ECE 454/750T10, Spring 2014 — Assignment 5
Due Fri, July 4, 11:59:59 PM

(Your submission must be typeset, and in pdf. Submit to the dropbox on Learn. If you are in 454, mention the names of both group members. Only one of the group members should make a submission.)

1.(5 points) Prove the claim on page 20 of the slide deck on Synchronization. "If every $C_i(\cdot), C_j(\cdot)$ satisfy κ_1 and κ_2, then $C(\cdot)$ satisfies κ_0."

2.(5 points) Prove the claim on page 29 of the slide deck on Synchronization. "$a \rightarrow b$ if and only if $VC(a) < VC(b)$."

3.(5 points) Suppose we use the protocol on page 22 of the slide deck on Synchronization for totally ordered multicast with logical (but not vector) clocks. Does the protocol achieve causally ordered multicast? If your answer is 'yes,' provide a proof. If your answer is 'no,' provide a counterexample.

4.(5 points) Consider page 40 of the slide deck on Synchronization. Devise a protocol by which n processes that can communicate with one another can organize themselves into a ring as shown to the right of the slide. What are the time- and space-efficiencies of your protocol?

5.(5 points) Page 41 of the slide deck on Synchronization (and your textbook) asserts that the number of messages between request and fulfilment for the Decentralized algorithm is unbounded. Propose a way to bound this, and give the corresponding tight lower- and upper-bounds for the number of messages.

6.(5 points) Page 41 of the slide deck on Synchronization (and your textbook) asserts that the number of messages between request and fulfilment for the Token Ring algorithm is unbounded. Propose a way to bound this, and give the corresponding tight lower- and upper-bounds for the number of messages.

7.(5 points) Consider the example we discussed at the start in the context of consistency — it is on pages 11–12 of the slide deck on Consistency and Figure 7-7 in the textbook. Is 001110 a legal output? Justify briefly. In particular, if you say 'yes,' you should identify the notion of "legal" that you adopt.