



- KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

Answer ALL Questions

(10 X 10 = 100 Marks)

1. Four jobs A, B, C and D come into the system in the order as shown at the same time (i.e. Arrival time = 0). The subscript of each job is that job's priority, where lower subscript means higher priority.

Process	A ₂	B ₄	C ₁	D ₃
CPU-Burst	7	2	3	4

Apply non-preemptive First come First serve [FCFS], Short-Job-First (SJF) and Priority scheduling to run these processes. For each process draw Gantt chart, calculate average waiting time and average turnaround time.

2. The following memory partitions are given in order: 230Kb, 510Kb, 700Kb, 430Kb, 900Kb, 150Kb, 1000kb. How would the best-fit, and worst-fit algorithms place processes of 112 Kb, 720 Kb, 508 Kb, 800Kb, 10kb, 320Kb and 690Kb? Which algorithm makes the most efficient use of memory?
3. Let the page trace be 3, 1, 2, 4, 3, 2, 5, 2, 1, 3, 2, 4. The computer on which this page trace is run has three page frames. Run this page trace with the FIFO, LRU and Optimal algorithms. Initially, the memory is empty. Fill in the tables with the content after each reference and compute the number of page faults, miss ratio and hit ratio.

Page	3	1	2	4	3	2	5	2	1	3	2	4
Memory												
Page faults												
Miss ratio												
Hit ratio												

4. a) Compare and contrast symmetric multiprocessing and asymmetric multiprocessing. Is it possible to achieve a true multi-tasking using a single processor? Justify your answer. [5]
- b) Explain the importance of Master Boot Record in booting process. Show the structure of MBR along with its field size. [5]

5. Suppose a hard disk drive has 600 cylinders numbered 0 to 599. The disk is currently serving a request at the cylinder 60 and the previous request was at the cylinder 40. The pending requests in the queue (in FIFO order) are at the cylinders: 70, 20, 30, 530, 330, 150, 450, 400, 570, 290. For each of the following disk scheduling algorithms: FCFS, SSTF and SCAN, Calculate the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests.
6. Multiple processes can communicate with each other using shared-memory IPC techniques. How does shared-memory IPC work? Give some examples of the Linux system calls that can be used for shared-memory IPC.
7. Consider the following segment table:

Segment No	Limit	Base
0	1000	1400
1	0400	6300
2	0400	4300
3	1100	3200
4	1000	4700

What are the physical addresses for the following logical addresses?

- (i) 1, 1048
(ii) 3, 1048
(iii) 0, 230
(iv) 2, 600
(v) 4, 1250

8. Multi-core technology can often, but not necessarily always, make applications run faster – Justify your answer? Research some real-life computing environments that are expected to benefit from multi-core chips and briefly explain why?

- 9.a) Consider the following snapshot of a system. There are no outstanding unsatisfied requests for resources.

	<i>Allocation</i>				<i>Max</i>			
	R_1	R_2	R_3	R_4	R_1	R_2	R_3	R_4
P_0	0	0	1	2	0	0	1	2
P_1	2	0	0	0	2	7	5	0
P_2	0	0	3	4	6	6	5	6
P_3	2	3	5	4	4	3	5	6
P_4	0	3	3	2	0	6	5	2

<i>Available</i>			
R_1	R_2	R_3	R_4
2	1	0	0

Answer the following questions:

- Is the system currently in a safe or unsafe state? Provide a step-by-step calculation and use a safe sequence to justify your claim.
- If a new request from P2 arrives for $[0, 1, 0, 0]$, can this request be safely granted immediately? Use a safe sequence to justify your claim.

OR

- 9.b) Consider the following snapshot of a system with five resource types R_1, R_2, R_3, R_4 and R_5 , and four processes A, B, C and D:

	Allocation					Request					Available				
	R_1	R_2	R_3	R_4	R_5	R_1	R_2	R_3	R_4	R_5	R_1	R_2	R_3	R_4	R_5
A	1	0	1	1	0	0	1	0	0	1	0	0	0	0	1
B	1	1	0	0	0	0	0	1	0	1					
C	0	0	0	1	0	0	0	0	0	1					
D	0	0	0	0	0	1	0	1	0	1					

Answer the following questions:

- Draw its resource allocation graph.
- Is the system in a deadlock state? If the system is in a deadlock state, list all processes that involve in a deadlock.

- 10.a) What do you mean by a critical section? Using semaphores, write a solution to readers and writers problem that gives priority to readers.

OR

- 10.b) Illustrate the Producer / Consumer Problem. Show a possible solution using monitors.

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