

- b) What are the different types of schedulers present in the system ? Bring out the relevance of each of them. 5

OR

6. a) Define thread. Explain various multithreading models. 5
- b) Consider the following set of processes. 8

| Process | CPU Burst Time | Arrival Time | Priority |
|----------------|----------------|--------------|----------|
| P ₁ | 3 ms | 0 | 3 |
| P ₂ | 5 ms | 1 | 1 |
| P ₃ | 2 ms | 2 | 2 |
| P ₄ | 5 ms | 3 | 5 |
| P ₅ | 5 ms | 4 | 4 |

Calculate the average waiting time and Turn around time for each.

- i) FCFS ii) SJF
 iii) Priority iv) RR (time slice = 2)

7. a) Describe the following - 9
 i) Swapping
 ii) Internal and external fragmentation.
 iii) Paging.
- b) What is page fault ? Explain different steps to handle page fault. 5

OR

8. a) With neat diagram explain the concept of demand paging. 4
- b) Explain optimal page replacement algorithm with an example. 5
- c) Consider following page reference string 4 3 2 1 4 3 5 4 3 1 5. Assume frame size = 3. How many page fault would occur for (i) FIFO page replacement (ii) Optimal page replacement. 5
9. a) What is critical section problem ? Explain the three condition that a solution to the critical section problem must satisfy. 7
- b) Explain semaphores and its limitations. 6

OR

10. Explain Dining - Philosopher problem and Reader - Writers problem with solution. 13
11. a) What is an Access Matrix ? Describe various methods to implement an Access matrix. 7
- b) Explain the various methods to detect a deadlock and recover it. 6

OR

12. a) Solve the following using Banker's algorithm and find out whether resultant system state is safe or not.

8

| Process | Allocation | | | Max | | | Available | | |
|----------------|------------|---|---|-----|---|---|-----------|---|---|
| | A | B | C | A | B | C | A | B | C |
| P ₀ | 0 | 1 | 0 | 7 | 5 | 3 | 3 | 3 | 2 |
| P ₁ | 2 | 0 | 0 | 3 | 2 | 2 | | | |
| P ₂ | 3 | 0 | 2 | 9 | 0 | 2 | | | |
| P ₃ | 2 | 1 | 1 | 2 | 2 | 2 | | | |
| P ₄ | 0 | 0 | 2 | 4 | 3 | 3 | | | |

- i) Find out if system state is safe. If safe find safe sequence.
- ii) If P₁ makes a request - P₁ (1, 0, 2) is resulting state safe ?
- iii) If P₄ makes a request - P₄ (3, 3, 0) can it be granted ? Solve.

- b) What are the various condition for deadlock prevention ?

5
