

HW2: Network Flows part 2

Problem 1: Seven types of packages are to be delivered by five trucks. There are three packages of each type, and the capacities of the five trucks are 6, 4, 5, 4, and 3 packages, respectively. Set up a maximum-flow problem that can be used to determine whether the packages can be loaded so that no truck carries two packages of the same type.

1. Draw the network diagram for this problem. *Hint: Draw a source and sink node. The source node should be connected to each of the 7 packages and the sink node should be connected to each of the trucks.*
2. Formulate a concrete max flow model that can determine whether the packages can be loaded so that no truck carries two packages of the same type.

Problem 2: (Adapted from Exercise 2.42, p 83) Consider the directed graph, $G = (V, E)$, given below, where each edge $(i, j) \in E$ has associated with it a distance $d_{i,j}$. Assume that node 1 is the source of the network. Our goal is to find the shortest path from node 1 to every other node in the network.

1. Formulate the concrete model whose solution gives the shortest path from node 1 to every other node in the network. *Hint: what is the unit of flow in this network? Think about how that impacts the supply and demand.*
2. Convert the concrete model from part (1) into a parameterized model.

