Jacobs University
Fall 2022

October 25, 2022

Operations Research

Homework 8

Due on November 9, 2022

Note: Your homework must be submitted via moodle (see the link on the class website) on the due day BEFORE THE TUTORIAL, i.e., before 20:45.

Problem 1 [10 points]

(HL, Problem 8.1-4.) The Versatech Corporation has decided to produce three new products. Five branch plants now have excess product capacity. The unit manufacturing cost of the first product would be \$41, \$39, \$42, \$38, and \$39 in Plants 1, 2, 3, 4, and 5, respectively. The unit manufacturing cost of the second product would be \$55, \$51, \$56, \$52, and \$53 in Plants 1, 2, 3, 4, and 5, respectively. The unit manufacturing cost of the third product would be \$48, \$45, and \$50 in Plants 1, 2, and 3, respectively, whereas Plants 4 and 5 do not have the capability for producing this product. Sales forecasts indicate that 700, 1 000, and 900 units of products 1, 2, and 3, respectively, should be produced per day. Plants 1, 2, 3, 4, and 5 have the capacity to produce 400, 600, 400, 600, and 1 000 units daily, respectively, regardless of the product or combination of products involved. Assume that any plant having the capability and capacity to produce them can produce any combination of the products in any quantity. Management wishes to know how to allocate the new products to the plants to minimize total manufacturing cost.

(a) Formulate this problem as a transportation problem.

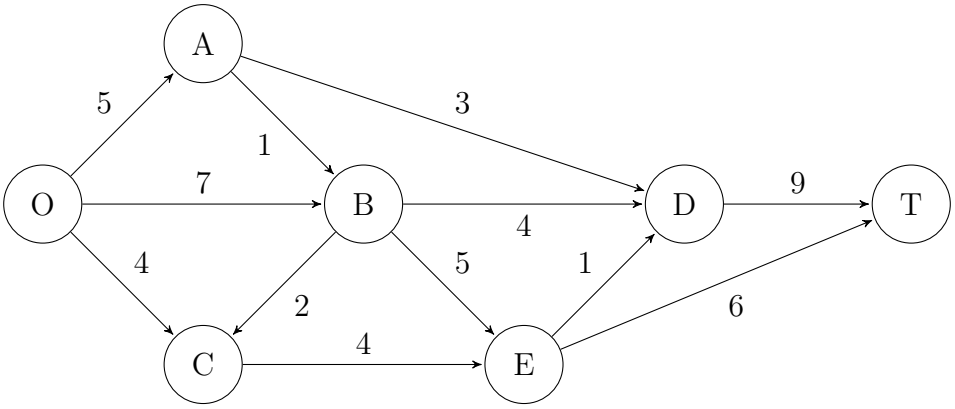
(b) Use Pyomo to obtain an optimal solution.

Part (a) should be submitted as a scan or typed into the Ipython notebook using mathematical markup; for part (b) submit your Ipython notebook showing code and output.

Problem 2 [10 points]

(a) Write a Pyomo program to solve the maximum flow problem for the Seervada Park example from Hillier and Lieberman, with the network data reproduced here. The arcs are directed and have a flow capacity as indicated.

(b) Ask the solver to return dual variables as well. Print out the dual variables that correspond to the capacity constraints. (Note: This can be used to identify the minimum cut of the network; see HL (9th edition) Chapter 9.5 “Finding an Augmenting Path”.)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