Course Code: 25MC9110 **R25**

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY::PUTTUR
(AUTONOMOUS)
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code: Operating Systems (25MC9110) **Course & Branch**: MCA
Year & Sem: I-MCA & II-Sem **Regulation:** R25

UNIT –I
OPERATING SYSTEMS OVERVIEW AND SYSTEM STRUCTURES

1		Explain the Evolution of Operating Systems from early computer systems to modern operating systems.	**[L2][CO1]**	**[12M]**
2	**a)**	Illustrate how different components of computer system architecture interact in a real-world system.	**[L3][CO1]**	**[6M]**
	b)	Define an operating system and outline its primary goals.	**[L2][CO1]**	**[6M]**
3		List the different types of Operating Systems. Briefly describe each type with suitable examples.	**[L1][CO1]**	**[12M]**
4	**a)**	Define system calls and explain their purpose in an operating system.	**[L2][CO1]**	**[6M]**
	b)	Describe how a user program interacts with the operating system through system calls.	**[L2][CO1]**	**[6M]**
5		Evaluate the importance of Operating System services in modern computing environments.	**[L4][CO1]**	**[12M]**
6	**a)**	Demonstrate how an operating system manages processes and memory during execution.	**[L3][CO1]**	**[6M]**
	b)	Differentiate between various generations of operating systems and analyze their impact on computing.	**[L4][CO1]**	**[6M]**
7	**a)**	Apply the concept of system calls to demonstrate file handling operations	**[L3][CO1]**	**[6M]**
	b)	Show how process control system calls are used in program execution.	**[L3][CO1]**	**[6M]**
8	**a)**	Define system programs and explain their role in system functionality.	**[L2][CO1]**	**[6M]**
	b)	Demonstrate the use of system programs in file management or system monitoring.	**[L3][CO1]**	**[6M]**
9		Illustrate how OS services are used in executing a program.	**[L3][CO1]**	**[12M]**
10		Compare different types of user interfaces and analyze their suitability for various users.	**[L4][CO1]**	**[12M]**

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UNIT –II

PROCESS CONCEPT, MULTITHREADED PROGRAMMING AND INTER-PROCESS COMMUNICATION

<table>
<tr><td>1</td><td>a)</td><td>Define a process in an operating system.</td><td>[L2][CO2]</td><td>[3M]</td></tr>
<tr><td></td><td>b)</td><td>Demonstrate how a process moves from ready state to running state.</td><td>[L3][CO2]</td><td>[9M]</td></tr>
<tr><td>2</td><td>a)</td><td>Define Inter-Process Communication (IPC) and explain its need.</td><td>[L2][CO2]</td><td>[6M]</td></tr>
<tr><td></td><td>b)</td><td>Describe the different methods of IPC with examples.</td><td>[L2][CO2]</td><td>[6M]</td></tr>
<tr><td>3</td><td colspan="2">Illustrate how processes move among different scheduling queues during execution with a suitable diagram.</td><td>[L3][CO2]</td><td>[12M]</td></tr>
<tr><td>4</td><td colspan="2">Analyze the role of the Process Control Block (PCB) in process management. Explain how context switching occurs between processes.</td><td>[L4][CO2]</td><td>[12M]</td></tr>
<tr><td>5</td><td>a)</td><td>Define a race condition and explain when it occurs.</td><td>[L2][CO2]</td><td>[6M]</td></tr>
<tr><td></td><td>b)</td><td>What is a critical section? Explain its significance in process synchronization.</td><td>[L2][CO2]</td><td>[6M]</td></tr>
<tr><td>6</td><td colspan="2">Analyze the Dining Philosophers Problem and explain how synchronization mechanisms like semaphores or monitors can be used to solve it.</td><td>[L4][CO2]</td><td>[12M]</td></tr>
<tr><td>7</td><td colspan="2">Consider the following processes. Apply the SJF Preemptive scheduling algorithm and calculate waiting time and turnaround time for each process.
<table>
<tr><th>Process</th><th>Arrival Time</th><th>Burst Time</th></tr>
<tr><td>P1</td><td>0</td><td>7</td></tr>
<tr><td>P2</td><td>2</td><td>4</td></tr>
<tr><td>P3</td><td>4</td><td>1</td></tr>
<tr><td>P4</td><td>5</td><td>4</td></tr>
</table></td><td>[L3][CO2]</td><td>[12M]</td></tr>
<tr><td>8</td><td colspan="2">Consider the following processes. Apply the FCFS scheduling algorithm and calculate waiting time and turnaround time for each process.
<table>
<tr><th>Process</th><th>Arrival Time</th><th>Burst Time</th></tr>
<tr><td>P1</td><td>0</td><td>7</td></tr>
<tr><td>P2</td><td>2</td><td>4</td></tr>
<tr><td>P3</td><td>4</td><td>1</td></tr>
<tr><td>P4</td><td>5</td><td>4</td></tr>
</table></td><td>[L3][CO2]</td><td>[12M]</td></tr>
<tr><td>9</td><td colspan="2">Consider the following processes. Apply the PRIORITY scheduling algorithm and calculate waiting time and turnaround time for each process.
<table>
<tr><th>Process</th><th>Arrival Time</th><th>Burst Time</th><th>Priority</th></tr>
<tr><td>P1</td><td>0</td><td>10</td><td>3</td></tr>
<tr><td>P2</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>P3</td><td>2</td><td>2</td><td>4</td></tr>
<tr><td>P4</td><td>3</td><td>1</td><td>2</td></tr>
</table></td><td>[L3][CO2]</td><td>[12M]</td></tr>
<tr><td>10</td><td colspan="2">Design a solution to the Readers–Writers Problem using semaphores. Explain how mutual exclusion and synchronization are achieved.</td><td>[L3][CO2]</td><td>[12M]</td></tr>
</table>

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UNIT –III

MEMORY-MANAGEMENT STRATEGIES AND VIRTUAL MEMORY MANAGEMENT

1	**a)**	Explain the need for memory management in an operating system.	**[L2][CO3]**	**[6M]**
	b)	Compare and evaluate paging vs segmentation with diagrams.	**[L4][CO3]**	**[6M]**
2	**a)**	What is swapping? Explain with a diagram.	**[L1][CO3]**	**[6M]**
	b)	Evaluate advantages and disadvantages of swapping.	**[L4][CO3]**	**[6M]**
3	Apply First Fit, Best Fit, and Worst Fit algorithms to allocate memory blocks.		**[L3][CO3]**	**[12M]**
4	Explain in detail memory management techniques.		**[L2][CO3]**	**[12M]**
5	**a)**	Discuss segmentation with suitable example.	**[L2][CO3]**	**[6M]**
	b)	Explain how fragmentation occurs and methods to reduce it.	**[L2][CO3]**	**[6M]**
6	Compare all file allocation methods with diagrams and advantages, disadvantages.		**[L3][CO3]**	**[12M]**
7	**a)**	Explain the concept of demand paging.	**[L2][CO3]**	**[6M]**
	b)	Analyze the occurrence of Belady's anomaly in FIFO.	**[L4][CO3]**	**[6M]**
8	Given Reference string: 7, 0, 1, 2, 0, 3, 0, 4 and Number of frames = 3 & 4. Apply FIFO page replacement and Find total number of page faults		**[L3][CO3]**	**[12M]**
9	Given Reference string: 1, 2, 3, 4, 1, 2, 5, 1, 2, 3, 4, 5 and Number of frames = 3 & 4. Apply LRU page replacement and Find total number of page faults		**[L3][CO3]**	**[12M]**
10	Given Reference string: 1, 2, 3, 4, 1, 2, 5, 1, 2, 3, 4, 5 and Number of frames = 3 & 4. Apply Optimal page replacement and Find total number of page faults		**[L3][CO3]**	**[12M]**

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UNIT –IV

DEADLOCKS AND FILE SYSTEMS

1	**a)**	Explain the four conditions required for deadlock to occur	**[L2][CO4]**	**[6M]**
	b)	Consider a system with processes P1, P2, P3 and resources R1, R2, R3. • P1 → holds R1 and requests R2 • P2 → holds R2 and requests R3 • P3 → holds R3 and requests R1 Determine whether a deadlock exists using Resource Allocation Graph.	**[L3][CO4]**	**[6M]**
2	**a)**	Explain deadlock prevention techniques with examples.	**[L2][CO4]**	**[6M]**
	b)	Apply Banker's Algorithm to determine whether the system is in a safe state.	**[L3][CO4]**	**[6M]**
3	**a)**	Write short notes on resource allocation graph.	**[L1][CO4]**	**[6M]**
	b)	Explain the concept of recovery from deadlock.	**[L2][CO4]**	**[6M]**
4	**a)**	Explain the deadlock detection algorithm for a system with a single instance of each resource type.	**[L2][CO4]**	**[6M]**
	b)	Explain how deadlock detection is performed in systems with multiple instances of resources.	**[L2][CO4]**	**[6M]**
5	**a)**	Compare sequential access, direct access, and indexed access methods.	**[L4][CO4]**	**[6M]**
	b)	Demonstrate the steps involved in performing file operations	**[L3][CO4]**	**[6M]**
6	**a)**	Compare read, write, create, and delete operations performed on files.	**[L4][CO4]**	**[6M]**
	b)	Explain the different file access methods used in operating systems.	**[L2][CO4]**	**[6M]**
7		Compare all file allocation methods with diagrams and advantages, disadvantages.	**[L3][CO4]**	**[12M]**
8	**a)**	A disk queue contains requests: 98, 183, 37, 122, 14, 124, 65, 67 and Initial head position = 53; Calculate total head movement using FCFS.	**[L3][CO4]**	**[6M]**
	b)	Disk requests: 82, 170, 43, 140, 24, 16, 190 and Initial head position = 50 Find total seek time using SSTF.	**[L3][CO4]**	**[6M]**
9	**a)**	Disk requests: 95, 180, 34, 119, 11, 123, 62, 64 and Initial head position = 50 Direction = towards 0, Calculate total head movement using SCAN.	**[L3][CO4]**	**[6M]**
	b)	Disk requests: 98, 183, 37, 122, 14, 124, 65, 67 and Initial head position = 53 Disk size = 0–199, Compute total head movement using C-SCAN.	**[L3][CO4]**	**[6M]**
10	**a)**	What is RAID? Explain the basic techniques used in RAID.	**[L2][CO4]**	**[6M]**
	b)	Discuss various RAID levels in detail.	**[L2][CO4]**	**[6M]**

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UNIT –V

SYSTEM PROTECTION AND SECURITY

1	**a)**	Define System Protection. What are the main goals of protection in an operating system?	**[L1][CO5]**	**[6M]**
	b)	Explain the principles of protection in OS with suitable examples.	**[L2][CO5]**	**[6M]**
2	**a)**	What is meant by a protection domain? How does it differ from an access domain?	**[L2][CO5]**	**[6M]**
	b)	Illustrate the concept of an Access Matrix with a simple example involving users and files.	**[L3][CO5]**	**[6M]**
3	**a)**	What is revocation of access rights? Why is it necessary?	**[L2][CO5]**	**[6M]**
	b)	Compare Access Control Lists (ACL) and Capability Lists.	**[L4][CO5]**	**[6M]**
4	Consider 3 users (U1, U2, U3) and 3 files (F1, F2, F3). Construct an access matrix and Assign permissions and Identify unauthorized access attempts		**[L3][CO5]**	**[12M]**
5	Compare different access control mechanisms and evaluate their advantages and limitations.		**[L5][CO5]**	**[6M]**
6	**a)**	Explain different types of program threats with suitable examples.	**[L2][CO5]**	**[6M]**
	b)	Discuss the basic working principle of cryptography in security.	**[L2][CO5]**	**[6M]**
7	**a)**	Apply encryption techniques to secure communication between two users.	**[L3][CO5]**	**[6M]**
	b)	Differentiate between symmetric and asymmetric cryptography.	**[L4][CO5]**	**[6M]**
8	**a)**	Explain different methods of security attacks.	**[L2][CO5]**	**[6M]**
	b)	Describe the four levels of security measures.	**[L2][CO5]**	**[6M]**
9	**a)**	Illustrate how a Trojan Horse program can compromise system security and suggest preventive measures.	**[L3][CO5]**	**[6M]**
	b)	Apply the concept of Denial of Service (DoS) attack and explain how it affects system performance.	**[L3][CO5]**	**[6M]**
10	Describe the concept of authentication. Explain how hash functions and digital signatures are used to verify message integrity and authenticity in secure communication.		**[L2][CO5]**	**[12M]**

Prepared by:

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