26·11·2024 (E)

SOMAIYA VIDYAVIHAR UNIVERSITY

Semester: July 2024 –November 2024		
Maximum Marks: 100 **Examination: ESE Examination**		**Duration:3 Hrs.**
Programme code: 01 **Programme: Computer Engineering**	**Class: TY**	**Semester:V (SVU 2020)**
Institute/School/Department: K J Somaiya School of Engineering	**Name of the department:COMP**	
Course Code: 116U01C503	**Name of the Course: Operating Systems**	
Instructions: 1)Draw neat diagrams 2) All questions are compulsory **3) Assume suitable data wherever necessary**		

Que. No.	Question	Max. Marks
Q1	Solve any **Four**	**20**
i)	Explain the system booting process with a neat diagram.	5
ii)	Define the following parameters with respect to choice of an appropriate scheduling algorithm – Throughput, Efficiency, Fairness, Turnaround time, Response time.	5
iii)	What is demand paging? State any two advantages and disadvantages of demand paging scheme of memory management.	5
iv)	Discuss evolution of OS.	5
v)	Explain the sequential and indexed-sequential file organization methods.	5
vi)	Discuss binary and counting semaphores. Write pseudocode for wait and signal semaphore primitives.	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	**10**
i)	What is multithreading? Can user level threads support multithreading? Justify your answer.	5
ii)	Explain how the PCB is used during context switching between processes. Also describe why PCBs are critical to process management in a multitasking operating system.	5
	OR	
Q2 A	Consider the set of process CPU burst time (in milliseconds) shown below. Process / Burst Time P0 – 26 P1 – 3 P2 – 7 P3 – 2 Illustrate the scheduling of processes using First Come First Served (FCFS) with the help of Gantt charts under the following conditions: A. All processes arrive at the same time, B. Processes arrive according to the shortest burst time. Analyse the issues in above scenario. Comment on average waiting time.	10

Q 2 B	Solve any **One**	**10**
i)	Consider the sleeping barber problem- Imagine a barbershop with a single barber and a row of waiting chairs for customers. The barber spends most of his time cutting hair, but when there are no customers, he takes a nap in the barber chair. When a customer arrives at the barbershop and finds the barber sleeping, they wake him up and get a haircut. If other customers arrive while the barber is busy, they either wait in the chairs if there are empty seats or leave if all the chairs are occupied. The key challenge in this scenario is to ensure that customers are served in a fair and orderly manner, without overcrowding the shop or having customers wait indefinitely. A. Discuss issues with respect to process synchronization and concurrency. B. If a solution is to be designed for this problem using semaphore and/or mutex, List items/objects for which semaphores could be used. State types of suggested semaphores. C. Justify your semaphore choices.	10
ii)	For an instance of readers-writer' s problem involving many readers and many writers- A. Discuss and justify issues with respect to process synchronization and concurrency. B. If a solution is to be designed for this problem using monitors, which conditional variables would be more significant? Discuss your approach.	10

Que. No.	**Question**	**Max. Marks**
Q3	Solve any **Two**	**20**
i)	Consider the given instance of Banker's algorithm. A. Apply the Banker's algorithm to figure out if the system is in safe state or unsafe state. B. If the system is in safe state, give sequence of process execution.	10
ii)	Explain the concepts of main memory, physical memory, logical memory, and virtual memory in detail. Discuss the relationship between these different types of memory and how they interact within a modern operating system.	10
iii)	Discuss various hardware approaches for concurrency and synchronization. Should they be a recommended practice? Justify your answer.	10

	Allocation				*Request*				*Available*			
	R_1	R_2	R_3	R_4	R_1	R_2	R_3	R_4	R_1	R_2	R_3	R_4
P_1	1	0	0	0	0	1	0	0	2	0	0	0
P_2	0	1	0	0	0	0	1	0				
P_3	0	0	1	0	0	0	0	1				
P_4	0	1	0	1	1	0	0	0				
P_5	0	0	0	1	0	0	0	0				

Que. No.	Question	Max. Marks
Q4	Solve any **Two**	**20**
i)	Consider a disk with tracks numbered from 0 to 199. The I/O requests are received for tracks- 98, 183, 41, 122, 14, 124, 65, and 67. The read-write head starts at track 53. A. Calculate the total head movements and average seek time using the disk scheduling algorithms: a. First-Come, First-Serve (FCFS) b. SCAN B. Illustrate the head movement with a suitable graph.	10
ii)	A. What are the file inodes? Discuss contents of Unix file inode. B. Assuming that a disk block structure can hold 10 direct memory addresses for a file, explain with a neat diagram how the file management module can support files of very large sizes.	10
iii)	A. Discuss various file Directory structures in terms of their characteristics. B. For each structure, identify the advantages and disadvantages in terms of usability, access efficiency, and data organization	10

Que. No.	Question	Max. Marks
Q5	Solve any **Four**	**20**
i)	Discuss device drivers as interface between OS and hardware.	5
ii)	What is thrashing? How does it affect performance?	5
iii)	Discuss the necessary and sufficient condition for a deadlock to occur in system?	5
iv)	Discuss the advantages and disadvantages of FIFO and LRU page replacement policies.	5
v)	Explain circular I/O buffering technique. State applications of the same.	5
vi)	Compare and contrast best fit and worst fit memory allocation methods. Support your answer with a suitable example.	5