1. We have studied three MST algorithms in the Congest model: (i) Distributed Kruskal, (ii) Gallagher-Humblet-Spira, and (iii) Garay-Kutten-Peleg.

(a) Suppose that the input is an $n$-vertex graph with diameter $O(n^{1/3})$. Which of these three algorithms will be asymptotically the fastest? Explain your answer.

(b) Suppose that the input is an $n$-vertex graph whose MST has diameter $O(n^{1/3})$. Which of these three algorithms will be asymptotically the fastest? Explain your answer.

2. Consider the Garay-Kutten-Peleg MST algorithm. Recall that the second phase of this algorithm is a version of the Distributed Kruskal (or Pipelined) algorithm and this phase runs in $O(\sqrt{n} + \text{diameter}(G))$ rounds on an $n$-vertex graph $G$. Also recall that this phase runs in $O(\sqrt{n} + \text{diameter}(G))$ rounds because there are $O(\sqrt{n})$ MST fragments after Phase 1 and we need to gather $O(\sqrt{n})$ additional edges in Phase 2 to complete the MST construction. Describe this version of the Distributed Kruskal algorithm using pseudocode. Use the pseudocode that we wrote for the original version of the Distributed Kruskal algorithm and modify it to the current setting in which we are starting with a bunch of already-computed MST fragments.

3. Exercise 7.5 on Spanning Tree Verification from Professor Pandurangan’s notes.

4. Exercise 5.6 on Leader Election in a complete graph from Professor Pandurangan’s notes.

5. Exercise 5.8 on Leader Election in general graphs from Professor Pandurangan’s notes.

6. Exercise 5.11 on estimating network size in general graphs from Professor Pandurangan’s notes.