Homework 3 – Distributed Systems
Monsoon 2021
IIIT Hyderabad

Due date: October 1, 2021, 10 PM

Answer the following questions. Each question is for 4 points.

1. Explain what happens in the worst case with respect to the termination detection algorithm that uses distributed snapshots. What is the worst case scenario and how many messages are exchanged in the worst case scenario?

2. Read about the way Unix (and Linux) file systems use multiple indirect inode blocks to store files. Why does not GFS use such a hierarchical mechanism? What are some other advantages/disadvantages of these two approaches: flat vs hierarchical storage models for metadata?

3. In the algorithm of Lamport for mutual exclusion, show a scenario where a processor/site P satisfies condition L1 but not condition L2. Similarly, show a scenario where a process/site P satisfies condition L2 but not condition L1. Use four or more processors so as to make the example non-trivial.

4. Where does the algorithm of Lamport require that the channels guarantee FIFO delivery order. What could happen if no FIFO guarantee exists. Explain with a scenario as to which conditions among L1 and L2 fail.