



Programme: B.Tech

Course Name: Operating Systems

Maximum Marks: 25

SID: 21104027

Year/Semester: 2025/24252

Course Code: CS6801/CS5801

Time allowed: 90 mins

Name: Shashank Agarwal

• All questions are compulsory. (Total 4 questions)

• Unless stated otherwise, the symbols have their usual meanings in context with subject. Assume suitably and state, additional data required, if any.

Q. No.	Question	Marks
1. ✓	<p>Consider a single processor system with four processes A, B, C and D, represented as given below, where for each process the first value is its arrival time and the second value is its CPU burst time.</p> <p>A (0, 10), B (2, 6), C (4, 3) and D (6, 7).</p> <p>Calculate the average waiting times when pre-emptive Shortest Remaining Time First (SRTF) and Non- Pre-emptive Shortest Job First (NP-SJF) scheduling algorithms are applied to the process. You are supposed to draw Gantt chart for both and show a step by step calculation.</p>	6
2.	<p>A library has a limited number of study desks (5 desks in total). Students (consumers) come to the library and occupy a desk to study, while the librarian (producer) ensures that empty desks are available by clearing and preparing them once a student leaves.</p> <p>However, the system follows these conditions:</p> <ol style="list-style-type: none"> 1. If all desks are occupied, a new student must wait until a desk becomes available. 2. If no student is using a desk, the librarian does not need to prepare any desks and waits for students. 3. The system should run efficiently without unnecessary waiting or conflicts <p>A) How would you implement synchronization in this scenario to ensure that students and the librarian operate smoothly without issues?</p> <p>B) What synchronization primitives (mutex, semaphore, etc.) would you use to control access to the study desks?</p> <p>C) How would you prevent race conditions where multiple students try to occupy the same desk simultaneously?</p>	6
3.	<p>Distinguish between a program and a process. Additionally, provide a diagram illustrating different process states, explicitly indicating the scheduler utilized at each stage. Briefly describe the significance of each scheduler in no more than two lines. Include a visual representation of the process states in the diagram.</p>	6
4. ✓	<p>What is an operating system, and how does it manage multiple processes? Explain the differences between multiprocessing, multiprogramming, and multitasking, highlighting their unique characteristics and use cases.</p>	7