Operating System

(A)

1. **What is an Operating system?**
   Ans.
   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.

2. **Write the components of operating system.**
   Ans.
   An operating system consists of the following components:

   - Management of processes
   - File Administration
   - Network Management
   - Main Memory Management
   - Management of Secondary Storage
   - Management of I/O Devices
   - Security Management
   - Command Interpreter System

3. **What is a distributed system? Explain why distributed system are desirable?**
   Ans.
   Distributed System:
   Distributed System is a collection of autonomous computer systems that are physically separated but are connected by a centralized computer network that is equipped with distributed system software. The autonomous computers will communicate among each system by sharing resources and files and performing the tasks assigned to them.
   Example:
   Telephone and cellular networks are also examples of distributed networks.

   Distributed system's desirability:
   Distributed systems offer a number of advantages over monolithic, or single, systems, including:

   Greater flexibility: It is easier to add computing power as the need for services grows. In most cases today, you can add servers to a distributed system on the fly.
   Reliability: A well-designed distributed system can withstand failures in one or more of its nodes without severely impacting performance. In a monolithic system, the entire application goes down if the server goes down.
   Enhanced speed: Heavy traffic can bog down single servers when traffic gets heavy, impacting performance for everyone. The scalability of distributed databases and other distributed systems makes them easier to maintain and also sustain high-performance levels.
   Geo-distribution: Distributed content delivery is both intuitive for any internet user, and vital for global organizations.

That's why, **distributed system are desirable.**
4. **Classify operating system? Describe multiprogramming and time sharing operating system.**
   Ans.
   Operating systems can be classified as follows:

   i.   **Multi-user:** is the one that concede two or more users to use their programs at the same time. Some of O.S permits hundreds or even thousands of users simultaneously.
   ii.   **Single-User:** just allows one user to use the programs at one time.
   iii. **Multiprocessor:** Supports opening the same program more than just in one CPU.
   iv.   **Multitasking:** Allows multiple programs running at the same time.
   v.   **Single-tasking**: Allows different parts of a single program running at any one time.
   vi.   **Real time**: Responds to input instantly. Operating systems such as DOS and UNIX, do not work in real time.

   Multiprogramming Operating System:
   In the multi-programming system, one or multiple programs can be loaded into its main memory for getting to execute. Main objective of multiprogramming is to manage entire resources of the system. Multiprogramming operating system has ability to execute multiple programs with using of only one processor machine . One example is User can use MS-Excel , download apps, transfer data from one point to another point, Firefox or Google Chrome browser, and more at a same time.
   Time-Sharing Operating System:
   Time-Sharing Operating System requires high specification hardware and uses lots of resources. CPU idle time is reduced in Time-sharing operating system. Reliability, Data mixing, and communication are some problems faced in Time-sharing operating systems. UNIX and LINUX are examples of Time-sharing operating systems.
5. **Discuss the functions of operating system.**
   Ans.
6. **What do you understand by user mode and kernel mode of operations?**
   Ans.
   User Mode: When a Program is booted up on an Operating system let's say windows, then it launches the program in user mode. And when a user-mode program requests to run, a process and virtual address space (address space for that process) is created for it by windows. User-mode programs are less privileged than user-mode applications and are not allowed to access the system resources directly. For instance, if an application under user-mode wants to access system resources, it will have to first go through the Operating system kernel by using syscalls.

   Kernel Mode: The kernel is the core program on which all the other operating system components rely, it is used to access the hardware components and schedule which processes should run on a computer system and when, and it also manages the application software and hardware interaction. Hence it is the most privileged program, unlike other programs it can directly interact with the hardware. When programs running under user mode need hardware access for example webcam, then first it has to go through the kernel by using a syscall, and to carry out these requests the CPU switches from user mode to kernel mode at the time of

execution. After finally completing the execution of the process the CPU again switches back to the user mode.
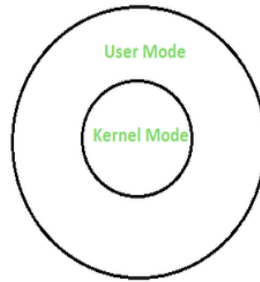
7. **Why we build distributed system.4-10.**
   Ans.
8. **What is the main advantage of multiprogramming.-3-10.**
   Ans.
   Advantages of Multiprogramming :

   - CPU never becomes idle
   - Efficient resources utilization
   - Response time is shorter
   - Short time jobs completed faster than long time jobs
   - Increased Throughput

9. **What is the difference between multiprogramming and multiprocessing?**
   Ans.

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.

10. **Write the operating system activities in connection with memory management and storage management.**
    Ans.

The three major activities of the operating system with regard to memory management are:

- o Keeping track of which parts of memory are currently being used and by whom
- o Deciding which processes are to be loaded into memory when memory space becomes available
- o Allocating and deallocating memory space as needed

The three major activities of the operating system with regard to secondary storage management are:

- o Free space management
- o Storage allocation
- o Disk scheduling

11. **What are the purpose of an operating system?**
Ans.
An operating system has three main functions:
(1) Manage the computer's resources, such as the central processing unit, memory, disk drives, and printers.
(2) Establish a user interface.
(3) Execute and provide services for applications software.

12. **Explain the reasons for building distributed systems.**
Ans.
4 Key Reasons for building Distributed Systems.
i. Resource Sharing ·
ii. Computation Speedup.
iii. Reliability ·
iv. Communication.

Resource sharing:
Resource sharing means that the existing resources in a distributed system can be accessed or remotely accessed across multiple computers in the system. Computers in distributed systems shares resources like hardware (disks and printers), software (files, windows and data objects) and data.
Computation Speedup:
A distributed system allows us to distribute the sub-computations among the various sites. These sub-computations can be run concurrently and thus provide computation speedup because the same task gets distributed to various computers and ultimately load get distributed and computation becomes faster.
Reliability:
Reliability denotes the ability of a distributed system to deliver its services even when one or several of its software of hardware components fail.
Communication:
Communication between processes and objects in a distributed system is performed by message passing. through request and reply messages. The system is structured as a group of processes (objects), called servers, that deliver services to clients.

(B)

1. **What do you mean by job and process?**

   Ans.

   Job:

   Job means an application program and it is not a system program.

   For example, a job could be the running of an application program such as a weekly payroll program.
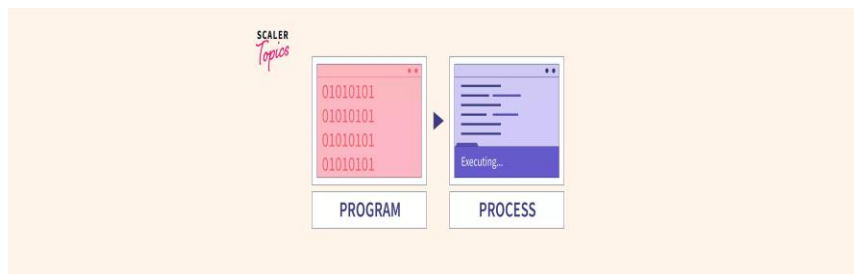
   Process:

   A process refers to a program under execution. This program may be an application or system program.

   For example, when you want to search something on web then you start a browser. So, this can be process.

2. **Define process and program.**

   Ans.

   Process:

   A process is an active instance of the program which is started when the program is executed

   Program:

   A program is a passive entity that contains the set of codes required to perform a certain task.

   Once a program is executed, a process is started by the program. The process executes the instructions written in the program.

3. **What are the activities of process management?**

   Ans.

   The five major activities of the operating system with regard to process management are:

   - The creation and deletion of both user and system processes
   - The suspension and resumption of processes
   - The provision of mechanisms for process synchronization
   - The provision of mechanisms for process communication
   - The provision of mechanisms for deadlock handling

4. **Describe different status of a process.**

   Ans.

The process executes when it changes the state. The state of a process is defined by the current activity of the process.

Each process may be in any one of the following states –

- **New** – The process is being created.

- **Running** – In this state the instructions are being executed.
- **Waiting** – The process is in waiting state until an event occurs like I/O operation completion or receiving a signal.
- **Ready** – The process is waiting to be assigned to a processor.
- **Terminated** – the process has finished execution.

5. **Briefly write the activities of operating system in connection with process management.**
   Ans.

   The five major activities of the operating system with regard to process management are:

   - The creation and deletion of both user and system processes
   - The suspension and resumption of processes
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   - The provision of mechanisms for deadlock handling

6. **Describe process control blocks.**
   Ans.
   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.

| Process State |
| Process Number |
| Program Counter |
| Registers |
| Memory Limits |
| List of Open Files |
| . . . . |

Process Control Block (PCB)

7. **Define process. What are possible states of process.**
   Ans.
   A process is an active instance of the program which is started when the program is executed. The process executes when it changes the state. The state of a process is defined by the current activity of the process.
   Each process may be in any one of the following states –

- **New** – The process is being created.
- **Running** – In this state the instructions are being executed.
- **Waiting** – The process is in waiting state until an event occurs like I/O operation completion or receiving a signal.
- **Ready** – The process is waiting to be assigned to a processor.
- **Terminated** – the process has finished execution.

8. Define context switch.

    Ans.

    Context Switch involves storing the context or state of a process so that it can be reloaded when required and execution can be resumed from the same point as earlier. This is a feature of a multitasking operating system and allows a single CPU to be shared by multiple processes.

9. **Define process. Draw the process state diagram and explain it.**

    Ans.

    Process:

    A process is an active instance of the program which is started when the program is executed.

    The process executes when it changes the state. The state of a process is defined by the current activity of the process.

    A process changes its state during its execution. Each process may be in one of the following states:

    i.   **New:** when a new process is being created.
    ii.   **Running:** A process is said to be in running state when instructions are being executed.
    iii.   **Waiting:** The process is waiting for some event to occur (such as an I/O operation).
    iv.   **Ready:** The process is waiting for processor.
    v.   **Terminated:** The process has finished execution.
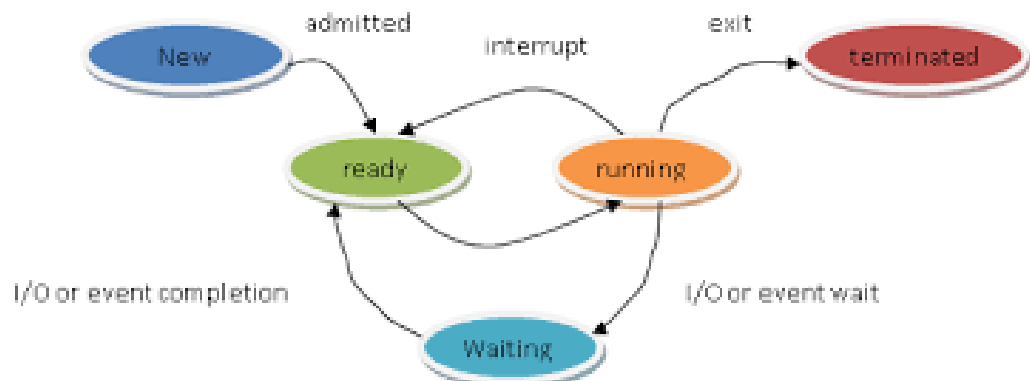
10. **.What is the difference between short term, medium term and long term scheduler.**

    Ans.

S. No.	Long-Term Scheduler	Short-Term Scheduler	Medium-Term Scheduler
1	It is a Job Scheduler	It is a CPU Scheduler	It is a process swapping scheduler
2	It takes process from the job pool	It takes process from the ready state	It takes process from running or wait/dead state
3	Its speed is lesser than short-term scheduler	It is fastest among the two other schedulers	Its speed is in between long-term and short-term
4	It controls the degree of multiprogramming	It has less control over the degree of multiprogramming	It reduces the degree of multiprogramming

11. Write the reasons of process cooperation.
Ans.

12. What are the difference between process and thread.
Ans.

Process	Thread
A process is the instance of a program executed by one or many threads.	A thread is a basic unit of CPU utilisation, which consists of its own thread ID, a program counter, a register and a stack.
A process may contain multiple threads depending on the operating system.	A thread is the smallest unit of execution within a process.
In a multiprocessing environment, multiple processes do not share resources such as memory with each other.	Multiple threads of a given process running concurrently can share resources such as memory with each other.
Processes take more time for context switching.	Threads take less time for context switching.
Processes take more time for creation and termination.	Threads take lesser time for creation and termination.
Processes consume more resources.	Threads consume fewer resources.
No other process can execute until the first process gets unblocked.	Another thread in the same task can run while one thread is blocked and waiting.
Process communication is complex.	Thread communication is much easier and efficient.

13. What do you mean by thread? Is there any advantage of thread over process?
Ans.
Thread:
A thread is a single sequential flow of control within a program. The real excitement surrounding threads is not about a single sequential thread. Rather, it's about the use of multiple threads running at the same time and performing different tasks in a single program.

Advantage of thread over process :

Unlike processes, threads share data and information. They do, however, have their own stack.

We can create more than one thread by using just one system call. To further simplify things, thread management requires few or even no system calls because we don't need extra mechanisms such as IPC to maintain communication between threads.

14. **Write the operations that perform operating system on process.**
    Ans.

15. **Explain the situation when CPU switches from a process to another process.**
    Ans.