Department of Computer Science & Engineering

Mid Sem Examination March 2022

Branch: **4th Year B.Tech CSE**
Course: **CSL409** Topics in **Distributed Systems (Slot C)**
Duration**: 1Hrs**   Max. Marks: **25**

Note: Attempt all questions. Credit reserved for neat comments/ to the point answers. Assume any missing data.

Q. 1   In some cases is it possible that Lamport's clock algorithm falls short (Lamport Clock is not able to follow that event a happened before event b), and the vector clock algorithm concludes clearly that event *a* happened before event *b* or NOT. Justify your answer with an example   CO1 [5]

Q. 2   Draw a space-time diagram for a case where causally ordered broadcast is violated. How does the protocol by Birman et. al. (BSS) for causally ordered broadcast handle such a case?

CO4 [5]

Q. 3   Using Lamport's Distributed Mutual Exclusion algorithm, there are two obvious consequences of a machine failure: A machine dies holding a lock forever; and the inability to make forward progress because a machine fails to respond to messages. How would you solve the first problem, of a machine dying and holding a lock forever?

CO1[5]

Q. 4   *[For students with even Roll No]*
Design an algorithm that uses fewer total messages than Ricart and Agrawala per critical section, but where the worst case latency for entry into the critical section is a constant number of hops, like in the centralized algorithm. Use of centralized components i.e., one lock manager per lock, is allowed, as long as full centralization (for each lock) is avoided.

CO1, CO4 [5]

OR

[For students with odd Roll No]
Explain with example, how do you think a new site (or a recovering site) can join non-token based mutual exclusion algorithms and get their clocks synchronized?

CO1, CO4 [5]

Q. 5   *[For students with even Roll No]*
If the FIFO channel assumption in the Chandy-Lamport algorithm is violated, then which step of the proof for the Chandy-Lamport algorithm given a consistent cut, breaks down?

CO4 [4]

OR

[For students with odd Roll No]
Consider a distributed system where each node has its own clock. Assume that all the clocks in the system are perfectly synchronized. Also assume that the communication

network is reliable. Give an algorithm for recording the global state (simpler than Chandy- Lamports algorithm). CO4 [4]