

JK Lakshmipat University Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, May 2025
B. Tech. (CSE), Semester IV, 2024-25

Roll No.....

CS1108: OPERATING SYSTEMS

Time: 2.5 hours

Max. Marks: 40

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Mention all the assumptions for your answers clearly.

Q. 1	(a) What is context switching in an operating system? Explain the steps involved during a context switch. Why is context switching considered an overhead, and how can it affect system performance?	4.0 (CO4)															
	(b) Write short notes on following: i. Thrashing ii. Microkernel iii. Buffering and Caching	6.0 (CO2, 3, 6)															
Q. 2	(a) An operating system uses Shortest Remaining Time first (SRTF) process scheduling algorithm. Consider the arrival times and execution times for the following processes: <table border="1" data-bbox="507 1066 1018 1294" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Process</th><th>Burst Time</th><th>Arrival Time</th></tr> </thead> <tbody> <tr> <td>P0</td><td>20</td><td>0</td></tr> <tr> <td>P1</td><td>25</td><td>15</td></tr> <tr> <td>P2</td><td>10</td><td>30</td></tr> <tr> <td>P3</td><td>15</td><td>45</td></tr> </tbody> </table> Calculate the average turnaround time and average waiting time.	Process	Burst Time	Arrival Time	P0	20	0	P1	25	15	P2	10	30	P3	15	45	4.0 (CO4)
Process	Burst Time	Arrival Time															
P0	20	0															
P1	25	15															
P2	10	30															
P3	15	45															
	(b) What is a critical section problem? Does the following solution satisfy all the requirements for a critical section problem? Explain in detail. <pre>do { flag[i] = true; turn = j; while (flag[j] && turn == j); critical section flag[i] = false; remainder section } while (true);</pre>	3.0 (CO5)															
	(c) Consider a system having m resources of the same type. These resources are shared by 3 processes A, B, C, which have peak time demands of 3, 4, 6 respectively. What is the minimum value of m that ensures that deadlock will never occur?	2.0 (CO5)															

Q. 3	(a) Consider a simple segmentation system that has the following segment table.	3.0 (CO5)										
	<table><tr><th>Starting Address</th><th>Length (in bytes)</th></tr><tr><td>660</td><td>248</td></tr><tr><td>1752</td><td>422</td></tr><tr><td>222</td><td>198</td></tr><tr><td>996</td><td>604</td></tr></table>	Starting Address	Length (in bytes)	660	248	1752	422	222	198	996	604	
	Starting Address	Length (in bytes)										
	660	248										
	1752	422										
222	198											
996	604											
For each of the following logical addresses, determine the physical address or indicate if a segment fault occurs:												
i. 0, 198 <segment no, length>												
ii. 1, 530 <segment no, length>												
	(b) Consider a 32-bit computer with page size 2KB and physical memory of 32 GB. Each virtual page has additional 8 bits for hardware control. The computer has a two-level page table. What are the minimum number of bits required in second level page table entry?	3.0 (CO5)										
	(c) A process contains eight virtual pages on disk and is assigned a fixed allocation of four page frames in main memory. The following page trace occurs 1,0,2,2,1,7,6,7,0,1,2,0,3,0,4,5,1,5,2,4,5,6,7,6,7,2,4,2,7,3,3,2,3 Show the successive page residing in the four frames using LRU replacement policy. Calculate the page fault rate, defined as the ratio of number of page faults to the total number of memory accesses.	4.0 (CO5)										
Q. 4	Discuss various file allocation methods. OR What is Direct Memory Access (DMA)? How does it improve system performance compared to programmed-I/O?	3.0 (CO6)										
Q. 5	(a) Suppose a disk queue with requests for I/O to blocks on cylinders:- 100, 175, 50, 120, 120, 20, 150, 75, 200 If the disk head is currently at 60 (assume the head movement is towards the larger cylinder number), find out the total disk head movement for the following algorithms:- i. SSTF ii. C-LOOK	4.0 (CO6)										
	(b) Windows and Linux adopt different design philosophies for process management, file systems, and security models. Conduct a comparative analysis of their process scheduling algorithms and file system structures (e.g., NTFS vs EXT4). Which system provides better performance for real-time applications and why?	4.0 (CO1, 2)										