

HOMework #2

1. Suppose that P_1 , P_2 , and P_3 , are variables whose values are 1 if a particular plant is to be opened and 0 otherwise. Write a *single* linear constraint that reflects each of the following word constraints. (15 points)
 - (a) Not more than two of the three plants should be opened.
 - (b) If neither Plant 2 nor Plant 3 are opened, then Plant 1 should not be opened.
 - (c) If Plant 1 is opened or Plant 3 is not opened, then Plant 2 must be opened. (Hint: First write two constraints for this and then combine them into one constraint.)
2. The city of Wobegone is planning the purchase of new police cruisers that cost \$15,000 each, ambulances that cost \$25,000 each, and fire trucks that cost \$48,000 each. City regulations require at least one ambulance for every two fire trucks. Also, the total amount spent on police vehicles must be at least twice that spent on fire trucks. Each of the three fire stations must have at least one fire truck but not more than two. Formulate a model to determine the maximum number of fire trucks to purchase with a total budget of \$700,000. (15 points)
3. Consider a network with nodes numbered 1, 2, ..., n in which each node is connected by an arc to every other node and for which each arc ij connecting node i to node j has a nonnegative weight, w_{ij} . Create a model with variables, objective function, and constraints to determine a collection of arcs—think of the arcs you choose as colored red—whose total weight is as large as possible, subject to the restriction that no node can have more than 3 red arcs touching it. (15 points)
4. Use Solver or OpenSolver in EXCEL to solve each of the following linear programming problems. To do so, complete the model in the given Excel data and interpret the optimal solution (including slack variables) and optimal objective function value in the context of the problem.
 - (a) The Product-Mix Problem of BlubberMaid (see the file blubber.xls). (5 points)
 - (b) The Make-Or-Buy Problem of MTV Steel (see the file MakeOrBuy.xls). (5 points)
 - (c) The Energy Problem of Lilliput on page 11 in Section 1.2 of your textbook (see the file energy.xls). (5 points)
5. Use OpenSolver to solve the problem of Capital Bank in Lecture 4. In which projects do you invest? How much total return will you get? Is the budget constraint binding? Why or why not? (10 points)
6. Solve the problem in the Excel data file BigTransLP.xlsm by clicking on the button labeled Solve Model (which calls OpenSolver) in the worksheet and providing the birth day, month, and year (in the form DDMMYY) of one of your group members. Then answer the following questions (10 points):
 - (a) What were the values of DD, MM, and YY in the birth date that you used?
 - (b) What value did you get for the total transportation cost in cell S45?
 - (c) Now click on Solver, whose menu is already filled out, and solve this problem. What message do you get?