

**BACHELOR OF TECHNOLOGY (CBCS - 2023)**  
**B. Tech. Sem-V INFORMATION TECHNOLOGY : WINTER: 2025**  
**SUBJECT: DISTRIBUTED SYSTEMS**

Day : Monday  
 Date : 08/12/2025

**W-30780-2025**

Time : 02:30 PM-05:30 PM  
 Max. Marks : 60

NB :

1. All questions are COMPULSORY.
2. Figures to the right indicate FULL marks.
3. Draw neat labelled diagram WHEREVER necessary.

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|-----------|--|--------------|
| Q. 1      | Apply the concept of distributed computing evolution to explain how advances in networking and hardware have shaped modern distributed systems. Provide real-world examples.           | CO1 BT3 (10) |
| <b>OR</b> |  |              |
| Q. 1      | Apply each model of Distributed Computing Systems (client-server, peer-to-peer, cluster, cloud) to an appropriate application scenario and justify the suitability.                    | CO1 BT3 (10) |
| Q. 2      | Apply the concept of Remote Procedure Call (RPC) to design a simple client-server interaction for a banking application. Show how the RPC mechanism hides communication complexities.  | CO2 BT3 (10) |
| <b>OR</b> |  |              |
| Q. 2      | Critically evaluate the role of events and process states in maintaining consistency across distributed systems. Discuss how incorrect event ordering can affect application behavior. | CO2 BT5 (10) |
| Q. 3      | Analyze the architectural differences between flat distributed transactions and nested distributed transactions. Show how each affects concurrency and recovery.                       | CO3 BT4 (10) |
| <b>OR</b> |  |              |
| Q. 3      | Evaluate the role of locking mechanisms in distributed transactions. Discuss issues such as lock contention, blocking, and lock granularity.   | CO3 BT5 (10) |
| Q. 4      | Analyze the structural differences between data-centric and client-centric consistency models. Discuss how each model affects read/write performance and user experience.              | CO4 BT4 (10) |
| <b>OR</b> |  |              |
| Q. 4      | Examine the architecture of distributed coordination-based systems and analyze how communication and naming mechanisms contribute to overall system coordination.                      | CO4 BT4 (10) |
| Q. 5      | Investigate how does a cryptographic technique, within a distributed setup, ensures confidentiality and integrity.   | CO5 BT4 (10) |
| <b>OR</b> |  |              |
| Q. 5      | Evaluate distributed hashing algorithms and justify which design best supports secure and scalable data lookup.  | CO5 BT5 (10) |

Q. 6 Analyze the challenges of leader election in asynchronous networks and explain how message delays affect algorithm correctness. CO6 BT2 (10)

OR

Q. 6 Evaluate stronger correctness conditions such as deadlock-freedom and starvation-freedom, and discuss their implications for designing mutual exclusion algorithms. CO6 BT2 (10)

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