K M M INSTITUTE OF POSTGRADUATE STUDIES ::TIRUPATI
(Affiliated to S.V.University, Tirupati & Affiliated to AICTE, New Delhi)
MCA I SEMESTER / PRE-FINAL/OPERATING SYSTEM

A

Time: 3hrs **Max.Marks: 70**

PART – A

Answer any FIVE questions **5 X 4 = 20**

1: Define a Kernel and differentiate between its two main types: Monolithic and Microkernel.
2: What is a Process Control Block (PCB)? List at least four essential pieces of information it stores for the operating system.
3: State the four necessary conditions that must simultaneously hold for a Deadlock to occur in a system.
4: Explain the concept of Virtual Memory and how it allows programs to execute even if they are larger than the physical RAM.
5: Define Seek Time and Rotational Latency in the context of disk scheduling and overall storage performance
6. Define the **CIA Triad** (Confidentiality, Integrity, and Availability) and explain how a breach of availability (e.g., Denial of Service) impacts a system.
7. Differentiate between a **Trojan Horse** and a **Trapdoor**. How does a trapdoor provide unauthorized access?

PART – B

Answer FIVE Questions choosing one from each Unit **5 X 10 = 50**

Unit 1

1. a) What is an Operating System? List its two primary viewpoints (User vs. System).
b) Explain the various Operating System services and discuss the evolution of OS from Batch systems to Distributed systems.

2. a) Define a System Call. List the five major categories of system calls.
b) Compare and contrast Monolithic, Layered, and Microkernel OS architectures with appropriate diagrams.

Unit 2

3. a) What is a Process Control Block (PCB)? Mention at least four pieces of information it contains.
b) Explain the five states of a process (New, Ready, Running, Waiting, Terminated) and draw the state transition diagram.

4. a) Differentiate between Preemptive and Non-Preemptive scheduling.
b) Given a set of processes with arrival and burst times, illustrate the Round Robin (RR) and Shortest Job First (SJF) scheduling algorithms using a Gantt chart.

Unit 3

5. a) Define the Critical Section Problem and state the three requirements for its solution.
b) Explain the Producer-Consumer Problem and show how it can be solved using Semaphores.

6.a) List the four necessary conditions for a Deadlock to occur.
b) Describe the Banker's Algorithm for deadlock avoidance with a practical example.

Unit 4

7. a) Differentiate between Internal and External fragmentation.
b) Explain the concept of Paging in detail. How does it differ from Segmentation?.

8. a) What is Virtual Memory? Explain the role of the Page Table.
b) Define Thrashing. Explain the various Page Replacement Algorithms (FIFO, LRU, Optimal) with an example reference string.

Unit 5

9. a) Discuss User Authentication techniques in detail. Compare the security of standard passwords versus One-Time Passwords (OTP) and Multi-Factor Authentication (MFA)
b) Explain the Remote Procedure Call (RPC) mechanism. Detail the steps from the client stub calling a procedure to the server stub returning the result.

10. a) Explain the concept of Intrusion Detection Systems (IDS) and how Firewalls (e.g., Proxy or Stateful Inspection) act as a primary defense against network threats.
b) Discuss various Network Topologies (Ring, Tree, Multi-access Bus) and analyze them based on basic cost, communication cost, and reliability.

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B

Time: 3hrs **Max.Marks: 70**

PART – A

Answer any FIVE questions **5 X 4 = 20**

1: Define Spooling (Simultaneous Peripheral Operations On-Line) and explain how it differs from traditional buffering to improve CPU utilization.
2: Differentiate between a User-level thread and a Kernel-level thread, specifically regarding their management and visibility to the operating system.
3: Explain the Bounded-Buffer problem (also known as the Producer-Consumer problem) and the role of semaphores in preventing buffer overflow and underflow.
4: What is the Memory Management Unit (MMU)? Describe its primary role in translating a logical address generated by the CPU into a physical address in RAM.
5: Define Direct Memory Access (DMA) and explain how it allows high-speed I/O devices to transfer data directly to or from memory without constant CPU intervention
6: State two primary motivations for using a Distributed OS over a centralized one, such as Resource Sharing and Fault Tolerance.
7. What is a Logic Bomb, and under what specific conditions does it typically execute its malicious function?

PART – B

Answer FIVE Questions choosing one from each Unit **5 X 10 = 50**

Unit 1

1. a) Define Dual-Mode Operation and explain the role of the Mode Bit.
b) Compare Distributed Systems and Clustered Systems, highlighting their architectural differences and advantages.

2.a) What is System Boot? Describe the role of the Bootstrap program.
b) Explain the concept of Virtual Machines. How does a Hypervisor differ from a standard OS kernel?

Unit 2

3. a) Differentiate between Long-term, Short-term, and Medium-term schedulers.
b) Explain the concept of Inter-Process Communication (IPC). Compare the Shared Memory and Message Passing models.

4. a) What is a Thread? How does it differ from a Process in terms of resource sharing?
b) Discuss Multithreading Models (Many-to-One, One-to-One, and Many-to-Many) and their impact on system performance.

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Unit 3

5. a) Define Race Condition and provide a real-world example of why it must be avoided.
b) Describe Peterson's Solution for the critical section problem. Does it work on modern multicore systems?

6. a) Explain the difference between Deadlock Prevention and Deadlock Avoidance.
b) Discuss the various methods for Deadlock Recovery once a deadlock has been detected.

Unit 4

7. a) What is a Translation Lookaside Buffer (TLB), and why is it used in paging?
b) Explain Dynamic Loading and Dynamic Linking. How do they improve memory utilization?

8. a) Define Belady's Anomaly. Which page replacement algorithm is immune to it?
b) Calculate the Effective Access Time (EAT) for a demand-paging system given specific page fault rates and memory access times.

Unit 5

9. a) Provide a detailed comparison between a Distributed Operating System (DOS) and a Network Operating System (NOS) regarding their objectives, transparency, and resource management.
b) Explain various program threats such as Viruses, Worms, and Buffer Overflows. Discuss the self-replicating nature of worms compared to the host-dependency of viruses.

10. a) Describe the role of Cryptography in system security. Differentiate between Symmetric and Asymmetric encryption and their typical use cases in securing network communication
b) Describe the mechanism of a Denial of Service (DoS) attack. Contrast it with a Distributed Denial of Service (DDoS) attack and explain the role of "zombie" systems.