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Course Name: BCSC0004: Operating System

Course Outcome

CO1- Understand the classification of operating system environment.

CO2- Apply the concept of CPU process scheduling for the given scenarios

CO3- Illustrate the process synchronization and concurrency process in operating system

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Mid-Term Examination, Even Semester 2024-25
B.Tech (CSE), Year-IInd, Semester-IVth
BCSC0004: Operating Systems

Time: 2 Hours **Maximum Marks: 30**

Instruction for students:

1. All parts of a question should be answered in one place.
2. Figures on the right-hand side margin indicate full marks.
3. Answers should be to the point only.

Section – A

Attempt All Questions 3 X 5 = 15 Marks

No.	Detail of Questions	Marks	CO	BL	KL
1	Define the purpose of an operating system and explain the working of its components in brief.	3	CO1	R	C
2	Differentiate between Time-Sharing and Real-Time Operating Systems. Additionally, discuss their advantages and disadvantages in enhancing system performance.	3	CO1	An	P
3	Distinguish between the convoy effect and starvation in CPU scheduling with suitable examples. Also, suggest possible solutions for these problems, if they exist.	3	CO2	U	C
4	Consider four processes A, B, C, and D that arrive at times 0, 2, 3, and 4, with CPU execution times of 5, 4, 1, and 3 milliseconds, respectively. Apply suitable CPU scheduling algorithms to determine the optimal waiting time. Compare the average waiting time for preemptive and non-preemptive scheduling algorithms used.	3	CO2	A	P
5	Imagine you arrive at a busy restaurant for lunch and find a long queue there. While allotted table, a VIP guest arrives, and the chef takes you to the waiting room to give priority to serving the VIP. After the VIP has been served, you are allotted a table. However, when you reach the table, the chef is busy serving another	3	CO2	An	M

	table, so you have to wait a little longer before you get your lunch. How will the operating system handle this situation in process management? Explain with suitable diagram and operations.				

Section – B

Attempt All Questions 5 X 3 = 15 Marks

No.	Detail of Question	Marks	CO	BL	KL
6	Consider five processes P1, P2, P3, P4, and P5, with the following burst times and priorities (lower values represent higher priority): Process | Arrival time | Running time | Priority P1 | 0 | 8 | 3 P2 | 1 | 4 | 2 P3 | 2 | 6 | 1 P4 | 3 | 5 | 4 P5 | 4 | 2 | 5 If the system uses **Preemptive Priority Scheduling,** calculate the completion time for each process and determine the average waiting time, Response time, turnaround time and throughput.	5	CO2	A	P
7	Consider two processes, P1 and P2, that share a critical resource. The operating system uses Peterson's Solution to solve the critical section problem. Given the following two processes: • **P1:** Wants to enter the critical section to print a document. • **P2:** Wants to enter the critical section to send an email. Explain how Peterson's solution ensures that only one process at a time can access the critical section. Illustrate the steps of Peterson's solution, including the roles of the flag and turn variables, and discuss how this approach prevents race conditions and ensures mutual exclusion. What are the limitations of Peterson's solution, especially when applied to more than two processes?	5	CO3	An	C
8	Consider a small café with one barista and several customers. The barista prepares coffee and places it on	5	CO3	A	M

	a counter (the bounded buffer). Each customer picks up a coffee from the counter once it's ready. The counter can hold only a limited number of coffees at a time, so if the barista tries to place a coffee when the counter is full, they must wait. Similarly, if the counter is empty, customers must wait until the barista prepares more coffee. How can the café manage the flow of coffee preparation and collection to avoid situations where the barista overfills the counter or customers try to pick up coffee when none is available? Explain the synchronization mechanisms in operating system that could be used to manage the shared buffer between the barista and customers, ensuring that neither the barista nor the customers experience unnecessary delays or conflicts.				