	School of Engineering & Technology	
	Department: SOET	**Session: 2024-2025**
	Programme: B Tech CSE/Cybersecurity/DS/AI/Ml/FSD/UI/UX	**Semester: V**
	Course Code: ENCS303	**Number of students:152**
	Course Name: Operating System	**Faculty: Dr. Tanvi Chawla**

Assignment Number:4

Instructions:

- Attempt all questions.
- Keep answers concise and to the point.
- Logical reasoning and clarity will carry more weight than lengthy descriptions.
- Where applicable, show calculations or diagrams clearly.
- Academic integrity is expected; original responses will be rewarded.

Total marks:20

Short Answer type: Part A	Marks
1. Explain race conditions with a real-world example outside of computing, and show how mutual exclusion addresses it.	2
2. Compare Peterson's Solution and semaphores in terms of implementation complexity and hardware dependency.	2
3. The producer-consumer problem can be solved using either semaphores or monitors. Identify one advantage of using monitors in a multi-core system.	2
4. For the Reader-Writer problem, explain how starvation can occur and describe one method to prevent it.	2
5. In deadlock prevention, the "Hold and Wait" condition can be eliminated. Explain one practical drawback of doing so in an OS.	2
Part B: Application/Numerical Based	
6. **Distributed Deadlock Detection Simulation**: Three sites S1, S2, and S3 have the following wait-for graph fragments: • **S1:** P1 → P2, P3 → P4 • **S2:** P2 → P5, P5 → P6 • **S3:** P6 → P1 a) Combine these fragments to form the global wait-for graph. b) Detect if a deadlock exists, and list the processes involved. c) Suggest one distributed algorithm that could be applied to detect it.	2

7. **Distributed File System Performance**: A DFS has the following characteristics: • Average local file access time: 5 ms • Average remote file access time: 25 ms • Probability of file being remote: 0.3 a) Calculate the expected file access time. b) Suggest one caching strategy to improve performance, and justify your choice.	2
8. In a concurrent system, a full checkpoint takes 200 ms, while an incremental checkpoint takes 50 ms. The system must maintain recovery capability within a 1-second recovery point objective (RPO). a) Propose an optimal mix of checkpointing methods over a 10-second period to meet the RPO with minimal overhead. b) Explain your reasoning.	2
9. **Case Study — Global E-Commerce Platform**: A global e-commerce company runs its services using a distributed operating system deployed across multiple continents. a) Identify the main distributed scheduling challenges for handling flash sales events and suggest an algorithm suitable for load balancing. b) Propose a fault tolerance strategy that ensures service availability even in the event of regional data center failures, considering both recovery time objective (RTO) and RPO.	4

Submission Guidelines:

- Assignment must be submitted on the LMS only.
- File name format: EnrollmentNumber_Name (e.g., *22ABC1234_RahulSharma*).
- Submission deadline: Within 1 week from the date of assignment publication.
- Late submissions will not be accepted unless approved in advance.