ISE/MA/OR 766

Homework #2

Assigned: February 27, 2024 **Due Date: March 7, 2024**

Problem 1: In Homework #1 (Part 2), you were asked to find a pair of arc-disjoint paths with the shortest total distance from a given node $i = 1$ to a given node j in a directed network with n nodes and m arcs.

Now you have learned much more beyond the "shortest path problem". Please reformulate your previous approach in the context of other network flow models (e.g., the minimal cost flow problem). Be sure to provide the Logic that supports your new approach and work out an illustrative Example.

Moreover, can your new approach be further extended to find 3 (or even more) arc-disjoint paths with the shortest total distance? Why? Please Explain in detail.

Problem 2: In the class, we learned about the minimal cost flow problem. You are asked to extend the basic minimal cost flow model to accommodate two extra requirements: (1) Each node i (except the source node s and terminal node t), there associates a demand (net excess) $d_i \geq 0$ to be satisfied while node t is still expected to receive a flow value of v. (2) When each unit of flow flowing through node i, a service/transshipment cost c_i is charged. Your task is to formulate this new problem as a basic minimal cost flow problem. Be sure to provide the Logic that supports your formulation and work out an illustrative Example.

Please submit your work electronically to me at fang@ncsu.edu.