U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February 2025 Semester End Main Examinations

Programme: B.E. **Semester: IV**
Branch: CSE(DS),CSE(ICB),AI&DS **Duration: 3 hrs.**
Course Code: 23DC4PCOPS **Max Marks: 100**
Course: Operating Systems

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

				CO	PO	Marks
			UNIT – I			
1	a)		Explain the components of computer system with neat diagram and briefly discuss user view and system view of OS	*CO1*	*PO1*	**8**
	b)		Enumerate any 4 operating System services with diagram	*CO1*	*PO1*	**5**
	c)		List the different structure of Operating system and explain any 2 of them in detail.	*CO1*	*PO1*	**7**
			OR			
2	a)		Analyze the importance of system calls in operating system design. Illustrate their role in facilitating communication between user programs and the hardware by describing a real example where specific system calls are crucial.	*CO2*	*PO2*	**10**
	b)		Evaluate the significance of protection and security mechanisms in modern operating systems. Provide examples of potential risks if these mechanisms are absent.	*CO2*	*PO2*	**10**
			UNIT – II			
3	a)		What is a Process? With a neat block diagram illustrate process states.	*CO2*	*PO2*	**6**
	b)		What is inter process communication? Explain two fundamental models of inter process communication.	*CO2*	*PO2*	**8**
	c)		Justify how readers writers' problem can be used to access database efficiently. Support your answer with suitable implementation	*CO2*	*PO2*	**6**
			OR			
4	a)		Differentiate between Binary Semaphore and Counting semaphore. Write pseudocode for wait and signal operation using structured variable	*CO2*	*PO2*	**7**
	b)		What is a critical section problem? Explain the requirements that a solution to critical section problem must satisfy?	*CO2*	*PO2*	**7**
	c)		Discuss on different implicit threading methods	*CO1*	*PO1*	**6**

			UNIT – III			
	5	a)	i) Consider the processes P1, P2, P3, P4 given in the below table, arrives for execution in the same order, with given Arrival Time and Burst Time Draw the GANTT chart and calculate the average waiting time and average turnaround time If the CPU scheduling policy is First come first serve. ii) Consider the following data with the Burst time given in milliseconds If the CPU scheduling policy is SJF non-preemptive, draw the GANTT chart and calculate the average waiting time and average turnaround time	***CO*** 2	**PO2**	**10**
		b)	You are a system administrator for a company with multiple networked printers. The company uses a custom print management system that handles print jobs from various departments. Each print job is a process that needs to acquire access to one or more printers, which are shared resources. Lately, you have noticed that the system occasionally gets stuck, with several print jobs waiting indefinitely because they are in a deadlock situation. Given the scenario of a print management system experiencing deadlocks due to multiple print jobs needing access to shared printers, what are some effective strategies for preventing deadlocks? Consider following Edge E = {P1 → R1, P2 → R3, R1 → P2, R2 → P2, R2 → P1, R3 → P3} I. Draw Resource allocation graph and find sets of P&R II. Examine whether graph has deadlock or not	***CO2***	***PO2***	**10**
			OR			

Process	Arrival Time	Burst Time
P1	0	8
P2	1	4
P3	2	9
P4	3	5

Process	Arrival Time	Burst Time
P1	3	1
P2	1	4
P3	4	2
P4	0	6
P5	2	3

<table>
<tr><td></td><td>6</td><td>a)</td><td>Consider a system with 5 processes P_0 through P_4 and three resource types A,B and C. Following are the resource types: A has 10, B has 5 and the resource type C has 7 instances.

<table>
<tr><th>Process</th><th colspan="3">Allocation</th><th colspan="3">Max</th><th colspan="3">Available</th></tr>
<tr><td></td><th>A</th><th>B</th><th>C</th><th>A</th><th>B</th><th>C</th><th>A</th><th>B</th><th>C</th></tr>
<tr><td>P0</td><td>0</td><td>1</td><td>0</td><td>7</td><td>5</td><td>3</td><td>3</td><td>3</td><td>2</td></tr>
<tr><td>P1</td><td>2</td><td>0</td><td>0</td><td>3</td><td>2</td><td>2</td><td></td><td></td><td></td></tr>
<tr><td>P2</td><td>3</td><td>0</td><td>2</td><td>9</td><td>0</td><td>2</td><td></td><td></td><td></td></tr>
<tr><td>P3</td><td>2</td><td>1</td><td>1</td><td>2</td><td>2</td><td>2</td><td></td><td></td><td></td></tr>
<tr><td>P4</td><td>0</td><td>0</td><td>2</td><td>4</td><td>3</td><td>3</td><td></td><td></td><td></td></tr>
</table>
Apply the Banker’s algorithm to answer the following
I. What is the content of need matrix?
II. Determine if the system is in safe state. If so, give safe sequence</td><td>CO2</td><td>PO2</td><td>10</td></tr>
<tr><td></td><td>b)</td><td>A multiprocess environment with limited instances of resources ended with deadlock. It is therefore crucial to implement recovery mechanisms that can break these deadlocks and restore the system’s productivity. Identify and explain the various approaches for recovery of the system.</td><td>CO2</td><td>PO2</td><td>10</td></tr>
<tr><td></td><td></td><td>UNIT - IV</td><td></td><td></td><td></td></tr>
<tr><td>7</td><td>a)</td><td>Explain how paging is supported by TLB with a neat diagram.
How TLB solves the problem of 32bit system page table entries by reducing access time.</td><td>CO3</td><td>PO3</td><td>10</td></tr>
<tr><td></td><td>b)</td><td>Consider the page reference string: 1,0,7,1,0,2,1,2,7,3,0,3,2,4,0,3,6,2,1 for a memory with 3 frames.
i. Determine the number of page faults and page hit ratio using FIFO,
LRU replacement algorithms
ii. Explain which algorithm is most efficient?</td><td>CO3</td><td>PO3</td><td>10</td></tr>
<tr><td></td><td></td><td>OR</td><td></td><td></td><td></td></tr>
<tr><td>8</td><td>a)</td><td>Critically analyze the role of page replacement algorithms in virtual memory management. Compare common algorithms such as FIFO, LRU and Optimal in terms of efficiency and practicality.</td><td>CO2</td><td>PO2</td><td>10</td></tr>
<tr><td></td><td>b)</td><td>A program requires a contiguous memory block of size 300KB. Given the available memory blocks: 100KB, 200KB, 300KB, 400KB, and 500KB, demonstrate the memory allocation using First Fit, Best Fit, and Worst Fit strategies.</td><td>CO2</td><td>PO2</td><td>10</td></tr>
<tr><td></td><td></td><td>UNIT - V</td><td></td><td></td><td></td></tr>
<tr><td>9</td><td>a)</td><td>Illustrate virtualization concept. Describe the trap-and-emulate method employed by virtual machines to transfer control from virtual user mode to virtual kernel mode.</td><td>CO2</td><td>PO2</td><td>8</td></tr>
<tr><td></td><td>b)</td><td>Discuss the following concepts in detail:
• Paravirtualization
• Type 1 Hypervisor
• Programming-environment Virtualization</td><td>CO1</td><td>PO1</td><td>6</td></tr>
</table>

		c)	Explain how live migration is implemented easily in Virtual Machine Manager (VMM) when compared to general purpose operating systems	***CO2***	**PO2**	**6**
			OR			
	10	a)	Explain how virtualization integrates with operating system components. Provide examples of how operating systems are modified to support virtual environments.	***CO2***	**PO2**	**10**
		b)	Discuss the benefits and challenges of deploying virtual machines in a cloud computing infrastructure.	***CO2***	**PO2**	**10**

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