Unit 1

PART – A: (Multiple Choice Questions)

2x10=20 Marks

1	**The strategy of allowing processes that are logically runnable to be temporarily suspended is called** **A.**preemptive scheduling B.non preemptive scheduling C.shortest job first D.first come first served E.None of the above
v	**Process is** A.program in High level language kept on disk B.contents of main memory **C.**a program in execution D.a job in secondary memory E.None of the above
3	**Fork is** A. the dispatching of a task B. the creation of a new job **C.** the creation of a new processv D. increasing the priority of a task E. None of the above
4	**Interprocess communication** A.is required for all processes B.is usually done via disk drives C.is never necessary, **D.**allows processes to synchronize activity
5	**The FIFO algorithm** A.executes first the job that last entered the queuev **B.**executes first the job that first entered the queue C.execute first the job that has been in the queue the longest D.executes first the job with the least processor needs E.None of the above
6	**Inter-process communication** A.is required for all processes B.is usually done via disk drivesv C.is never necessary, D.allows processes to synchronize activity

UNIT-1

PART – B: (Short Answer Questions)

1	**What are the functions of operating system?**

Functions of Operating system:

Memory Management
File Management
Device Management
I/O management
Networking
Security
Processor Management
Secondary storage management
Common interpretation

2 Describe system calls and its type.

System calls provide an interface between the process and the OperatingSystem. System calls allow user-level processes to request some services from theoperating system which process itself is not allowed to do.

Types of System Calls	Windows	Linux

Process Control	CreateProcess()
	ExitProcess()
	WaitForSingleObject()
		fork()
		exit()
		wait()

File Management	CreateFile()
	ReadFile()
	WriteFile()
	CloseHandle()
		open()
		read()
		write()
		close()

Device Management	SetConsoleMode()
	ReadConsole()
	WriteConsole()
		ioctl()
		read()
		write()

Information Maintenance	GetCurrentProcessID()
	SetTimer()
	Sleep()
		getpid()
		alarm()
		sleep()

Communication	CreatePipe()
	CreateFileMapping()
	MapViewOfFile()
		pipe()
		shmget()
		mmap()

3 Explain Booting the system and Bootstrap program in operating system.

The procedure of starting a computer by loading the kernel is known as booting the system.

When a user first turn on or booted the computer, it needs some initial program to run. This initial program is known as Bootstrap Program. It is stored in read-only memory (ROM) or electrically erasable programmable read-only memory (EEPROM). Bootstrap program locates the kernel and loads it into main memory and starts its execution

4 What is an operating system?

An Operating System (OS) is an interface between a computer user and computer hardware. An operating system is a software which 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.

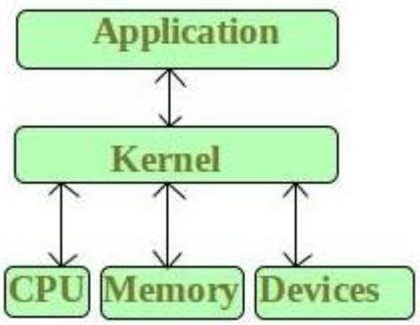
Some popular Operating Systems include Linux Operating System, Windows Operating System, VMS, OS/400, AIX, z/OS, etc.

5 What is a Kernel?

Kernel is an active part of an OS i.e., it is the part of OS running at all times.It is a programs which can interact with the hardware. Ex: Device driver, dll files,system files etc.

Or

Kernel is the core part of an operating system which manages system resources. It also acts like a bridge between application and hardware of the computer. It is one of the first programs loaded on start-up (after the Bootloader)



6 Explain the basic functions of process management.

The basic functions of the OS wrt the process management are :

- Allocating resources to processes,
- Enabling processes to share and exchange information,
- Protecting the resources of each process from other processes and
- Enabling synchronization among processes.

7 What do you know about interrupt?

Interrupt is the mechanism by which modules like I/O or memory may interrupt the normal processing by CPU. It may be either clicking a mouse, dragging a cursor, printing a document etc the case where interrupt is getting generated.

8 What are the various IPC mechanisms?

Inter process communication (IPC) is used for exchanging data between multiple threads in one or more processes or programs. The Processes may be running on single or multiple computers connected by a network. The full form of IPC is Inter-process communication.

It is a set of programming interface which allow a programmer to coordinate activities among various program processes which can run concurrently in an operating system. This allows a specific program to handle many user requests at the same time.

9 Differentiate between the user mode and monitor mode.

Difference between User and Monitor Mode

- User mode and monitor mode are distinguished by a bit called the mode bit.
- User mode uses bit 1 and monitor mode uses bit 0.
- At the boot time hardware starts with the monitor mode.
- Also, at the time of interrupt user mode is shifted to the transfer mode.
- The system always switches to the user mode before passing control to the user program.
- Whenever the system gains control of the computer it works in monitor mode otherwise in user mode.

10 Explain PCB.

- For each process, the operating system maintains the **data structure**, which keeps the complete information about that process. This record or data structure is called **Process Control Block (PCB).**
- Whenever a user creates a process, the operating system creates the corresponding PCB for that process. These PCBs of the processes are stored in the memory that is reserved for the operating system.
- The process control block has many fields that store the relative information about that process as you can see in the above figure. PCB contains Process-Id, Process State, Process Priority, Accounting Information, Program Counter, and also some other information which helps in controlling the operations of the process.

11 What is meant by Batch Systems?

Batch Operating system is one of the important type of operating system.

The users who using a batch operating system do not interact with the computer directly. Each user prepares its job on an off-line device like punch cards and submits it to the computer operator. To speed up the processing, jobs with similar needs are batched together and run as a group. The programmers exit their programs with the operator and the operator then sorts the programs with similar requirements into batches.

The problems that occurs with Batch Systems are as follows –

- There is a lack of interaction between the user and the job.
- CPU is being often idle, because the speed of the mechanical I/O devices is slower than the CPU.
- It is difficult to provide the desired priority.

12 **What is meant by Multiprogramming?**

A multiprogramming is a parallel processing in which the multiple programs can run simultaneously.

- Multiprogramming is the allocation of more than one concurrent program on a computer system and its resources.
- Multiprogramming allows using the CPU effectively by allowing various users to use the CPU and I/O devices effectively.
- Multiprogramming makes sure that the CPU always has something to execute, thus increases the CPU utilization.

13 **What are the advantages of distributed systems?**

Advantages of Distributed Systems

Some advantages of Distributed Systems are as follows –

- All the nodes in the distributed system are connected to each other. So nodes can easily share data with other nodes.
- More nodes can easily be added to the distributed system i.e. it can be scaled as required.
- Failure of one node does not lead to the failure of the entire distributed system. Other nodes can still communicate with each other.
- Resources like printers can be shared with multiple nodes rather than being restricted to just one.

14 **What are the applications of real-time systems?**

Applications of Real Time Operating System

Real-time systems are used in:

- Airlines reservation system.
- Air traffic control system.
- Systems that provide immediate updating.

- Used in any system that provides up to date and minute information on stock prices.
- Defense application systems like RADAR.
- Networked Multimedia Systems
- Command Control Systems
- Internet Telephony
- Anti-lock Brake Systems
- Heart Pacemaker

15 What is the use of Fork and Exec System Calls?

fork() is used to create a new process and when Exec() is invoked the program specified in the parameter to exec()will replace the entire process.

Example of frok()

```
#include <stdio.h>
#include <sys/types.h>
#include <unistd.h>

int main()
{
   fork();
   printf("Hello world!\n");
return 0;
}
```

Example of exec()

Main file:

```
#include<stdio.h>
#include<stdlib.h>
#include<unistd.h>
int main()
{
      char *args[]={"./EXEC",NULL};
      execv(args[0],args);
printf("Ending-----");

   return 0;
}
```

Caller file:

```
#include<stdio.h>
```

```
#include<unistd.h>

int main()
{
   int i;

   printf("I am EXEC.c called by execv() ");
   printf("\n");
   return 0;
}
```

16 **What is meant by the state of the process?**

A process from its creation to completion goes through various stages in order to complete the works defined on it. Each of these stages are known as states of a process.

Different states of processes are

1. New - When a process is creating using fork()
2. Ready - Process has been created but not assigned a processor to run.
3. Running - Process has been assigned a processor and is executing.
4. Waiting - Process is waiting for some event to complete(I/O)
5. Terminated - The process is completed/suspended.

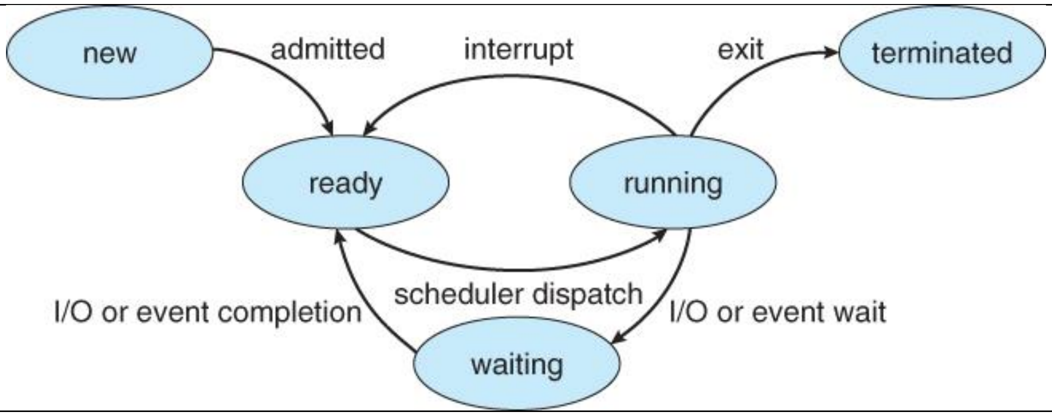
17 **What is the function of following UNIX commands: *vi, cat, pwd, psw*.**

cat: Concatenate files and print to stdout.

- **Syntax**: cat [OPTION]…[FILE]
- **Example**: Create file1 with entered cotent
  - $ cat > file1
  - Hello
  - ^D

  pwd: Print the present working directory
  - **Syntax**: pwd [OPTION]
  - **Example**: Print ‘dir1’ if a current working directory is dir1
    - $ pwd

18 **Draw a neat process state diagram.**

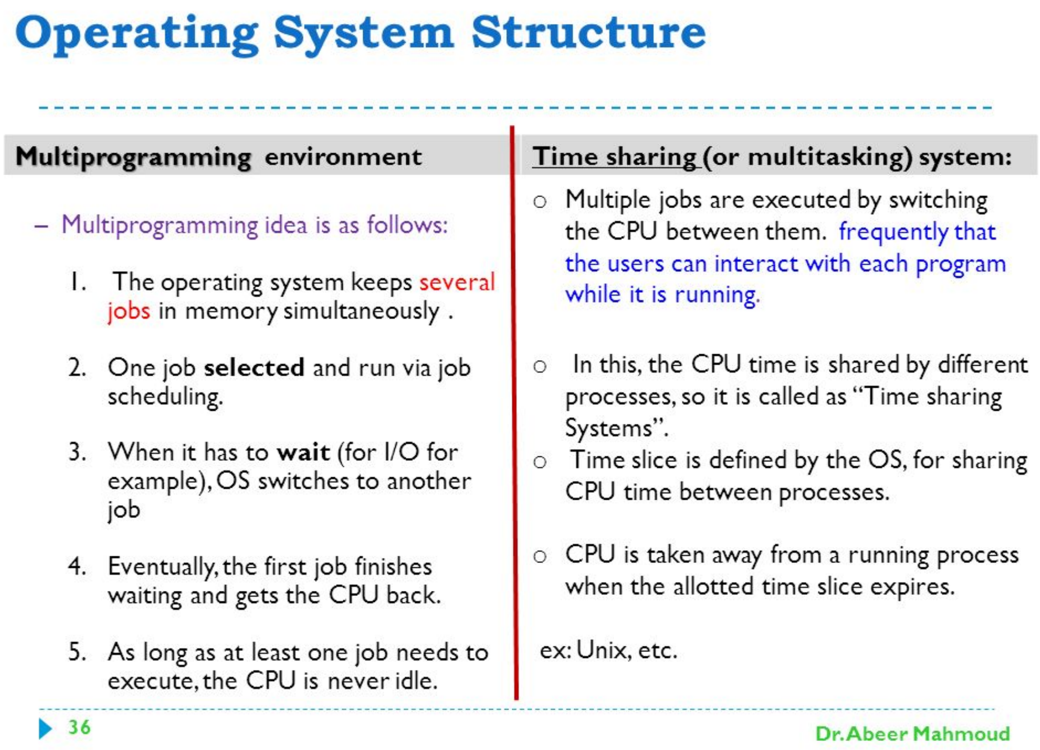


19 **What are the 3 different types of scheduling queues?**

The Operating System maintains the following important process scheduling queues –

- **Job queue –** This queue keeps all the processes in the system.
- **Ready queue –** This queue keeps a set of all processes residing in main memory, ready and waiting to execute. A new process is always put in this queue.
- **Device queues –** The processes which are blocked due to unavailability of an I/O device constitute this queue.

20 **Differentiate between a Multiprogramming System and a Timesharing System.**



Operating System Structure

Multiprogramming environment

– Multiprogramming idea is as follows:

1. The operating system keeps several jobs in memory simultaneously .
2. One job **selected** and run via job scheduling.
3. When it has to **wait** (for I/O for example), OS switches to another job
4. Eventually, the first job finishes waiting and gets the CPU back.
5. As long as at least one job needs to execute, the CPU is never idle.

Time sharing (or multitasking) system:

○ Multiple jobs are executed by switching the CPU between them. frequently that the users can interact with each program while it is running.

○ In this, the CPU time is shared by different processes, so it is called as "Time sharing Systems".

○ Time slice is defined by the OS, for sharing CPU time between processes.

○ CPU is taken away from a running process when the allotted time slice expires.

ex: Unix, etc.

36

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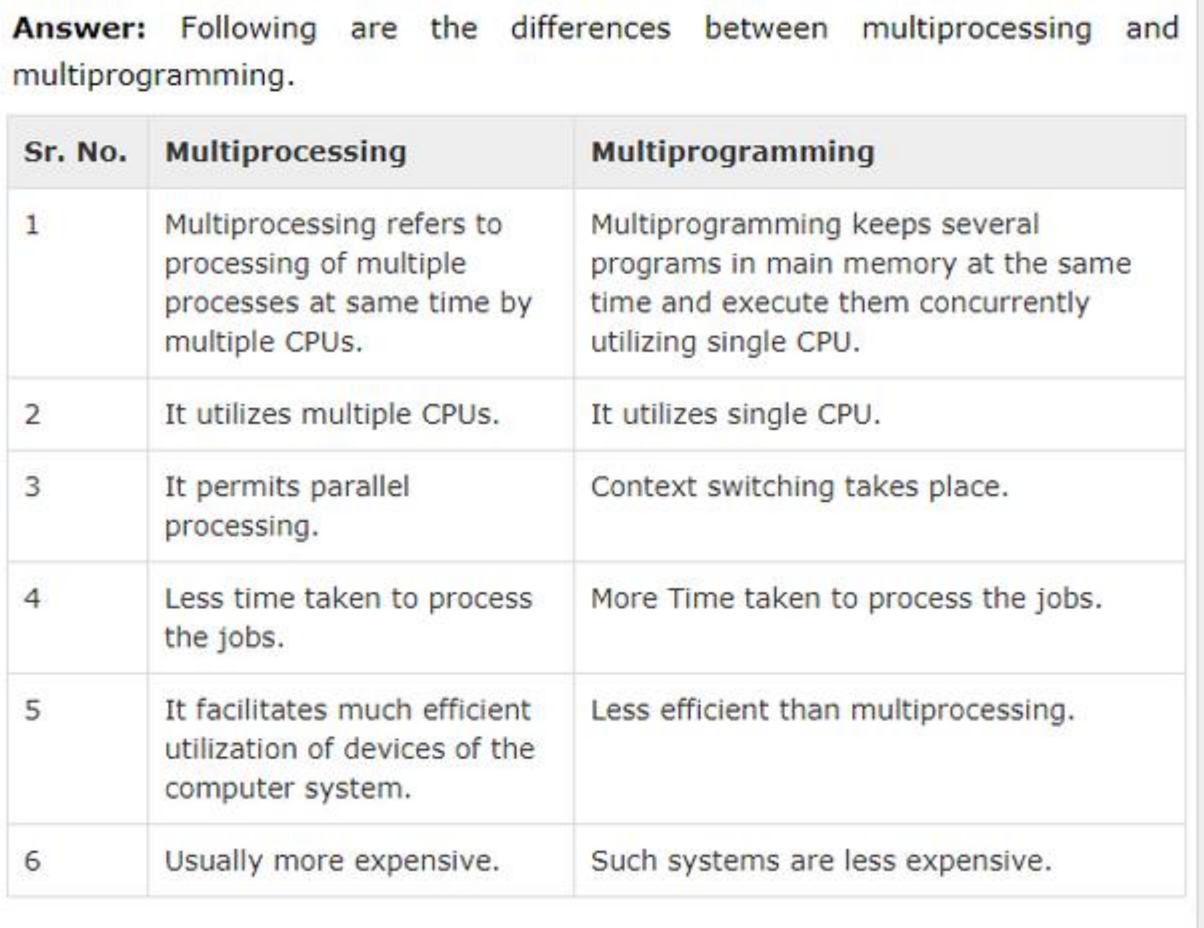
21 **What are the advantages of distributed operating system?**

Advantages of distributed operating systems:-

- Give more performance than single system
- If one pc in distributed system malfunction or corrupts then other node or pc will take care of
- More resources can be added easily
- Resources like printers can be shared on multiple pc’s

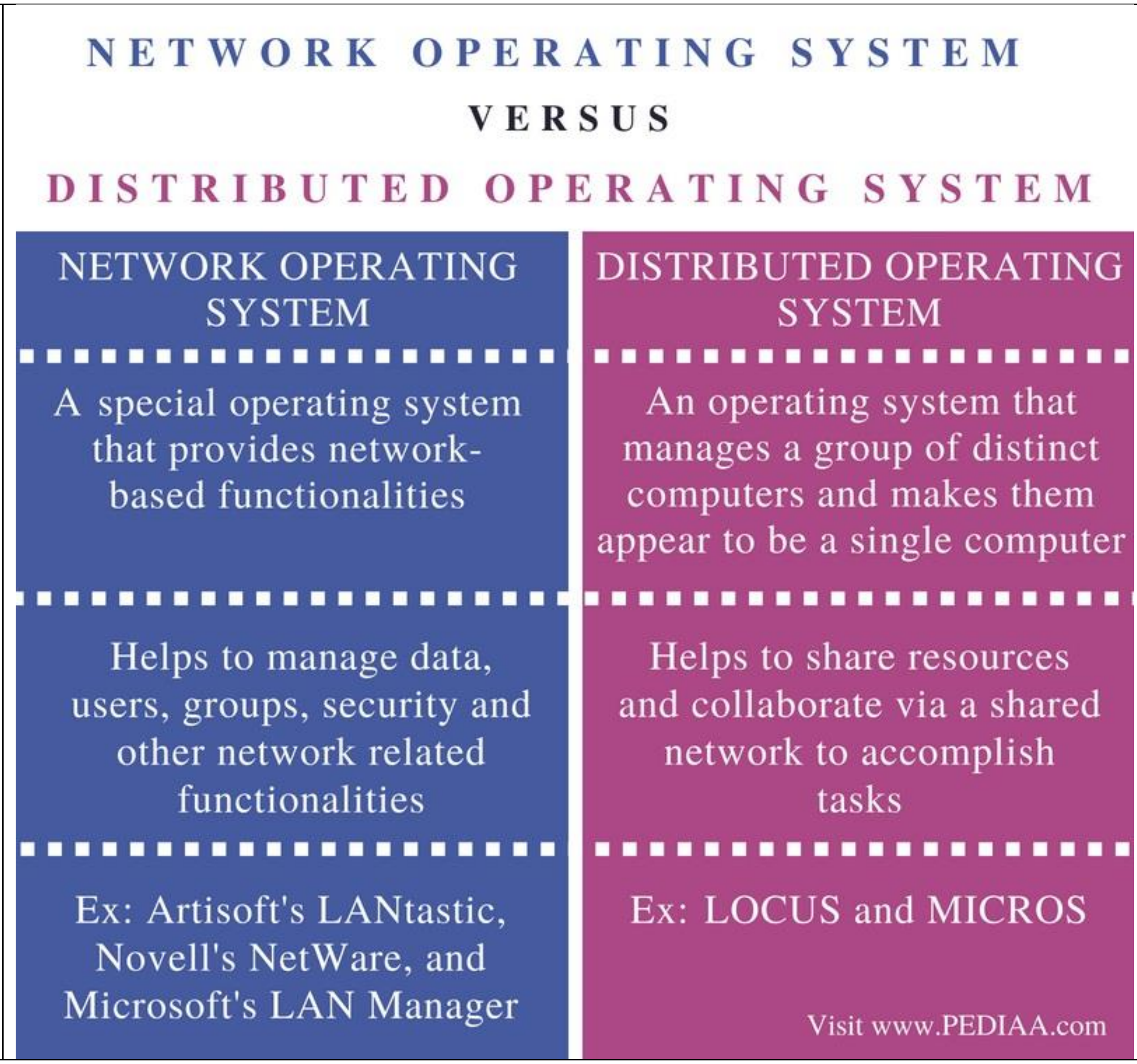
22 **What are the differences between multiprocessing and multiprogramming?**



Answer: Following are the differences between multiprocessing and multiprogramming.

Sr. No.	Multiprocessing	Multiprogramming
1	Multiprocessing refers to processing of multiple processes at same time by multiple CPUs.	Multiprogramming keeps several programs in main memory at the same time and execute them concurrently utilizing single CPU.
2	It utilizes multiple CPUs.	It utilizes single CPU.
3	It permits parallel processing.	Context switching takes place.
4	Less time taken to process the jobs.	More Time taken to process the jobs.
5	It facilitates much efficient utilization of devices of the computer system.	Less efficient than multiprocessing.
6	Usually more expensive.	Such systems are less expensive.

23 **What are the primary differences between Network Operating System and Distributed Operating System?**



NETWORK OPERATING SYSTEM

VERSUS

DISTRIBUTED OPERATING SYSTEM

NETWORK OPERATING SYSTEM	DISTRIBUTED OPERATING SYSTEM
A special operating system that provides network-based functionalities	An operating system that manages a group of distinct computers and makes them appear to be a single computer
Helps to manage data, users, groups, security and other network related functionalities	Helps to share resources and collaborate via a shared network to accomplish tasks
Ex: Artisoft's LANtastic, Novell's NetWare, and Microsoft's LAN Manager	Ex: LOCUS and MICROS

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UNIT-1

PART – C: (Long Answer Questions)

1

Explain the various types of System calls with an example for each.

The interface between a process and an operating system is provided by system calls. In general, system calls are available as assembly language instructions. They are also included in the manuals used by the assembly level programmers.

System calls are usually made when a process in user mode requires access to a resource. Then it requests the kernel to provide the resource via a system call.

There are mainly five types of system calls. These are explained in detail as follows –

1)Process Control

These system calls deal with processes such as process creation, process termination etc.

2)File Management

These system calls are responsible for file manipulation such as creating a file, reading a file, writing into a file etc.

3)Device Management

These system calls are responsible for device manipulation such as reading from device buffers, writing into device buffers etc.

4)Information Maintenance

These system calls handle information and its transfer between the operating system and the user program.

5)Communication

These system calls are useful for interprocess communication. They also deal with creating and deleting a communication connection.

2

Define operating system and list out the function and component of operating system.

//components aur functions tha definition likhne ka mn kare to likhna nhi too bss list likh do.....

An Operating System (OS) is an interface between a computer user and computer hardware. An operating system is a software which 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.

Some popular Operating Systems include Linux Operating System, Windows Operating System etc.

some of important functions of an operating System are:-

- Memory Management

=>Memory management refers to management of Primary Memory or Main Memory. Main memory is a large array of words or bytes where each word or byte has its own address.

- Processor Management

=> An Operating System does the following activities for processor management –

- Keeps tracks of processor and status of process. The program responsible for this task is known as **traffic controller**.
- Allocates the processor (CPU) to a process.
- De-allocates processor when a process is no longer required.

- Device Management

  => An Operating System manages device communication via their respective drivers.

- File Management

  => A file system is normally organized into directories for easy navigation and usage. These directories may contain files and other directions.

- Security

  => By means of password and similar other techniques, it prevents unauthorized access to programs and data.

- Control over system performance

  => Recording delays between request for a service and response from the system.

- **Job accounting**

  =>Keeping track of time and resources used by various jobs and users.

  Error detecting aids

  = >Production of dumps, traces, error messages, and other debugging and error detecting aids.

- **Coordination between other softwares and users**

=> Coordination and assignment of compilers, interpreters, assemblers and other software to the various users of the computer systems.

Components of Operating System

The components of an operating system play a key role to make a variety of computer system parts work together. The operating components are

1 Kernel

The kernel in the OS provides the basic level of control on all the computer peripherals.

2 Process Execution

The OS gives an interface between the hardware as well as an application program so that the program can connect through the hardware device by simply following procedures & principles configured into the OS

3 Interrupt

In the operating system, interrupts are essential because they give a reliable technique for the OS to communicate & react to their surroundings.

4 Memory Management

The functionality of an OS is nothing but memory management which manages main memory & moves processes backward and forward between disk & main memory during implementation.

5 Multitasking

It describes the working of several independent computer programs on a similar computer system. Multitasking in an OS allows an operator to execute one or more computer tasks at a time

6 Networking

Networking can be defined as when the processor interacts with each other through communication lines. The design of communication-network must consider routing, connection methods, safety, the problems of opinion & security.

7 Security

If a computer has numerous individuals to allow the immediate process of various processes, then the many processes have to be protected from other activities.

8 User Interface

A GUI or user interface (UI) is the part of an OS that permits an operator to get the information. A user interface based on text displays the text as well as its commands which are typed over a command line with the help of a keyboard.

A

What do you mean by a Process? How it differs from a Program? Explain the structure of a Process Control Block.

The term process (Job) refers to program code that has been loaded into a computer's memory so that it can be executed by the central processing unit (CPU). A process can be described as an instance of a program running on a computer or as an entity that can be assigned to and executed on a processor. A program becomes a process when loaded into memory and thus is an active entity.

Difference between Program and Process :

1.	Program contains a set of instructions designed to complete a specific task.	Process is an instance of an executing program.
2.	Program is a passive entity as it resides in the secondary memory.	Process is a active entity as it is created during execution and loaded into the main memory.
3.	Program exists at a single place and	Process exists for a limited span of time as

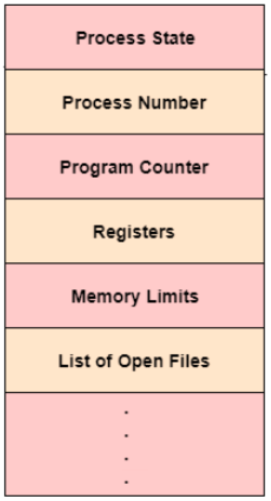
	continues to exist until it is deleted.	it gets terminated after the completion of task.
4.	Program is a static entity.	Process is a dynamic entity.
5.	Program does not have any resource requirement, it only requires memory space for storing the instructions.	Process has a high resource requirement, it needs resources like CPU, memory address, I/O during its lifetime.
6.	Program does not have any control block.	Process has its own control block called Process Control Block.

Process Control Block is a data structure that contains information of the process related to it. The process control block is also known as a task control block, entry of the process table, etc.

It is very important for process management as the data structuring for processes is done in terms of the PCB. It also defines the current state of the operating system.

Structure of the Process Control Block

The process control stores many data items that are needed for efficient process management. Some of these data items are explained with the help of the given diagram –



Process Control Block (PCB)

The following are the data items –

Process State

This specifies the process state i.e. new, ready, running, waiting or terminated.

Process Number

This shows the number of the particular process.

Program Counter

This contains the address of the next instruction that needs to be executed in the process.

Registers

This specifies the registers that are used by the process. They may include accumulators, index registers, stack pointers, general purpose registers etc.

List of Open Files

These are the different files that are associated with the process

CPU Scheduling Information

The process priority, pointers to scheduling queues etc. is the CPU scheduling information that is contained in the PCB. This may also include any other scheduling parameters.

Memory Management Information

The memory management information includes the page tables or the segment tables depending on the memory system used. It also contains the value of the base registers, limit registers etc.

I/O Status Information

This information includes the list of I/O devices used by the process, the list of files etc.

Accounting information

The time limits, account numbers, amount of CPU used, process numbers etc. are all a part of the PCB accounting information.

Location of the Process Control Block

The process control block is kept in a memory area that is protected from the normal user access. This is done because it contains important process information. Some of the operating systems place the PCB at the beginning of the kernel stack for the process as it is a safe location.

B

Differentiate between long term scheduler and short term scheduler. What is the purpose of medium term scheduler?

Difference Between Long-Term and Short-Term Scheduler:

1.	Long-Term Scheduler takes the process from job pool.	Short-Term Scheduler takes the process from ready queue.
2.	Long-Term Scheduler is also known as **Job Scheduler**.	Short-Term Scheduler is also known as **CPU Scheduler**.
3.	In Long-Term Scheduler, the programs are setup in the queue and as per the requirement the best one job is selected.	In Short-Term Scheduler no such queue is exist.
4.	It regulates the more DOM (Degree of Multi-programming).	It regulates the less DOM (Degree of Multi-programming).
5.	It regulates the programs which are selected to system for processing.	It ensures which program is suitable or important for processing.

6.	Speed is less than the short-term scheduler.	Speed is very fast as compared to long-term scheduler.
7.	Long-Term Scheduler changes the process state from **New** to **Ready**.	Short-Term Scheduler changes the process state from **Ready** to **Running**.
8.	Time-sharing operating systems have no long-term scheduler.	It may be minimal in time-sharing system.
9.	It select a good process, mix of I/O bound and CPU bound.	It select a new process for a CPU quite frequently.

A

Describe message passing and shared memory technique in IPC system.

1. Shared Memory Model :

In this IPC model, a shared memory region is established which is used by the processes for data communication. This memory region is present in the address space of the process which creates the shared memory segment.The processes who want to communicate with this process should attach this memory segment into their address space.

2. Message Passing Model :

In this model, the processes communicate with each other by exchanging messages. For this purpose a communication link must exist between the processes and it must facilitate at least two operations send (message) and receive (message). Size of messages may be variable or fixed.

B

Describe briefly about different types of operating system

An Operating System performs all the basic tasks like managing file,process, and memory. Thus operating system acts as manager of all the resources, i.e. **resource manager**. Thus operating system becomes an interface between user and machine.

Types of Operating Systems: Some of the widely used operating systems are as follows-

1. Batch Operating System –

This type of operating system does not interact with the computer directly. There is an operator which takes similar jobs having same requirement and group them into batches. It is the responsibility of operator to sort the jobs with similar needs.

2Time-SharingOperatingSystems:-

Each task is given some time to execute, so that all the tasks work smoothly. Each user gets time of CPU as they use single system. These systems are also known as Multitasking Systems. The task can be from single user or from different users also. The time that each task gets to execute is called quantum.

3.DistributedOperatingSystem –

These types of operating system is a recent advancement in the world of computer technology and are being widely accepted all-over the world and, that too, with a great pace. Various autonomous interconnected computers communicate each other using a shared communication network. Independent systems possess their own memory unit and CPU.

4.NetworkOperatingSystem –

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

5. Real-Time Operating System –

These types of OSs serves the real-time systems. The time interval required to process and respond to inputs is very small. This time interval is called **response time**.

Explain briefly about the services of operating system.

A

An Operating System provides services to both the users and to the programs.

- It provides programs an environment to execute.
- It provides users the services to execute the programs in a convenient manner.

Following are a few common services provided by an operating system –

- Program execution

  => Operating systems handle many kinds of activities from user programs to system programs like printer spooler, name servers, file server, etc. Each of these activities is encapsulated as a process.

- I/O operations

=> An I/O subsystem comprises of I/O devices and their corresponding driver software. Drivers hide the peculiarities of specific hardware devices from the users.

- File System manipulation

  => A file represents a collection of related information. Computers can store files on the disk (secondary storage), for long-term storage purpose. Examples of storage media include magnetic tape, magnetic disk and optical disk drives like CD, DVD. Each of these media has its own properties like speed, capacity, data transfer rate and data access methods.Communication

- Error Detection

  => Errors can occur anytime and anywhere. An error may occur in CPU, in I/O devices or in the memory hardware. Following are the major activities of an operating system with respect to error handling –

- Resource Allocation

  => In case of multi-user or multi-tasking environment, resources such as main memory, CPU cycles and files storage are to be allocated to each user or job

- Protection

=> Considering a computer system having multiple users and concurrent execution of multiple processes, the various processes must be protected from each other's activities.

B

Describe the structure of operating system.

The operating system sits somewhere between the hardware and other software. To ensure smooth administration, the operating system is structured differently than most other programs. Usually, the systems consist of different layers. The base layer, the one furthest removed from the user interface, is at the core of the OS and is its most important element. That's why this part is usually loaded first. The core presents a direct interface to the hardware, because it initializes and passes on commands between programs and the hardware.

All other layers are assembled on top of the core element and are progressively removed from interacting with the hardware. Each level communicates with the layer above or below it. At the top is the **user interface** which presents the interface between the user and the software. When a user executes a task, the command is transmitted through the different layers until it reaches the correct one, for example, the processor.