

Operating System is an integrated set of programs that is used to manage the various resources and overall operation of the computer system.

### Types of OS

#### 1) On the basis of Interface

a) GUI

b) CUI

#### 2) On the basis of User

a) Single User

b) Multi User

#### 3) On the basis of processing

a) Multi tasking

b) Multi programming

c) Multi processing

d) Realtime OS

e) Online OS

f) Network OS

g) Batch OS

h) Time share OS.

## Functions of OS

- ① User Interface
- ② Resource Management
- ③ Process Management
- ④ File Management
- ⑤ I/O Management
- ⑥ Device Management
- ⑦ Storage Management
- ⑧ Deadlock Prevention
- ⑨ Interrupt Handling
- ⑩ Protection and Security
- ⑪ Virtual Memory

## Differentiate between GUI and CUI.

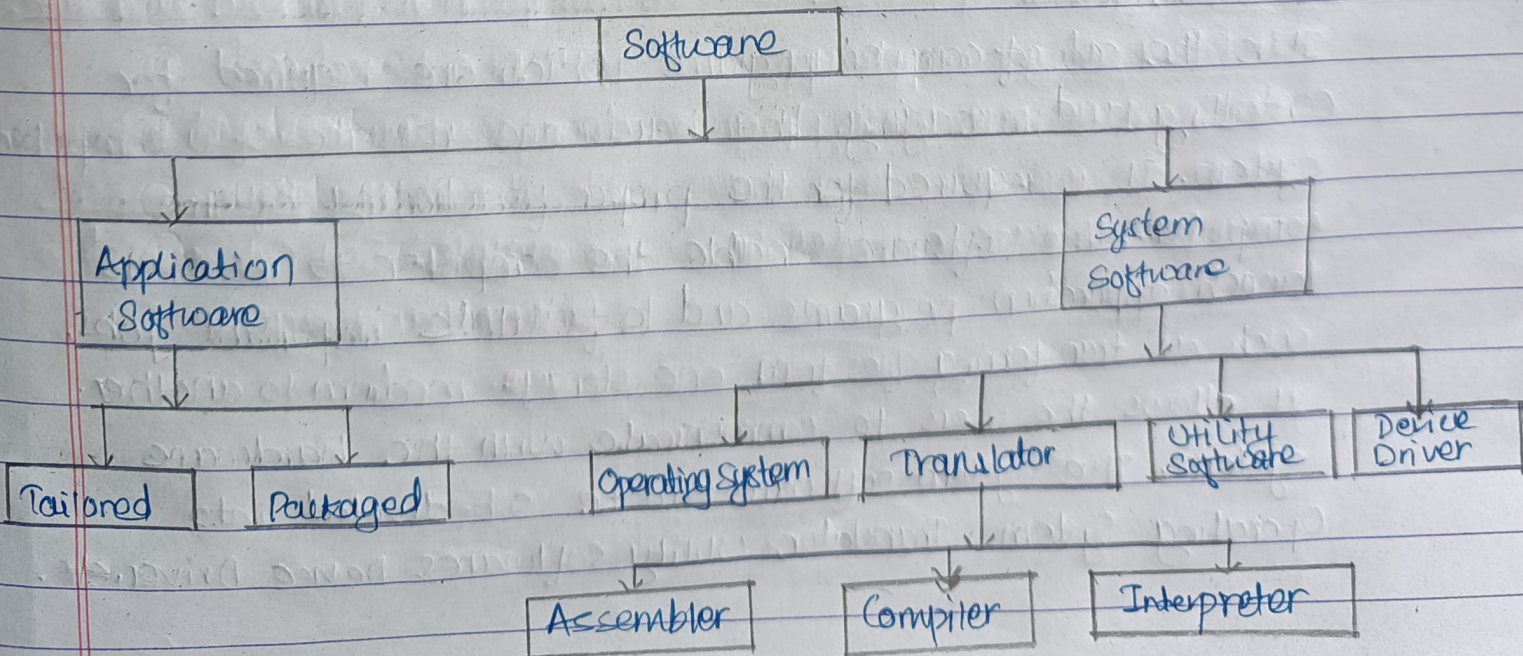
GUI	CUI
1) It stands for Graphical User Interface.	1) It stands for Command User Interface.
2) It is very user friendly.	2) It is not user friendly.
3) It supports text, images, videos, audios, graphics & animations.	3) It supports only text.
4) It supports pointing devices like mouse, joystick etc.	4) It does not support any pointing device.
5) Input can be given by pointing and clicking.	5) Input can be given by using commands.
6) The user don't have to memorize any commands.	6) The user have to memorize all the commands.

GUI	CUI
7) It is easy to learn and understand.	7) It is difficult to learn and understand.
8) It occupies more storage space.	8) It occupies less <del>more</del> storage space.
9) It is slower.	9) It is faster.
10) It is usually multiuser OS. • Example: Windows	10) It is single user OS. • Example: MS-DOS.

## Assignment

1) Explain the types of software in computer system.

⇒ Software is a collection of programs, procedures and documentation that perform some specific tasks on a computer system. Software tells the computer how the tasks are to be performed. Software can be broadly categorized classified into two categories i.e. system software and application software.



## Application Software

Application software is a computer program designed and developed to perform a group of coordinated functions or activities for the benefit of user. It is the software developed to solve a specific user oriented problems. Example of application software: MS-word, MS-Excel. There are two types of application software:

- **Customized or Tailored Software:** It is the software designed to meet the specific requirements of an organization or individuals. It is developed on the demand of customer by a software contractor. For example: software for air traffic control system, software for billing school fees etc.
- **Packaged software:** It is the software designed and developed for general purpose. These are the software which are produced by development organization and sold on the open market to any customer who is able to buy them. For example: MS-word, MS-Excel etc.

## System Software

It is the set of computer programs which are required for controlling and managing the hardware resources of a computer system. It is required for the proper functioning of the computer. This software enable the computer to boot, to launch application programs and to facilitate important jobs, such as transferring files from one storage medium to another.

It allows the users to communicate with the hardware system. The system software can be sub-divided into Operating System, Translator, Utility Software & Device Driver, etc.

• **Operating system**: An operating system is an integrated set of programs that is used to manage the various resources and overall operation of the computer system. It also provides the basis for application programs and act as mediator between users and hardware.

• **Translator**: Computer only can understand the program written in machine language. Hence, the program written in other language must be translated into machine language before executing them. There are three types of translator i.e. Assembler, Compiler and Interpreter.

• **Utility software**: It is also called system support software. It enhance or extends the operating system's capabilities or which simply offers new features not provided by operating system itself. Utility software are used to maintain, support, enhance and secure existing program. Example of utility software includes backup software, antivirus software, data recovery software, disk management etc.

• **Device Drivers**: Device drivers are a set of programs that controls the operation and functionality of different devices. Each device in the computer system has a device driver associated with it for proper functioning. It acts as a translator between hardware and software. For proper working of a device, its corresponding device driver must be installed on the computer.

## 2) Differentiate between 3GL and 4GL.

Third Generation Languages (3GL) and Fourth Generation Languages (4GL) are terms used in the field of programming languages to describe different generations of programming languages. Here are the main differentiating factors between 3GL and 4GL.

3GL	4GL
1) It requires specification of how to perform task.	1) It requires specification of what tasks to be performed. <del>it requires</del>
2) It requires large number of procedural instruction.	2) It requires fewer instruction.
3) It is difficult to learn.	3) It is easy to learn.
4) It is difficult to debug.	4) It is easy to debug.
5) It is typically file oriented.	5) It is typically generally database oriented.
6) It is also known as procedural language.	6) It is also known as problem oriented language.
7) Due to larger complexity 3GL used to have lengthy program.	7) Due to reduced complexity, 4GL used to have less lengthy program.
Example: Java, C, C++ etc.	Example: SQL (Structured Query Language)

### 3) Differentiate between customized software & packaged software.

⇒ Customized software & packaged software are the two types of application software. The differences between customized software and packaged software are as follows:

Customized / Tailored software	Packaged Software
1) Customized software are developed to meet the needs of a single entity.	1) Packaged software are developed for a mass audience.
2) These software are highly customizable to specific needs.	2) These software have limited customizability.
3) It is more costly as the cost is borne by a specific client.	3) It is less costly as its cost is distributed among larger user base.
4) There is more close interaction between developer and user in these software.	4) There is mediated interactions involving analysts, resellers, consultants and system integrators across multiple channels.
5) These software are difficult to use because these software are custom-built or customized.	5) These software are easy to use because they have an easy interface.
6) Customized software can be modified or changed as per need.	6) Packaged software can't be modified.
Example: Air traffic control system, Billing software for school.	Example: MS-Word, MS-Excel.

## Differentiate between compiler and Interpreter.

A compiler and an Interpreter both are the types of language translator, but they differ in how they process and execute. The differences between them are listed below:

Compiler	Interpreter
1) Compiler scans the entire program and translates it as a whole into machine code.	1) Interpreter scans the program line by line and translate into machine code.
2) Execution is faster.	2) Execution is slower.
3) Errors are displayed after entire program is checked.	3) Errors are displayed for every instruction.
4) Error detection is difficult.	4) Error detection is comparatively easier.
5) More memory is required due to the creation of object code.	5) Less memory is required as it doesnot create intermediate object code.
6) Compilers are not user friendly hence not easy to use.	6) Interpreters are user friendly and hence easy to use.
7) It is not flexible.	7) It is flexible.
8) It doesnot allow a program to run until it is completely error free.	8) It runs the program from first line and stops execution only if it encounters an error.



5) Explain some function of OS.

⇒ Operating system is large and complex software consisting of several components. Each component of the operating system has its own set of defined input and outputs. The main function of operating system is to manage the resources such as memory and files of a computer system. The operating system also resolves the conflicts that arise when two users or programs request the same resource at the same time. Therefore, the operating system is also called the resource manager of a computer system.

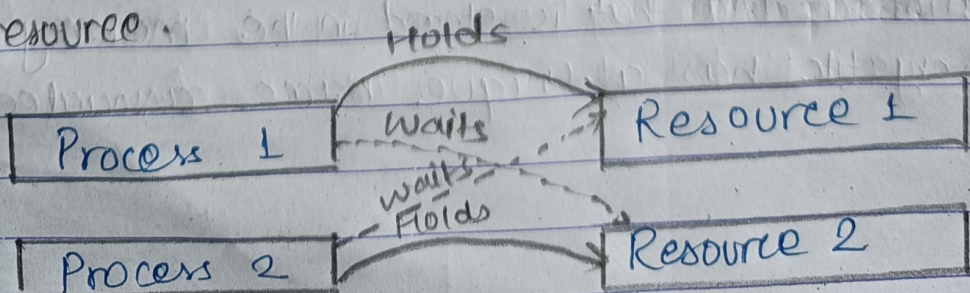
Some functions of OS are:

- **Process Management:** A process is a program basically a program that is being currently run by a user on a computer system. The process management activities handled by the OS are: control access to shared resources, control execution of applications, create execute and delete a process etc.
- **Memory Management:** The OS manages the memory resources of a computer system. All the programs are loaded in the main memory before their execution. It is the function of OS to determine how much memory should be provided to each process.
- **File Management:** The OS manages the files and directories of a computer system. A file can be defined as the collection of information or data that is stored in the memory of computer system. Every file has a unique name associated with it.

- **Device Management**: This function of OS deals with the management of peripheral devices such as printer, mouse and keyboard attached to a computer system. An OS interacts with the hardware devices through specific device drivers. The primary task of an OS is to manage the input/output operations performed by the end users.
- **Protection and Security**: OS protects the resources of system from various threats such as virus attacks and unauthorized access. An operating system uses various techniques such as authentication, authorization etc. for ensuring security of a computer system.
- **User Interface**: Operating system provides an interface between the user and the hardware. The user interface is a set of commands or graphical user interface via which the user interacts with the applications and the hardware.

6) Define deadlock. How does deadlock occur? How can we prevent deadlock?

⇒ Deadlock is a situation when a process waits endlessly for a resource and the requested resource is being used by another process that is waiting for some other resource.



The following are some of the reasons due to which a deadlock may occur.

- **Mutual exclusion**: In mutual exclusion, only one process at a time can use the resource. Any other process requesting the resource has to wait until the resource is released.
- **Hold and wait**: In this condition, a process holds a resource while requesting another resource, which may be currently held by another process.
- **No pre-emption**: In this condition, a process is not allowed to force some other process to release a resource. A process releases the resources by itself.
- **Circular wait**: In this situation, a process  $P_1$  waits for a resource held by another process  $P_2$ , and the process  $P_2$  waits for a resource held by process  $P_1$ .

There are a number of methods through which deadlock can be prevented. Some of these methods are:

- **Ignore Deadlock**: In this method, it is assumed that a deadlock would never occur. There is a good chance that a deadlock may not occur for a long period of time. As a result, the ignore deadlock method can be useful in some cases.
- **Detect and recover from deadlock**: In this method, the deadlock is first detected using allocation/request graph. This graph represents the allocation of resources to different processes. After a deadlock has been detected, a number of methods can be used to recover from the deadlock.
- **Avoid deadlock**: In this method, a process requesting a resource is allocated the resource only if there is no possibility of deadlock occurrence.

## 7) Differentiate between multiprocessing & multiprogramming.

⇒ Multiprocessing and Multiprogramming are both concepts related to managing multiple tasks or processes in a computer system, but they refer to different aspects of handling concurrent execution. Here's a brief differentiation between multiprocessing & multiprogramming:

Multiprocessing	Multiprogramming
1) It involves the simultaneous execution of multiple processes by utilizing multiple processors or cores in a computer system.	1) It involves the concurrent execution of multiple programs or processes by a single processor.
2) The number of CPU is required is more than one.	2) The number of CPU for multiprogramming is one.
3) It aims to improve system throughput and performance by executing multiple tasks concurrently.	3) It aims to keep the CPU busy by allowing it to switch between programs during idle time.
4) Less time taken to process the jobs.	4) More time taken to process the jobs.
5) They are usually more expensive system.	5) They are less expensive system.
6) It permits parallel processing.	6) Context switching takes place.

8) How is WIMP better than CUI OS?

⇒ WIMP (Windows, Icons, Menus, Pointing Device) and CUI (Character User Interface) are two different types of user interfaces, each with its own set of advantages and disadvantages. The choice between them depends on the specific requirements and preference of users. It's not accurate to say that one is universally better than the other.

WIMP is better than CUI OS because of the following:

- 1) **Graphical Representation**: WIMP interfaces being graphical, offer a more visually intuitive representation of information. Users can interact with icons, windows, and menus, making it easier for them to understand and navigate the system.
- 2) **Multitasking**: WIMP interfaces are generally better at handling multitasking. Users can open multiple windows simultaneously, switch between them, and perform different tasks concurrently.
- 3) **User-Friendly**: WIMP interfaces are often considered more user-friendly, especially for those who may not be familiar with command-line syntax. Icons and menus make it easier for users to discover and access features without memorizing commands.
- 4) **Mouse Interaction**: The use of pointing devices such as a mouse, in WIMP interfaces enables precise and efficient navigation. Users can click, drag and drop elements, which enhances the overall user experiences.

5) Visual Feedback: WIMP interfaces provide immediate visual feedback, helping users understand the impact of their actions. For example, dragging a file to the trash icon visually represents the act of deleting it.

6) Accessibility: WIMP interfaces tend to be more accessible to a broader audience, including those who may not have extensive technical knowledge. This can contribute to a more inclusive user.