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| **SESSION** | **FEB-MARCH 2025**  |
| **PROGRAM** | **MASTERS OF COMPUTER APPLICATIONS (MCA)** |
| **SEMESTER** | **II** |
| **COURSE CODE & NAME** | **DCA 6208 OPERATING SYSTEMS**  |
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**Set-I**

**Q1. Explain the concept of context switching and why is it necessary? Also discuss the main steps involved in process creation? 10**

**Ans 1.**

**Context Switching in Operating Systems**

Context switching is the process through which an operating system switches the CPU from executing one process to another. Each process has its own state, and context switching saves the current state of the running process so that it can be resumed later and loads the state of the new process to be executed. This transition allows multitasking, where multiple processes can be managed by a single CPU efficiently.

**Why Context Switching is Necessary**

Context switching is essential in a multitasking environment where many processes share the

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**Q2. Discuss all the CPU scheduling algorithms. 10**

**Ans 2.**

**CPU Scheduling**

CPU scheduling is the process of determining which process in the ready queue should be assigned to the CPU next. The choice of scheduling algorithm can significantly impact system performance in terms of throughput, CPU utilization, response time, and waiting time.

**First-Come, First-Served (FCFS) Scheduling**

This is the simplest scheduling algorithm, where the process that arrives first is executed first. It

**Q3. Describe the role of semaphores in process synchronization with an example. 10**

**Ans 3.**

**Process Synchronization**

Process synchronization is required when multiple processes access shared resources like memory or files. Without proper coordination, it may lead to race conditions, inconsistent data, or deadlocks. Semaphores are synchronization tools that help manage concurrent processes in a controlled manner.

**Definition of Semaphores**

A semaphore is an integer variable used to signal whether a resource is available or not. It is

the backbone of synchronization in modern operating systems.

**Set-II**

**Q4. Discuss the benefits of using virtual machines. Provide examples of virtual machine use case. 10**

**Ans 4.**

**Virtual Machines**

A virtual machine (VM) is a software-based emulation of a physical computer system. It allows multiple operating systems to run on a single physical machine by abstracting hardware components. Virtual machines use a hypervisor to manage resource allocation between the host system and the guest systems, making them highly flexible and efficient.

**Benefits of Using Virtual Machines**

One of the major benefits of virtual machines is hardware independence. VMs allow users to run

**Q5. Given a reference string 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2 and a memory with 3 frames, simulate the FIFO and LRU page replacement algorithm and determine the number of page faults. 10**

**Ans 5.**

**Page Replacement in Memory Management**

In operating systems, page replacement algorithms are used when a page that is needed is not present in memory, and there is no empty frame available. In such cases, one of the existing pages must be replaced. Two of the most common page replacement strategies are FIFO (First-In-First-Out) and LRU (Least Recently Used). These algorithms help the OS decide which page

**Q6. What is a firewall, and how does it protect systems and networks? Describe different types of firewalls. 10**

**Ans 6.**

**Firewalls in System Security**

A firewall is a security system designed to monitor and control incoming and outgoing network traffic based on predetermined security rules. It acts as a barrier between trusted internal networks and untrusted external networks such as the Internet. Firewalls help in preventing unauthorized access, data breaches, and cyber-attacks by filtering traffic.

**How Firewalls Protect Systems and Networks**

Firewalls operate by analyzing data packets and applying rules to determine whether the traffic