

Model Question Paper: Operating System (30 Marks)

Q.1 a)

Define the term "Operating System". (2 Marks)

An Operating System (OS) is a software that acts as an interface between the computer hardware and the computer user. It manages hardware resources and provides essential services for computer programs.

Q.1 b)

Explain the difference between a process and a thread. (2 Marks)

A process is an instance of a program in execution, while a thread is a smaller unit of a process that can be scheduled and executed independently.

Q.1 c)

Describe the functions of an operating system in a computer system. (4 Marks)

The functions of an operating system include:

- **Process management:** Ensures that processes are scheduled and executed correctly.
- **Memory management:** Allocates and deallocates memory space to processes.
- **File system management:** Manages files, directories, and access permissions.
- **Device management:** Controls input/output devices like printers, displays, etc.
- **Security and access control:** Protects system resources from unauthorized access.

Q.1 d)

What is the role of a kernel in an operating system? (2 Marks)

The kernel is the core part of the operating system that manages the system's resources, such as the CPU, memory, and devices. It acts as a bridge between applications and hardware.

Q.2 a)

Discuss the concept of memory management in an operating system. What are the different types of memory allocation techniques? (4 Marks)

Memory management in an OS refers to the process of controlling and coordinating computer memory, which includes the allocation and deallocation of memory to various processes. Types of memory allocation include:

- **Contiguous allocation:** Memory is allocated in a continuous block.
- **Paged allocation:** Memory is divided into small, fixed-size blocks called pages.
- **Segmented allocation:** Memory is divided into segments of different sizes.

Q.2 b)

What is a deadlock in an operating system? Briefly explain any one method to prevent deadlock. (2 Marks).

A **deadlock** occurs when two or more processes are unable to proceed because each is waiting for the other to release resources. One way to prevent deadlock is by using the **Banker's algorithm**, which checks for safe resource allocation before granting resources to processes.

Q.2 c)

Differentiate between logical and physical address space. (2 Marks)

Logical address space is the address generated by the CPU during a program's execution, whereas **physical address space** refers to the actual location in the memory hardware.

Q.2 d)

What is a system call in the context of an operating system? (2 Marks)

A **system call** is a mechanism that allows a program to request services from the operating system's kernel, such as file operations or process management.

Q.3 a)

What are the various types of file systems used in modern operating systems? Explain any two. (4 Marks)

Common types of **file systems** include:

- **FAT32**: A file system that supports large volumes but has file size limitations.
- **NTFS**: A modern file system with support for large files, file permissions, and other features.
- **ext4**: A file system commonly used in Linux-based systems.

Q.3 b)

Explain the concept of scheduling in operating systems. What are the different types of CPU scheduling algorithms? (4 Marks)

CPU scheduling refers to the method used by an operating system to allocate the CPU to various processes. Common CPU scheduling algorithms include:

- **First-Come-First-Serve (FCFS)**: The first process to arrive gets executed first.
- **Round Robin (RR)**: Processes are assigned time slices in a cyclic order.
- **Shortest Job Next (SJN)**: The process with the shortest execution time is executed next.

Q.3 c)

What is the significance of virtual memory in an operating system? (2 Marks)

Virtual memory allows a computer to compensate for physical memory shortages by temporarily transferring data from random access memory (RAM) to disk storage. It enables the system to run larger programs than what would be possible with only the available physical memory.