3. **Paint**
   - Simple image editing program.
   - Used to draw, colour, crop, resize and save pictures in .jpg, .png, .bmp format.

2.5.6 Finding Files or Folders and Saving the Result

- Press Win + S or click Search box in Taskbar.
- Type file/folder name → Results appear instantly.
- Advanced search: Use filters (date modified, file type, size).
- To save the result:
  1. Right-click on search result → Open file location.
  2. Or copy the path and paste in a Word/Excel document.

2.5.7 Starting a Program by Command Line Operation

- Open Command Prompt (Win + R → type cmd).
- Type the program name and press Enter:
  - notepad → Opens Notepad
  - calc → Opens Calculator
  - mspaint → Opens Paint
  - control → Opens Control Panel
  - explorer → Opens File Explorer

2.5.8 Changing Window Settings

- **Adding/Removing Programs**: Go to **Control Panel → Programs and Features →** Right-click program → Uninstall.
- **Clearing the contents of Document Menu** (Recent Documents): Right-click Taskbar → Taskbar settings → Clear "Recently opened items".
- **Customizing the Taskbar**: Right-click Taskbar → Taskbar settings → Lock the taskbar / Auto-hide / Change position.
- **Control Panel Items**:
  - Adjust screen resolution
  - Add/remove hardware
  - Backup and Restore
  - Date and Time settings

2.5.9 Creating Shortcut (Icons) on Desktop Method 1:

1. Right-click on Desktop → New → Shortcut.
2. Browse the file/program → Next → Finish.

Method 2:

1. Right-click on file/folder → Send to → Desktop (create shortcut).

Shortcut icons have a small arrow mark on them.

2.5.10 System Tools

1. **Disk Scanning** (Error Checking): Right-click drive in This PC → Properties → Tools → Check (under Error checking).
2. **Disk Defragmenter** (Optimize Drives): Search "Defragment and Optimize Drives" → Select drive → Optimize. (Improves speed by arranging fragmented files).
3. **Backup**: Control Panel → Backup and Restore → Set up backup.
4. **Restore**: Use System Restore point to return Windows to previous state.
5. **Format**: Right-click drive → Format → Choose file system (NTFS) → Start. (Warning: Deletes all data permanently).

Q1. (5 marks) Explain Graphical User Interface (GUI) in Windows Operating System.
Answer: Graphical User Interface (GUI) is a user-friendly interface that allows interaction with the computer using icons, menus, windows, buttons and mouse instead of typing commands.

- It was popularized by Microsoft Windows.
- Main features: Visual representation of files and programs, easy multitasking, drag-and-drop facility.
- Advantages: Easy to learn and use even for beginners.
- Disadvantage: Uses more memory and processing power than Command Line Interface.
- In Windows, GUI is provided through Desktop, Taskbar and File Explorer.

Q2. (5 marks) Describe the basic elements of Windows Operating System.
Answer: The main elements visible on the screen after starting Windows are:

- **Desktop**: Main background screen where shortcuts and icons are placed.
- **Taskbar**: Bar at the bottom of the screen that shows open programs, Start button and system tray (clock, volume, network).
- **This PC (My Computer)**: Icon that gives access to all drives, folders and devices.
- **Recycle Bin**: Temporary storage for deleted files and folders. Other elements include Documents, Pictures, Downloads and Network icons.

Q3. (5 marks) Write the steps to start and shut down Windows Operating System.
Answer: Starting Windows:

1. Press the Power button on the CPU.
2. BIOS performs POST (Power On Self Test).
3. Windows logo appears → Welcome screen → Enter password/PIN to log in.

Shutting Down Windows:

1. Click **Start** button → Power icon → Select **Shut down**. (Alternative: Press **Alt + F4** on Desktop → Select Shut down.)

- **Restart** is used when installing updates or fixing problems.
- **Sleep** saves current session with very low power consumption.

Q4. (5 marks) Explain File Management with Windows Explorer (File Explorer).
Answer: Windows Explorer is the main tool for managing files and folders.

- To open: Press **Win + E** or double-click **This PC**.
- Main functions: Create new folder (**Ctrl + Shift + N**), Copy (**Ctrl + C**), Cut (**Ctrl + X**), Paste (**Ctrl + V**), Rename (**F2**), Delete.
- Features: Navigation pane, Search box, View options (Large icons, Details, Tiles).
- It helps in organizing, copying, moving and searching files efficiently.

Q5. (5 marks) Describe any two Windows applications: Control Panel and Character Map.
Answer:

1. **Control Panel**: It is the central place to change system settings.
    - Open by searching "Control Panel" in Start menu.
    - Important items: Programs and Features, System and Security, Appearance and Personalization, Devices and Printers.
2. **Character Map**: Tool to insert special characters and symbols.
    - Open by searching "Character Map".
    - Useful for Devanagari fonts and symbols like ©, ®, ₹ etc.

10-Mark Long Answer Questions
Q1. (10 marks) Explain Windows Operating System. Describe its Graphical User Interface and basic elements.
Answer: Windows is the most popular Graphical User Interface based Operating System developed by Microsoft.
Graphical User Interface (GUI): GUI allows users to interact with the computer using visual elements like icons, windows, menus and mouse instead of text commands. It makes the system user-friendly and supports multitasking.
Basic Elements of Windows:

- **Desktop**: Main working area where shortcuts and icons are placed.
- **Taskbar**: Bottom bar showing open programs, Start button and notification area.
- **This PC**: Gives access to drives and devices.
- **Recycle Bin**: Stores deleted files temporarily.

Other Important Features:

- File management is done through File Explorer.
- Users can create shortcuts, customize taskbar, use system tools (Disk Defragmenter, Backup, etc.).
- Windows also provides Command Line operation through CMD for advanced tasks.

Thus, Windows OS combines user-friendliness of GUI with powerful file and system management tools.
Q2. (10 marks) Describe File Management with Windows Explorer and explain how to change various window settings in Windows Operating System.
Answer: File Management with Windows Explorer: Windows Explorer (File Explorer) is the main program for managing files and folders.

- Open by pressing **Win + E**.
- Functions: Create folder, copy, move, rename, delete, search files.
- Advanced features: Navigation pane, different view modes, sorting and filtering.

Changing Window Settings:

1. **Adding/Removing Programs**: Go to **Control Panel → Programs and Features →** Select program → Uninstall.
2. **Clearing Document Menu (Recent Files)**: Right-click Taskbar → Taskbar settings → Clear recently opened items.
3. **Customizing Taskbar**: Right-click Taskbar → Taskbar settings → Lock/unlock taskbar, auto-hide, change position.
4. **Other Control Panel Items**: Adjust screen resolution, set date & time, backup & restore, add hardware.

These settings help users personalize and maintain the Windows environment efficiently.
Q3. (10 marks) Explain important System Tools available in Windows Operating System.
Answer: Windows provides several built-in System Tools for maintenance:

1. **Disk Scanning (Error Checking)**: Checks and repairs bad sectors on the drive.
2. **Disk Defragmenter (Optimize Drives)**: Arranges fragmented files to improve speed.
3. **Backup**: Creates copy of important files and system image.
4. **System Restore**: Returns Windows to a previous working state using restore points.
5. **Format**: Completely erases data from a drive and prepares it for new use.

These tools are accessed through **Control Panel** or by searching in the Start menu. They help in improving performance, data safety and troubleshooting.