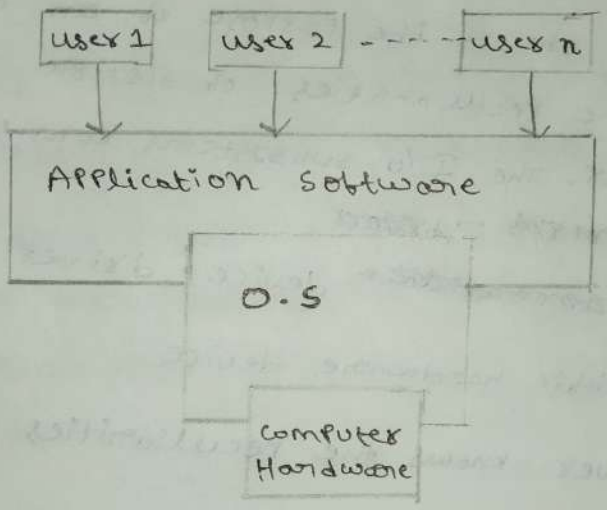
Dt: 16-08-24

1) what is an operating system ?

Ans: An operating system is the collection of programs (or) algorithms that acts as an interface between software and the computer hardware. The operating system is designed in such a way that it can manage the overall resources and operations of the computer.



Functions of O.S :-

a) memory management :- The O.S is responsible for manages the computer's primary memory. and the goal is to ensure that program's and processes can efficiently and effectively use memory, both for their execution and data storage.

b) Processor management :- The operating system is responsible for starting, stopping and managing processes and managing programs. It also ensures that processes receive the necessary resources (i.e CPU time, memory, and I/O devices) to function efficiently.

c) File management :- The operating system manages I/O devices and organizing the file system, including the creation, deletion and manipulation of files and directories.

d) Device management :- Device management handles all aspects of managing hardware devices connected to computer. It provides the necessary drivers and interfaces to enable communication b/w the device and the computer.

e) I/O management :- one of the purpose of an operating system is to hide the peculiarities of specific hardware devices from the user. The I/O subsystems consists of several components :-

→ A general device-driver interface.

→ Drivers for specific hardware device.

only the device driver knows the peculiarities of the specific device to which it is assigned.

f) Security and Protection :- Protection is the mechanism for controlling the access of processes or users to the resources defined by a computer system. Protection can improve reliability by detecting latent errors at the interfaces between component subsystems. A system can have adequate protection but still be prone to failure and allow inappropriate access. and data could be copied or deleted even through file and memory protection are working. It is the job of "security" to defend a system from external and internal attacks..

3) Storage management :-

The most modern computers systems use HDD's and NVM devices as the principal on-line storage media for both programs and data. Most programs including compilers, web browsers, word processors and games are stored on these devices as both the source and destination of their processing. Hence the proper management of secondary storage is of central importance to a computer system.

The operating system is responsible for the following activities in connection with secondary storage :-

→ Mounting and unmounting → Partitioning
→ Free-space management. → Protection.
→ Storage allocation
→ Disk scheduling

Q) What operating systems Do?

Ans:- A computer system can be divide into roughly four components :- Hardware, operating system, Application programs and a user. The hardware :- CPU, memory, i/o devices - provides the basic computing resources for the system. The Application programs :- word processors, compilers and web browsers - define the way in which these resources are used to solve user's problem. The operating system controls the hardware and co-ordinates its use among the various application programs for the various users.

we can also view a computer system as consisting of hardware, software and data. The O.S provides the means for proper use of these resources in the operation of the computer. An O.S is similar to a government like a govt, it performs no useful function by itself. It simply provides an environment within which others programs can do useful work.

Why should we learn operating system ?

Learning about O.S is essential because they are the backbone of all computer systems. An OS manages hardware, runs applications, and allows users to interact with their devices efficiently. Not learning about O.S is like trying to drive a car without knowing what the steering wheel does. Learning about the OS is learing to control and navigate your computer.

Features of O.S :-

→ Supervisor
→ Program execution
→ I/o Handling
→ Resource Allocate
→ Error handling
→ Protection of Resources.

Types of operating system :-

→ Batch operating system :-

⇒ Batch OS does not interact with the computer directly. there is an operator which takes similar jobs having the same requirements and groups them into batches. It is the responsibility of the operator to sort jobs with similar needs. Batch O.S is designed to manage and execute a large number of jobs efficiently by processing them in groups.

→ multi-programming operating system :-

⇒ multiprogramming O.S can be simply illustrated as more than one program is present in the main memory and any one of them can be kept in execution. This is basically used for better utilization of resources.

→ multi-processing O.S :-

⇒ multi-processing O.S is a type of operating system in which more than one CPU is used for the execution of resources. It betters the throughput of the system.

→ multi-Tasking O.S :-

⇒ multitasking O.S is simply a multiprogramming O.S with facility of a Round-Robin Scheduling Algorithm. It can run multiple programs simultaneously.
there are two types of multi-Tasking O.S :-

a) preemptive multi-tasking
b) cooperative " ".

→ Time-sharing O.S :-

⇒ Each task is given some time to execute so that all the tasks works smoothly. Each user get the time of the CPU.

as they use a single system. The time that each task gets to execute is called quantum. After this time interval is over OS switches over to the next task.

→ Distributed O.S :-

⇒ Distributed O.S are a recent advancement in computer technology, gaining widespread acceptance globally. ~~These systems consist of multiprocessors.~~ The major benifit of working with these types of the O.S is that it is always possible that one user can access the files or software which are not actually present on his system, but some other systems are connected within this network.

→ Network O.S :-

These systems run on a server and provide the capability to manage data, users, groups, security, applications and other networking functions. These types of O.S allows shared access to files, printers, security, applications and other networking functions over a small private network.

→ Real-Time O.S :-

These types of OS serve real-time systems. The time interval required to process and respond to inputs is very small. The time interval is called response time. Real-time systems are used when there are time requirements that are very strict like missile systems, air traffic control systems, robots etc.

Design goals of O.S :-

i) Convenice to use.

ii) Efficiency

iii) Isolation - multiple no. of user and multiple no. of tasks performed.

Dual mode of operation of O.S :-

- i) user mode ii) kernal mode.

⇒ A bit called the mode bit is added to the hardware of the computer to indicate the current mode. i.e kernal (0) and user (1). with the mode bit we distinguish b/w a task is executed on behalf of O.S and user application. "when the computer system is executing on behalf of a user application the system is in user mode. However, when a user application requests a service from the operating system (via a system call), the system must transition from user to kernal mode to fulfill the request".

⇒ At system boot time, the hardware starts in kernal mode. The O.S is then loaded and starts user application in user mode. whenever a trap or interrupt occurs, the hardware switches from user mode to kernal mode. (Change the state of mode bit to 0).

Dt:- 20-03-24

System call :- It is a method to interact with the computer H/w to perform any specific task.

⇒ In general, It is a request generated by a program or S/w to perform any specific task.

Types of system call :-

→ Process management :-

⇒ A program under execution is known as process. It is a dynamic object.

The process is dynamic object because when we write any program and after compilation we get the object codes and these are stored in the memory which is static in nature, upto this part it is under program so Program is static in nature. and The linker will link all the objects and loader will load to "RAM" for execution. from now this comes under Process and after loading into RAM further steps are done to execute the program. After execution the instructions are executed one by one.

⇒ A program is fixed in its content and structure when it is stored on disk. It is simply a collection of code and data that doesnot change on its own. when the program is not being executed, it just sits there as a static entity, like blueprint

→ Device management :- Read(), write()

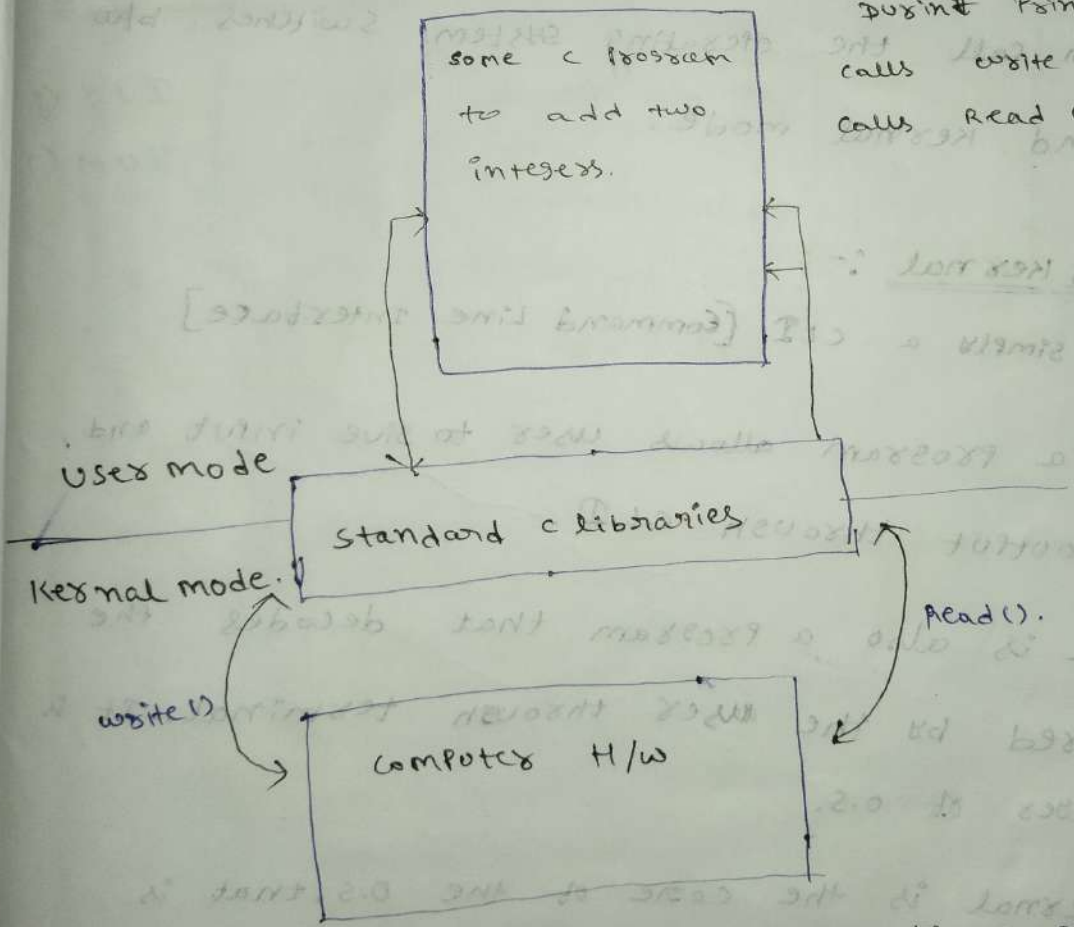
→ file management :- open(), close()

→ Information maintanie :- get time, set time.

→ communication management :- create, delete ...

⇒ A Temporary file is that which is need to execute a specific task. i.e It can be used a rough sheet in which we do memory allocation and some other tasks are done and then the specific task is executed.

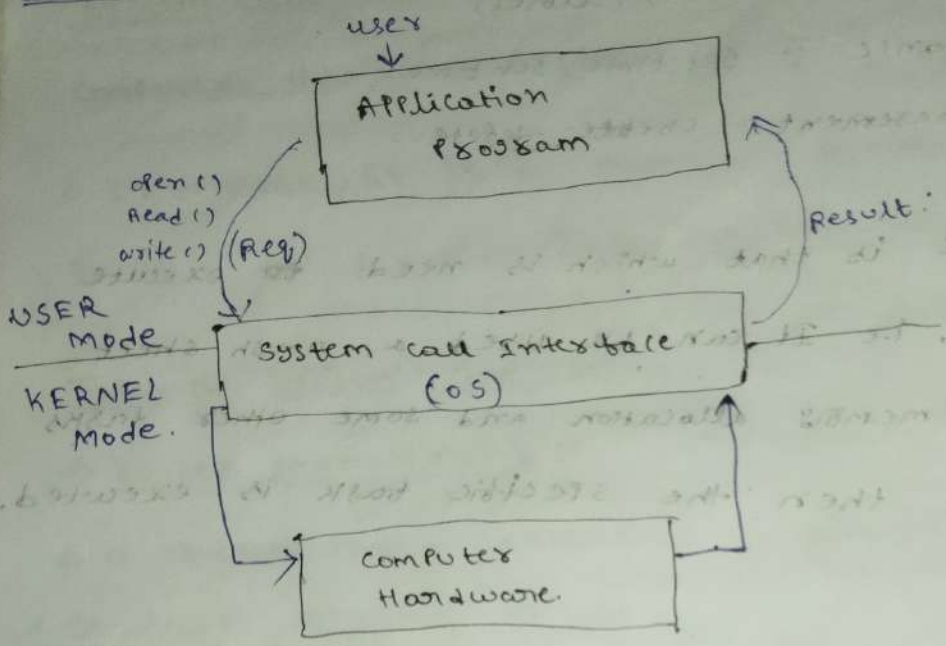
ex:-



During Printf(), the system calls write() and scanf() calls Read().

⇒ A process is dynamic because it represents a running program that is actively doing work. As it runs, it constantly changes - updating its position in the program, managing resources and interacting with O.S. It's state can shift b/w running, waiting or finishing depending on what it's doing at any moment.

Relation b/w O.S and System Call :-



⇒ Through System call the operating system switches b/w user mode and kernal mode.

Terminal, Shell, Kernal :-

⇒ Terminal is simply a CLI. [Command Line Interface]

⇒ Terminal is a program allows user to give input and can produce output through CLI.

⇒ **Shell** :- Shell is also a program that decodes the commands entered by the user through terminal. It is the second layer of O.S.

⇒ **Kernal** :- Kernal is the core of the O.S, that is responsible for executing the commands in computer H/w.

⇒ It is a program that runs after firmware and it is the program that run anytime in every computing device.