

2 Attempt any two of the following : $10 \times 23 = 20$

- (a) Consider a system consisting of processes P_1, P_2, \dots, P_n , each of which has a unique priority number. Write a monitor that allocates three identical line printers to these processes, using the priority numbers for deciding the order of allocation.
- (b) Define Mutual Exclusion and its need. One solution to the critical section problem or mutual exclusion implementation is with TestAndSet instruction (Test and lock). Explain this approach in detail and give its relative advantages and disadvantages.
- (c) It is said Inter Process Communication is best provided by a message passing system. Explain the implementation issues in massive passing system for Inter Process Communication.

3 Attempt any two of the following : $10 \times 2 = 20$

- (a) Explain the priority scheduling algorithm and its major drawbacks with their solution. Draw the Gantt chart and find average waiting time and response time of the process set given in the following table:

Process id	Arrival time	Execution Time	Priority
A	0	10	3
B	0	2	1
C	1	3	3
D	2	1	5
E	2	4	2

- (b) Discuss in brief any two evaluation methods which can be used for scheduling algorithms.
- (c) Write short notes on :
- Resource allocation graph and resource allocation graph algorithm.
 - Recovery from deadlock.



4 Attempt any two of the following : $10 \times 2 = 20$

- (a) What do you understand by Belady's anomaly. Which popular page replacement algorithm suffers from the Belady's anomaly? Also give the name of the class of algorithms, which can never suffer from Belady's anomaly and why?

A system using demand-paged memory, takes 250 ns to satisfy a memory request if the page is in memory. If the page is not in memory, the request takes on an average 5 ms if a free frame is available or the page to the swapped out has not been modified or 12 ms if the page to be swapped out has been modified. What is the effective access time if the page fault rate is 2%, and 40% of the time the page to be replaced has been modified? Assume the system is running only a single process and the CPU is idle during page swaps.

- (b) (i) Describe the First Fit, Best Fit and Worst Fit memory allocation algorithms.
- (ii) On a system using a disk cache, the mean access time is 41.2 ms, the mean cache access time is 2 ms, the mean disk access time is 100 ms, and the system has 8 MB of cache memory. For each doubling of the amount of memory, the miss rate is halved. How much memory must be added to reduce the mean access time to 20 ms? Assume the amount of memory may only increase by doubling.
- (c) Differentiate between paging and segmentation. On a system using paging and segmentation, the virtual address space consists of up to 8 segments where each segment can be up to 2^{29}

