CS7610: Homework 1
DUE Tuesday Sept. 25, 10:00 PM

1 Description

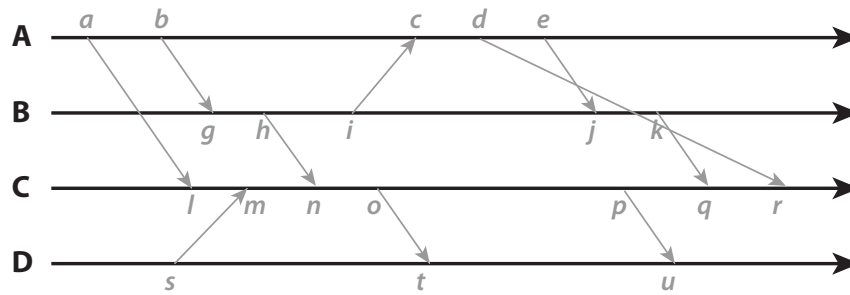**Problem 1** [20 points] Consider the sequence of events below:

Figure 1:

- Show the Lamport clocks at each step, as in the example showed in class. (10)

- Show the vector clocks at each step, as in the example showed in class. (10 points)

Problem 2 [15 points] Prove that the Lamport clocks algorithm presented in class provides a total order.

Problem 3 [15 points] Prove that the vector clocks algorithm presented in class provides a partial order.

Problem 4 [25 points] Consider the Chandy-Lamport Snapshot algorithm presented in class, now also assume that communication is not FIFO anymore. Propose an algorithm to record a global state when communication is not FIFO. You can use vector clocks. (Algorithm description 10 points and correctness proof 15 points).

Problem 5 [25 points] Consider the consensus algorithm in synchronous systems with crash failures presented in class and assume that a message can sometimes be delayed and arrive in the next round rather than only in the round it was sent. Show how can you modify the algorithm presented in class and prove that it is correct. (Describe the algorithm 10 points and correctness proof 15 points).

2 Submission

Information about submission is in post @11 in piaza. Name of the project in the submission command is hw1. Submission is in *PDF* format. Please do not submit be email.