

ORIE 5380, CS 5727: Optimization Methods
Homework Assignment 10
Due November 21, 12:00 pm

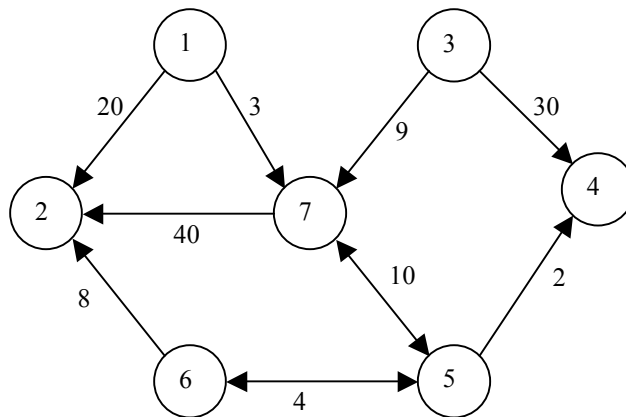
Please submit a single PDF document formatted to print and show all your work clearly.
Feel free to scan and submit handwritten work. Do not spend too much time on wordprocessing your answers.

Question 1

The figure below represents an oil pipeline network. The different nodes represent pumping and/or receiving stations. The lengths in miles of the different segments of the network are shown on the respective arcs. The bi-directional segments allow flows in both directions. The supplies at stations 1 and 3 are respectively 50 and 60 barrels per day. The demands at the stations 2 and 4 are respectively 90 and 20 barrels per day. Assume that the transportation cost is proportional to the distance and we are interested in minimizing the total transportation cost.

a) Formulate the problem as a min-cost network flow problem (i.e. write the problem that consists of an objective function and constraints).

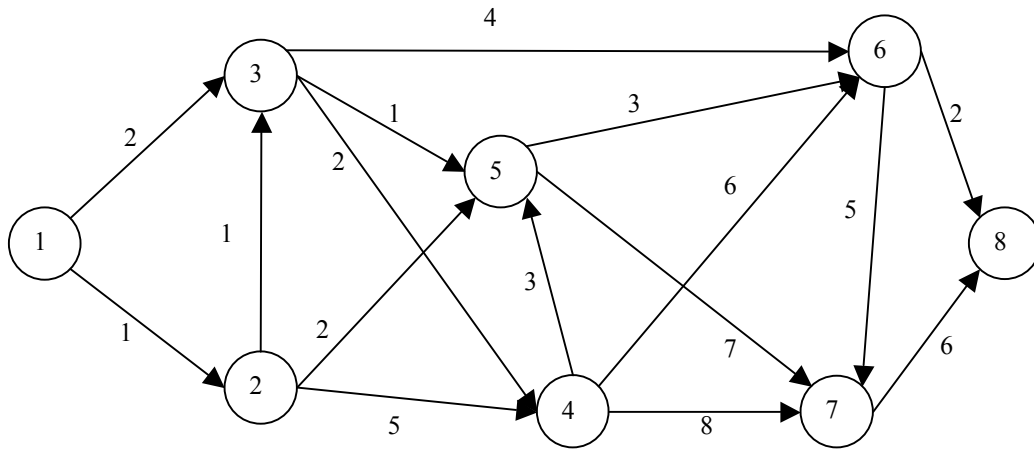
b) Find the minimum-cost transportation schedule by using AMPL. Turn in your AMPL files and state the optimal solution. (Do not worry too much about using a separate model and data files. It is perfectly fine if you hardcode everything in your model file.)



(There are three problems in this homework.)

Question 2

The network below represents the distances in miles between various cities.



- Formulate a linear optimization problem for finding the shortest path from city 1 to city 8 (i.e. write the problem that consists of an objective function and constraints).
- Find the shortest paths between the following pairs of cities by using AMPL: (from city 1 to city 8), (from city 1 to city 6), (from city 4 to city 8) and (from city 2 to city 6). Turn in your AMPL files and state the solution for all cases. (Do not worry too much about using a separate model and data files. It is perfectly fine if you hardcode everything in your model file.)