

6. (a) Consider the following page reference string : 9

0,3,1,3,2,0,4,5,0,3,0,1,1,2,3,0,5,3,2,0.
Implement FIFO, Optimal, LRU page replacement algorithms and compare the performance based on the number of page faults with frame size 3 and 4.

(b) Explain linked file allocation method in detail. 6

7. (a) Explain the life-cycle of an I/O request. 6
(b) Consider a disk queue with I/O requests on the following cylinders in their arriving order : 6

12, 44, 32, 10, 37, 56, 98, 35, 108, 78, 49.

The disk head is assumed to be at cylinder 40 and moving in the direction of decreasing number of cylinders. The disk consists of total 150 cylinders. Calculate and show with diagram the disk head movement using FCFS, SCAN and C-SCAN algorithms. 9



Roll No.

Total Pages : 04

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May 2025

B. Tech. (Fourth Semester)
Operating System (PCC-CS-403)

Time : 3 Hours]

[Maximum Marks : 75

Note : It is compulsory to answer all the questions (1.5 marks each) of Part A in short. Answer any *four* questions from Part B in detail. Different sub-parts of a question are to be attempted adjacent to each other.

Part A

1. (a) Differentiate between kernel and shell. 1.5
- (b) What is device controller ? 1.5
- (c) Define PCB. 1.5
- (d) Define system call. 1.5
- (e) What is a suspended process ? 1.5
- (f) What is a context switch time ? 1.5
- (g) What are the rules for selecting a time quantum in round robin process scheduling ? 1.5

- (h) What is a race condition ? 1.5
- (i) What is a page table ? 1.5
- (j) Define Thrashing. 1.5

Part B

- 2. (a) Explain Hybrid kernel based OS architecture. 10
- (b) Explain all the steps of OS booting sequence. 5
- 3. (a) Explain 7-state life-cycle of a process. 5
- (b) What is Spinlock ? How do you improve the semaphore implementation to avoid spinlock ? 5
- (c) Write the algorithms for providing synchronization solution to Reader-Writer problem having Readers' priority using semaphore. 5
- 4. Consider the following scenario of processes with their priority. 15

Process	Arrival time	Execution time	Priority
P1	10	9	2
P2	12	8	3
P3	14	3	5
P4	15	2	4
P5	18	7	1

- Draw the Gantt chart for the execution of the processes showing their start time and end time using priority-number based scheduling (preemptive), Shortest Job first (preemptive), RR with time quantum = 3. Calculate turnaround time, normalized turnaround time, waiting time for each process and average turnaround time, average normalized turnaround time and average waiting time for the system.
- 5. (a) How do you reduce two memory accesses in paging ? Explain. 5
 - (b) Consider a system with the following information. 10

Process	Alloc			Max			Available		
	A	B	C	A	B	C	A	B	C
P0	0	1	0	7	5	3	3	3	2
P1	2	0	0	3	2	2			
P2	3	0	2	9	0	2			
P3	2	1	1	2	2	2			
P4	0	0	2	4	3	3			

- (i) What is the content of matrix need ?
- (ii) Is the system in safe state ?
- (iii) A request from process P1 arrives for [1 0 2], can the request be granted immediately ?