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Advanced Distributed Algorithms and Data Structures
SS 2019
Homework Assignment 4

Problem 1:

Prove Lemma 4.8 on slide 60 of Chapter 4.

Hint: First, consider the case that the graph only has edge weights in $\{1, 2\}$, and derive from the number of connected components in $G^{(1)}$ the number of edges of weight 2 that are needed for a minimum spanning tree. Try to generalize your insights to $\{1, 2, \ldots, W\}$ for any $W \geq 2$.

Problem 2:

(a) Prove Lemma 4.13 on slide 99 of Chapter 4.

(b) Prove Lemma 4.14 on slide 103 of Chapter 4.

Problem 3:

Prove Theorem 4.17. In particular, show that the algorithm for checking bipartiteness is correct.

Hint: Exploit the fact that a graph is bipartite if and only if it does not contain a cycle of odd length.

Problem 4:

Implement the list distance algorithm in the NetSimLan environment and run it on some list with randomly generated edge weights.