U.S.N.										

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

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: III**

Branch: Computer Science and Business Systems **Duration: 3 hrs.**

Course Code: 23BS3PCOPS **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.

			UNIT - I	*CO*	*PO*	Marks
1	a)		List out the operating system responsibilities in connection with process and memory management.	CO1	PO1	**7**
	b)		Discuss the advantages and disadvantages of layered operating system with a neat diagram.	CO1	PO1	**7**
	c)		Identify various Services provided by Operating Systems	CO1	PO1	**6**
			OR			
2	a)		List and explain the categories of system calls.	CO1	PO1	**7**
	b)		Describe the microkernel method structure of the operating system with respect to mach system.	CO1	PO1	**7**
	c)		Explain the dual mode operation of an operating system.	CO1	PO1	**6**
			UNIT - II			
3	a)		Explain five state process models with neat diagram.	CO1	PO1	**6**
	b)		Describe the different types of inter-process communication	CO1	PO2	**7**
	c)		Consider the following data about processes: (i) Draw charts to illustrate execution using SRTF, Priority and Round-Robin (TQ = 1 ms) scheduling algorithms.(ii) Compute waiting time in each of the cases.(iii) Which of them provide minimal average waiting time and turnaround time?	CO2	PO3	**7**

Process	Arrival Time	Burst Time (ms)	Priority
P_1	0	7	3
P_2	3	2	2
P_3	4	3	0
P_4	5	1	1
P_5	6	3	4

<table>
<tr><td></td><td></td><td></td><td colspan="3">OR</td><td></td><td></td><td></td></tr>
<tr><td></td><td>4</td><td>a)</td><td colspan="3">Explain various multi threading models.</td><td>CO1</td><td>PO2</td><td>6</td></tr>
<tr><td></td><td></td><td>b)</td><td colspan="3">Explain the benefits of multi-threaded programming.</td><td>CO1</td><td>PO2</td><td>6</td></tr>
<tr><td></td><td></td><td>c)</td><td colspan="3">Solve the following: Given the snapshot of the system
<table><tr><td>Process</td><td>Arrival-time</td><td>Burst-Time</td><td>Priority</td></tr><tr><td>P1</td><td>0</td><td>5</td><td>2</td></tr><tr><td>P2</td><td>1</td><td>10</td><td>1</td></tr><tr><td>P3</td><td>2</td><td>4</td><td>0</td></tr><tr><td>P4</td><td>3</td><td>3</td><td>3</td></tr></table>Find the average waiting time and average turnaround time by using SJF and priority scheduling algorithm.</td><td>CO2</td><td>PO3</td><td>8</td></tr>
<tr><td></td><td></td><td></td><td colspan="3">UNIT - III</td><td></td><td></td><td></td></tr>
<tr><td></td><td>5</td><td>a)</td><td colspan="3">Identify the three requirements for solution to a critical section problem. Explain peterson’s solution.</td><td>CO1</td><td>PO2</td><td>6</td></tr>
<tr><td></td><td></td><td>b)</td><td colspan="3">Briefly discuss the Dining philosopher problem and build a solution using monitors.</td><td>CO2</td><td>PO3</td><td>7</td></tr>
<tr><td></td><td></td><td>c)</td><td colspan="3">Solve the following using bankers algorithm with the given snapshot of a system.
<table><tr><td rowspan="2">Process</td><td colspan="4">Allocation</td><td colspan="4">Maximum</td><td colspan="4">Available</td></tr><tr><td>A</td><td>B</td><td>C</td><td>D</td><td>A</td><td>B</td><td>C</td><td>D</td><td>A</td><td>B</td><td>C</td><td>D</td></tr><tr><td>P0</td><td>0</td><td>0</td><td>1</td><td>2</td><td>0</td><td>0</td><td>1</td><td>2</td><td>1</td><td>5</td><td>2</td><td>0</td></tr><tr><td>P1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>7</td><td>5</td><td>0</td><td></td><td></td><td></td><td></td></tr><tr><td>P2</td><td>1</td><td>3</td><td>5</td><td>4</td><td>2</td><td>3</td><td>5</td><td>6</td><td></td><td></td><td></td><td></td></tr><tr><td>P3</td><td>0</td><td>6</td><td>3</td><td>2</td><td>0</td><td>6</td><td>5</td><td>2</td><td></td><td></td><td></td><td></td></tr><tr><td>P4</td><td>0</td><td>0</td><td>1</td><td>4</td><td>0</td><td>6</td><td>5</td><td>6</td><td></td><td></td><td></td><td></td></tr></table>i) Compute the content of need matrix.
ii) Is the system in a safe state?</td><td>CO2</td><td>PO3</td><td>7</td></tr>
<tr><td></td><td></td><td></td><td colspan="3">OR</td><td></td><td></td><td></td></tr>
<tr><td></td><td>6</td><td>a)</td><td colspan="3">Describe deadlock. Explain characteristics of deadlock.</td><td>CO1</td><td>PO1</td><td>7</td></tr>
<tr><td></td><td></td><td>b)</td><td colspan="3">Explain the bounded buffer problem and construct a solution for it using semaphores.</td><td>CO1</td><td>PO2</td><td>8</td></tr>
</table>

		c)	Justify the statement resource allocation graph with cycle is not the sufficient condition for deadlock", with an example.	CO1	PO2	**5**
			UNIT - IV			
	7	a)	Write the total number of page faults for the following reference string with 3 page frame 7,0,1,2,0,3,0,4,2,3,0, 3,2,1,2,0,1,7,0,1 using (i) FIFO (ii) Optimal and (iii) LRU algorithm.	CO2	PO3	**7**
		b)	Discuss the basic method of segmentation with the segmentation hardware and neat block diagram.	CO1	PO2	**6**
		c)	Write the procedure to handle the page fault in demand paging with a diagram.	CO1	PO2	**7**
			OR			
	8	a)	Discuss the concept of "prepaging" in demand paging and its potential benefits and drawbacks.	CO1	PO1	**7**
		b)	Identify the reason for thrashing. Explain the same	CO1	PO1	**7**
		c)	Discuss the structure of the page table with a suitable diagram.	CO1	PO1, 2	**6**
			UNIT - V			
	9	a)	Suppose that a disk drive has 100 cylinders numbered from 0-100. The drive is currently serving a request at cylinder 50, the following is the queuc of pending requests in FlIFO order 44, 20, 95, 4, 50, 52, 47, 61, 87, 25. Starting from the current head position, what is the total distance that the disk arm moves to satisfy the pending requests for cach of the following disk-scheduling algorithms? (i) FIFO (ii) C-LOOK(iii) SSTF iv) SCAN v) C-SCAN	CO3	PO3	**10**
		b)	Compare and contrast the challenges of sequential versus random I/O operations on HDDs	CO2	PO2	**10**
			OR			
	10	a)	What are the different methods of free space management in file systems? Provide examples.	CO2	PO2	**10**
		b)	Describe how access control lists (ACLs) are implemented in file systems to manage file permissions.	CO2	PO2	**10**

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