Reg. No. : | | | | | | | | | | | | |

Question Paper Code:R5H01

B.E./B.Tech. DEGREE EXAMINATION, NOV 2025

Fifth Semester

R21USY501- DISTRIBUTED COMPUTING

CSE(Cyber Security)

(Regulations R2021)

Duration: Three hours | Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1.	Differentiate between a distributed system and a parallel multiprocessor system.	CO1- U
2.	What are some challenges in ensuring fault tolerance in a distributed system?	CO1- U
3.	What are past and future cones of an event in a distributed system?	CO1- U
4.	What does Jard–Jourdan's adaptive technique aim to improve in vector clock implementations?	CO1- U
5.	What is group communication in distributed systems?	CO1- U
6.	Define propagation tree in multicast.	CO1 -U
7.	Apply Lamport's algorithm to show the order of requests from three processes: P1, P2, P3.	CO2- App
8.	List any two differences between Lamport's and Ricart–Agrawala's algorithms.	CO1- U
9.	What is the difference between safe and atomic registers?	CO1- U
10.	What is an atomic snapshot in shared memory?	CO1- U

PART – B (5 x 16= 80 Marks)

11.	(a)	Explain the differences between message-passing systems and shared memory systems.	CO1- U	(16)
		Or		
	(b)	Discuss the importance of fault tolerance in distributed systems and common approaches to implement it.	CO1- U	(16)

12.	(a)	Describe the various models of communication networks in distributed systems. Compare and contrast synchronous, asynchronous, and partially synchronous models with examples.	CO1- U	(16)
		Or		
	(b)	Define the term "cut" in a distributed computation. Differentiate between consistent and inconsistent cuts. Use a space-time diagram to illustrate your answer.	CO1-U	(16)
13.	(a)	Apply a basic scenario of network-layer multicast using a tree-based approach and demonstrate message forwarding among routers.	CO2 -App	(16)
		Or		
	(b)	Design a fault-tolerant group communication mechanism that uses causal and total ordering to maintain consistency during node failures. Apply the model to a replicated database system and explain how your method maintains consistency during updates.	CO2- App	(16)
14.	(a)	What are quorum-based mutual exclusion algorithms? Explain with suitable examples.	CO1-U	(16)
		Or		
	(b)	Apply Raymond's tree-based algorithm in a system with a binary tree of 5 nodes.	CO1 -U	(16)
15.	(a)	Explain the concept of abstraction in shared memory systems. What are the key advantages of using abstraction in designing distributed shared memory?	CO1- U	(16)
		Or		
	(b)	Define wait-freedom in the context of concurrent computing. How does wait-freedom differ from other progress guarantees like lock-freedom and obstruction-freedom?	CO1-U	(16)