MA2210 - D term 2017 Homework III Show all work.

ONE

Use the Excel Simplex solver to find the solution to the LP problems in i) Homework I (superkitchen), and *ii*) Homework II (staffing problem).

For each of these problems:

- Implement your method as a maximization problem with constraints $Ax \leq b, x \geq 0$. Do not formulate the problem with slack variables.
- On paper, write down A and b, give your optimal solution and interpret the solution in terms of your business decision.
- Email a single Excel file with each problem in its own sheet (i.e. two tabs) to the PLA. In the subject of your email write FirstName LastName - HW3 Excel.

TWO

Tanya owns a window company with three employees (Caleb, Hakim, and Xiao) that makes two different kinds of hand-crafted windows: a wood-framed window and an aluminumframed window. The company makes a profit of \$180 for each wood-framed window and \$90 for each aluminum-framed window. Caleb makes the wood frames and can make 6 per day. Hakim makes the aluminum frames and can make 4 per day. Xiao forms and cuts the glass and can make 48 square feet of glass per day. Each wood-framed window uses 6 square feet of glass, and each aluminum-framed window uses 8 square feet of glass.

Tanya wants to decide how many of each window to produce per day in order to maximize profit.

a) Formulate a mathematical model for this problem. Remember to define all the variables precisely.

b) Find the optimal production schedule and the maximum profit that can be made.

THREE

You need to take a trip by car to another town that you have never visited before. You are studying a map to determine the shortest route to your destination. Depending on which route you choose there are five other towns (call them A, B, C, D, E) that you might pass through on the way.

The map shows the mileage along each road that directly connects two towns without any intervening towns. This information is summarized in the table below, where a dash indicates that there is no road directly connecting these two towns without going through any other towns.

Town	A	B	C	D	E	Destination
Origin	43	57	48	-	-	-
А		13	-	68	-	-
В			23	55	41	-
С				-	52	-
D					11	65
Ε						80

a) Formulate a network model for this problem.

b) Use the shortest path algorithm and the table at

http://users.wpi.edu/ sweekes/MA2210/ShortestPathTable.pdf to solve this problem.

What is the route that you will take and what is its length?

FOUR

Use the shortest path algorithm to find the shortest path from the origin to the destination in the network depicted below.



FIVE

The NoMoSloths Logging Company will soon begin logging eight groves of trees in the rainforest of Panarica. The project will require a system of dirt roads that makes each grove accessible from every other grove. The distance in miles between every pair of groves is given in the table below.

Grove	1	2	3	4	5	6	7	8
1	-	1.3	2.1	0.9	0.7	1.8	2.0	1.5
2	1.3	-	0.9	1.8	1.2	2.6	2.3	1.1
3	2.1	0.9	-	2.6	1.7	2.5	1.9	1.0
4	0.9	1.8	2.6	-	0.7	1.6	1.5	0.9
5	0.7	1.2	1.7	0.7	-	0.9	1.1	0.8
6	1.8	2.6	2.5	1.6	0.9	-	0.6	1.0
7	2.0	2.3	1.9	1.5	1.1	0.6	-	0.5
8	1.5	1.1	1.0	0.9	0.8	1.0	0.5	-

Management wishes to determine between which pairs of groves the roads should be constructed to in order to connect all groves with a minimum total length of road.

a) Formulate a network model for this problem.

b) Solve the problem.