(T) Roll No. .....

# PAPER ID—21143

## B. Tech. EXAMINATION, 2025

(Fourth Semester)

COMPUTER SCIENCE AND ENGINEERING

Operating System

*Time :* 3 *Hours* *Maximum Marks :* 70

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

**Note :** Attempt *Five* questions in all, selecting *one* question from each Section. Q. No. 1 is compulsory. All questions carry equal marks.

1. (a) What are the CPU scheduling criteria ?

   (b) What are three condition to satisfy for the solution of critical section Problem ?

(c) What is the difference between Best Fit and Worst Fit algorithm in memory allocation ?

(d) Explain the different File access modes.

(e) Explain the Least Recently used algorithm with example.

(f) What are different file allocation methods ? Explain.

(g) What is difference between Internal fragmentation and External fragmentation ? **2×7=14**

## Section A

**2.** (a) What is Operating System (OS) ? Explain the needs and Services of the OS in detail. 7

(b) Explain threads and its types in detail. 7

3. Consider the set of 4 processes whose arrival time and burst time are given below :

| Process | Arrival Time | Burst Time |
|---|---|---|
| $p_1$ | 0 | 8 |
| $p_2$ | 1 | 4 |
| $p_3$ | 2 | 9 |
| $p_4$ | 3 | 5 |

(a) If the CPU scheduling policy is Preemptive Shortest Job First (SJF), calculate the average waiting time and average turnaround time.

(b) If the CPU Scheduling is First Come First Served (FCFS), calculate the average waiting time and average turnaround time. **14**

## Section B

4. What is Semaphore ? How the producer consumer problem is solved using semaphore ? Explain in detail. **14**

5. Consider the following snapshot of a system :

| | Allocation | Max | Available |
|---|---|---|---|
| | A B C D | A B C D | A B C D |
| $p_0$ | 0 0 1 2 | 0 0 1 2 | 1 5 2 0 |
| $p_1$ | 1 0 0 0 | 1 7 5 0 | |
| $p_2$ | 1 3 5 4 | 2 3 5 6 | |
| $p_3$ | 0 6 3 2 | 0 6 5 2 | |
| $p_4$ | 0 0 1 4 | 0 6 5 6 | |

Answer the following questions using the banker's algorithm :

(a) What is the content of the matrix Need ?

(b) Is the system in a safe state ? Find the safe state sequence if any.

(c) If a request from process P1 arrives for (0, 4, 2, 0), can the request be granted immediately. **14**

## Section C

6. Explain the Demand Paging in detail and also its hardware. **14**

7. (a) Consider a logical address space of 64 pages of 1,024 words each, mapped onto a physical memory of 32 frames.

(i) How many bits are there in the logical address ? 3

(ii) How many bits are there in the physical address ? 4

(b) Explain the Working set model for the page allocation. 7

## Section D

8. Explain briefly the following Disk Scheduling Algorithm :

(a) SCAN 7

(b) SSTF 7

9. Explain in detail the difference between the UNIX and WINDOWS operating System. 14