**Time: 3 Hours** **Marks: 80**

1. Question 1 is compulsory.
2. Attempt any **three** from remaining five questions.
3. Assume suitable data where required.

1 a. Discuss Operating System as a Resource Manager. [5]

b. Draw process state diagram and explain the following states: [5]

1. New [5]
2. Ready
3. Running
4. Wait
5. Suspended ready
6. Suspended wait

c. Describe Microkernel with a diagram.

d. Discuss the importance of "Multithreading". Differentiate between kernel and user thread.

2 a. Differentiate between short term, medium term and long term scheduler with a diagram. [10]

b. Calculate AWT, ATAT, Response Time and Throughput of the following processes using Shortest job first (Non Pre-emptive). [10]

| Process | Arrival Time (ms) | Burst Time (ms) |
|---|---|---|
| P1 | 1 | 7 |
| P2 | 2 | 5 |
| P3 | 3 | 1 |
| P4 | 4 | 2 |
| P5 | 5 | 8 |

3 a. What are Semaphores? Differentiate between Counting and Binary Semaphores. Discuss Dinning Philosopher problem. [10]

b. What do you understand by a deadlock? Explain deadlock avoidance method. [10]

4 a. Explain different types of memory fragmentation. [8]

b. Compare the performance of FIFO, LRU and Optimal based on number of page hit for the following string. Frame size = 3; String (pages): 1 2 3 4 5 2 1 3 3 2 4 5 [12]

5 a. Explain Interrupt driven IO and discuss the advantages of Interrupt driven IO over programmed IO. [10]

b. Discuss various disk scheduling methods. [10]

6. a. Discuss various File Allocation Mechanism and their advantages. [10]

b. Explain Unix iNode Structure in detail. [10]

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