

**Malla Reddy College of Engineering & Technology**

(Autonomous Institution- UGC, Govt. of India)

(Affiliated to JNTUH, Hyderabad, Approved by AICTE, NBA &NAAC with ‘A’ Grade)

**Operating Systems**

**Technical Questions**

1. **What is an Operating System?**
   * An Operating System (OS) is a system software that acts as an interface between hardware and users.
2. **List and explain types of OS structures**.
   * Simple Batch: Executes batch jobs.
   * Multiprogrammed: Multiple jobs in memory.
   * Time-shared: Multiple users simultaneously.
   * Parallel: Multi-processor systems.
   * Distributed: Multiple computers.
   * Real-Time: Immediate response to events.
3. **What are the key components of an OS?**
   * Process Manager, Memory Manager, File System Manager, I/O Manager, and Security Manager.
4. **What services does the OS provide to users?**
   * Program execution, I/O operations, File management, Communication, Error detection, etc.
5. **What is the Linux operating system?**
   * Linux is a UNIX-like, open-source operating system based on the Linux kernel.
6. **List basic Linux utilities.**
   * ls, cd, pwd, mkdir, rm, cp, mv, cat, echo, grep, chmod, ps, top.
7. **Explain the Linux file system structure.**
   * Hierarchical: / is root. Common directories: /bin, /etc, /home, /usr, /var, /tmp.
8. **What is a kernel in Linux?**
   * The core part of Linux, managing system resources.
9. **Explain runlevels in Linux.**
   * Runlevels define system states (e.g., 0: halt, 1: single-user, 3: multi-user, 5: GUI, 6: reboot).
10. **What are inode and superblock?**

* Inode: Stores metadata of a file. Superblock: Contains file system information.

1. **What is a Shell in Linux?**

* A command-line interface to interact with OS.

1. **Types of Shells?**

* sh, bash, csh, ksh, zsh.

1. **Write a simple shell script to print your name.**

#!/bin/bash

echo "My name is ABC"

1. **Explain process states in OS.**

* New, Ready, Running, Waiting, Terminated.

1. **What are threads?**

* Lightweight subprocesses sharing the same address space.

1. **What are the scheduling criteria?**

* CPU utilization, throughput, turnaround time, waiting time, response time.

1. **Describe FCFS scheduling.**

* Processes are scheduled in the order of arrival.

1. **Describe SJF scheduling.**

* Shortest Job First: Executes job with the smallest burst time.

1. **Explain Round Robin scheduling.**

* Each process gets a time slice (quantum).

1. **What is context switching?**

* Saving and loading the state of a process during multitasking.

1. **Define deadlock.**

* A condition where processes wait forever for resources.

1. **What are the necessary conditions for deadlock?**

* Mutual Exclusion, Hold & Wait, No Preemption, Circular Wait.

1. **Deadlock prevention methods?**

* Eliminate one of the necessary conditions.

1. **Deadlock avoidance?**

* Banker's Algorithm.

1. Deadlock detection and recovery?

* Use wait-for graphs. Kill or rollback processes.

1. **What is a critical section?**

* A part of code accessing shared resources.

1. **What is a semaphore?**

* A synchronization tool using wait() and signal().

1. **Classical problems of synchronization?**

* Producer-Consumer, Dining Philosophers, Readers-Writers.

1. **What is a monitor?**

* A high-level synchronization construct.

1. **Give an example of synchronization using semaphore.**

semaphore s = 1;

wait(s);

// critical section

signal(s);

1. **What is IPC?**

* Mechanisms for communication between processes.

1. **Types of IPC mechanisms?**

* Pipes, Message Queues, Shared Memory, Sockets.

1. **What are pipes and FIFOs?**

* Pipes: temporary, unidirectional. FIFO: named pipes.

1. **How is shared memory used in Linux?**

* Via shmget(), shmat(), shmdt().

1. **Logical vs Physical Address space?**

* Logical: generated by CPU. Physical: address in RAM.

1. **What is paging?**

* Memory is divided into fixed-size pages and frames.

1. **Segmentation?**

* Divides memory into variable-length segments.

1. **Page replacement algorithms?**

* FIFO, LRU, Optimal.

1. **Explain demand paging.**

* Pages are loaded only when referenced.

1. **What is thrashing?**

* Excessive page replacement reducing CPU efficiency.

1. **Access methods for files?**

* Sequential, Direct, Indexed.

1. **Directory structures?**

* Single-level, Two-level, Tree, Acyclic Graph, General Graph.

1. **What is protection in OS?**

* Prevent unauthorized access.

1. **Explain system calls for file I/O.**

* open(), read(), write(), close(), lseek(), stat().

1. **What is inode in file system?**

* Stores metadata like size, permissions, timestamps.

1. **File allocation methods?**

* Contiguous, Linked, Indexed.

1. **What is ioctl() system call?**

* Device-specific input/output operations.

1. **Disk scheduling algorithms?**

* FCFS, SSTF, SCAN, C-SCAN.

1. **Explain SCAN disk scheduling.**

* Elevator algorithm: moves in one direction and services all requests.

1. **What is file system structure?**

* Logical storage of files: boot block, superblock, inode table, data blocks.