ECE 307

Spring 2019
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Homework 5

Date due: Thursday, February 28, 2019

1. Paltry Properties has just acquired four rental homes. Paltry wishes to have all the houses painted within the next week so that all can be available for the prime rental season. This means that each house will have to be painted by a different contractor. The following table shows the bids in thousands of dollars received from four contractors on the four houses.

house	painter bid			
	1	2	3	4
1	2.5	1.3	3.6	1.8
2	2.9	1.4	5.0	2.2
3	2.2	1.6	3.2	2.4
4	3.1	1.8	4.0	2.5

Paltry needs to decide which bids to accept in order to paint all houses at minimum total costs. **Formulate** a linear assignment problem to choose an optimal plan. **Solve** this problem using the transportation algorithm.

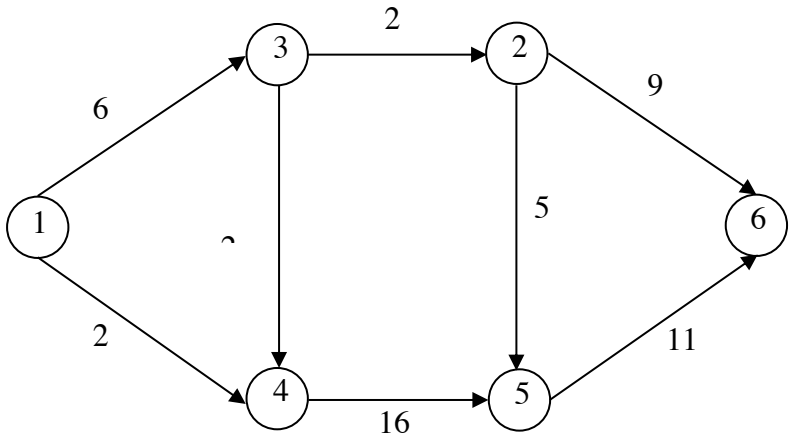
2. Crazy Crude oil company can produce 1,500 *barrels per day* from one of its fields and 1,200 *barrels per day* from the other. From there the crude oil can be piped to either of two tank farms, one at Axel and the other at Bull. Axel then trucks oil on to the Crazy Crude refinery at 0.40 *$ per barrel* to help meet its daily requirement of 2,000 *barrels*. Bull trucks to the refinery at 0.33 *$ per barrel*. It costs Crazy Crude 0.10 *$ per barrel* to pipe from field 1 to Axel and 0.35 *$ per barrel* to pipe from field 1 to Bull. Corresponding values for field 2 are *$* 0.25 and *$* 0.56. Also, the tank farms can truck between themselves at 0.12 *$ per barrel*. **Formulate** a linear program to determine an optimal piping plan. **Solve** this problem using the transportation algorithm.

3. **Formulate** problem 1 in Homework 2 as a transportation problem and **obtain** a basic feasible solution.

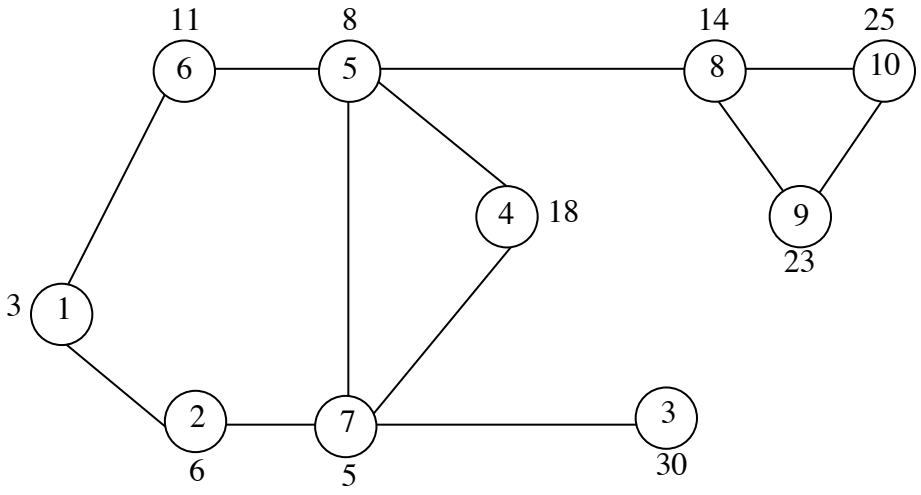
4. Problem 3.11, p.127 in **Ravindran**.

5. Problem 3.13, p.128 in **Ravindran**.

6. Consider the 6-node network below. Assume that the label on each arc is the costs and that we seek a minimum total cost path from node 1 to each other node. **Solve** the directed graph shortest path problem using the Dijkstra algorithm.



7. The figure shows the links of a proposed campus computer network. Each node is a computer, and the links are fiber-optic cable.



Designers now want to decide how to e-mail—e-mails will be broken into standard-length packets and should be routed from the internet gateway node 1 to/from all other nodes. For example, e-mail for node 4 might be transmitted by 1 to 6, then repeated by 6 to 5, then repeated by 5 to 4. Numbers on the nodes in the figure indicate minimum times (in nanoseconds) required by the corresponding computer to transmit or receive a message packet. The time to send a packet along any link of the network is the maximum of the times for the associated sending and receiving computers. **Solve** the graph above as a shortest path problem using the Dijkstra algorithm to establish the minimum distances from node 1 to every other node in the network.

8. Problem 3.16, p. 129 in **Ravindran**.
9. Problem 3.17, p. 129 in **Ravindran**.
10. Problem 3.18, p. 129 in **Ravindran**.
11. Problem 3.31, p. 133 in **Ravindran**.