2024

Operating Systems

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. Answer briefly: 4x5=20

    a) Define Operating System. List the objectives of an operating system.

    b) What is a critical section? State the four different conditions to achieved mutual exclusion.

    c) What is deadlock? Explain the four conditions for a deadlock to occur.

    d) Explain the difference between a process and a thread.

    e) What is the difference between preemptive and non-preemptive scheduling algorithm?

2. a) Discuss race condition with example. How can concept of critical region help to avoid race condition?   10

    b) What is inter process communication? Illustrate any one classical inter process communication problem.   10

3. a) Suppose that the following processes arrive for execution at the time indicated: 15

Process	Arrival Time	Burst Time
P1	0	10
P2	1	2
P3	2	3
P4	3	1
P5	4	5

Draw the Gantt Chart and calculate the average waiting time and turnaround time for these processes with? (Time quantum = 2)

i. FCFS scheduling algorithm

ii. SJF scheduling algorithm

iii. Round Robin scheduling algorithm

b) Explain the various states of process with state transition diagram. 5

4. a) State and explain different strategies for handling deadlock. 10

 b) What is resource allocation graph? How it can be used for describing deadlocks? 5

 c) Explain the concept of safe and unsafe state of a system with reference to Banker's algorithm. 5

5. a) Why should page replacement be performed? Compare FIFO, optimal and LRU page replacement algorithm with an example of your choice. 10

 b) What is Semaphore? Write the pseudocode and explain how semaphore can solve producer-consumer problem. 10

or

What is Readers Writers problem? Write the pseudocode for Readers and Writers to solve the problem.

6. Consider a bounded buffer of size 5 shared between a producer process and a consumer process. The following sequence of operations occurs: 20

 1. The producer produces 6 items sequentially.

 2. The consumer consumes 3 items after the first 4 items are produced.

 3. The producer then produces 2 more items.

 4. Finally, the consumer consumes all the remaining items.

Calculate:

 1. The state of the buffer after each step.

 2. The number of items produced and consumed.

7. a) Write short notes (any four) 5x4=20

 i. OS structure

 ii. Thread Scheduling

 iii. Priority Scheduling

 iv. Memory management

 v. priority inversion problem