

Ques 1) What is an Operating System & Types of OS?

→ An operating system is a software that act as an interface between computer hardware & user application. It manages the resources and provide services for the efficient and secure execution of programs.

Eg. Windows, MacOS, Linux, ~~etc~~, RTOS, etc.

Ques 2) Program vs Threads vs Process

→ Program - A program is a set of instruction written in a programming language that performs a specific task.

Process - A process is an instance of a program in execution.

Thread - A thread is a unit of execution within a process.

Ques 3) Difference between Multiprogramming, Multiprocess, Multitasking and Multithreading?

→ Multiprocess - It refers to the execution of multiple processes on a system with multiple CPUs or CPU cores.

Multithreading - It involves executing multiple threads within a single process.

Multiprogramming - It is a technique where multiple programs are loaded into memory simultaneously.

~~Ques 4~~ Multitasking - It is a technique that allows multiple tasks or processes to run concurrently on a single CPU.

Ques 4) CPU scheduling Algorithms
→ These are used by the OS to determine the order in which processes are executed on the CPU.

- 1) First-Come, First Served (FCFS) - the process that arrives first ^{is} is executed first.
- 2) Shortest ~~Job~~ Job Next (SJN) or Shortest Job First (SJF) :- SJN or SJF scheduling select the process with the shortest total execution time next.
- 3) Round Robin - Round Robin is a serving scheduling algorithm that assigns a fixed time quantum to each process in a circular manner.
- 4) Priority Scheduling - It assigns a priority value to each process, and the CPU is allocated with the highest priority.
- 5) Multilevel Queue Scheduling :- Multilevel queue scheduling divides the ready queue into multiple priority queues, each with its own scheduling algorithm.

Process Synchronization

Ques 5) What is critical section problem?

→ The critical section represents a portion of code or block where a process or thread accessed a shared resource, such as file or database.

Ques 6) What is Process Synchronization?

→ Multiple processes or threads working on a different task simultaneously. Process synchronization ensure that they cooperate and communicate effectively to avoid conflicts and ensures proper order of execution.

Key requirements of synchronization mechanism:-

- 1) Mutual exclusion
- 2) Progress (at least one at a time)
- 3) Bounded waiting

Ques 7) Process Synchronization Mechanisms?

1) Locks/Mutexes: locks or mutexes (mutual exclusion) provide a ~~very~~ simple and effective way to achieve mutual exclusion. They allow only one process or thread to acquire a lock ~~at~~ at a time, ensuring ~~exclusive~~ exclusive access to a shared resource or critical section.

2) Semaphores:- They can be implemented as binary semaphores or counting semaphores.

Semaphores provide mechanism for mutual exclusion, signalling and coordination.

3) Read-write locks: where multiple readers can read simultaneously access a resource without a conflict but it is not for write locks.

Ques 8) What is Deadlock?

→ It is a situation in which more than one process is blocked because it is holding a resource and also require some resources that is acquired by some other process.

Necessary conditions for Deadlocks:-

- Mutual Exclusion:- It implies that two processes can't use the same resource at the same time.
- Hold & Wait:- A process waits for some resources while holding another resource at the same time.
- No preemption:- The process once scheduled will be executed till the completion.
- Circular wait:- All the processes must be waiting for the resources in a cyclic manner.

Ques 9) Deadlock Handling Techniques? (RTOS)

→ 1) Deadlock prevention:- to avoid any one condⁿ.

- 2) Deadlock Avoidance :- Same as previous, 'banker's' algorithm.
- 3) Deadlock Detection :- periodically examining the resource allocation state to determine if a deadlock has occurred.
- 4) Deadlock Recovery :- used to recover from a deadlock once it has been detected.
- 5) Deadlock Ignorance :- Some system choose to ignore the problem of deadlock entirely.

Ques 10) What is memory management?

→ The functionality of an OS which handles or manages primary memory and moves processes back and forth between main memory & disk during execution.

Two approaches used in memory management:

- 1) Fixed Partitioning :- memory is divided into fixed sized portions of blocks and each portion is assigned to a specific task/process or task.
- 2) Dynamic Partitioning :- dynamically stored.

Ques 11) Partitions and Memory Allocation?

→ First Fit :- It allocates the first available memory block that is large enough to

accommodate the process.

Best Fit: - The best fit algorithm searches for the smallest available memory block that is large enough to accommodate the process.

Worst Fit: - largest available memory block is given to the process.

Ques 12) What is Paging?
→ It is a storage mechanism used in OS to retrieve processes from secondary storage to the main memory as pages.

Ques 13) What is virtual memory?
→ It creates an imaginary memory space by combining physical memory (RAM) and second storage (like a hard disk). When a program needs more memory than actual, it temporarily moves some data to the secondary storage.

Ques 14) Page Replacement algorithms?

- 1) First In First Out
- 2) Optimal Page Replacement
- 3) Least Recently used.

Ques 15) What is Thrashing?

→ A phenomenon that occurs in computer systems ~~where~~ when the system spends an excessive amount of time ~~on~~ on page swapping rather than executing useful work.

Ques 16) What is Segmentation?

→ Segmentation is a memory management technique in which the memory is divided into the variable size parts.

Segmentation divides process into smaller subparts known as modules.

Ques 17) Disk Management?

→ Disk management in OS involves organizing and maintaining the data on a storage device such as hard disk or solid-state.

Ques 18) Disk Scheduling algorithms?

→ An algorithm that keeps and manages input and output requests arriving for the disk in a system.

- 1) FCFS (First-come, First served)
- 2) SSTF (Shortest seek Time First)
- 3) SCAN
- 4) C-SCAN
- 5) LOOK
- 6) C-LOOK (Circular look)

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