Assignment No. 6

Question 1.

Solution:

Formulation:

Objective Function

max: 14000 Y1 + 3500 Y2;

Constraints:

14000 Y1 + 3500 Y2 - 150 X1 - 0.2 X2 <= 0;

14000 Y1 + 21000 Y2 - 400 X1 - 0.7 X2 <= 0;

42000 Y1 + 10500 Y2 - 320 X1 - 1.2 X2 <= 0;

28000 Y1 + 42000 Y2 - 520 X1 - 2 X2 <= 0;

19000 Y1 + 25000 Y2 - 350 X1 - 1.2 X2 <= 0;

14000 Y1 + 15000 Y2 - 320 X1 - 0.7 X2 <= 0;

150 X1 + 0.2 X2 = 1;

Xi >= 0, Yj >=0

Question 2.

Solution:

Given:

x1 = Production rates for product 1

x2 = Production rates for product 2

x3 = Production rates for product 3

Maximize Z = P - 6C - 3D

P = total (discounted) profit over the life of the new products,

C = change (in either direction) in the current level of employment,

D = decrease (if any) in next year’s earnings from the current year’s level.

Profit Goal:

Max P = 20x1 +15x2 + 25x3

Employment level goal:

6x1 + 4x2 + 5x3 = 50

Earnings next year goal:

8x1 + 7x2 + 5x3 >=75

Part 1)

Model Formulation:

y1 = 6x1 + 4x2 + 5x3 - 50

y2 = 8x1 + 7x2 + 5x3 -75

Substitute the information into the original constraints

For employment level goal y1 = y1+ - y1-

y1+ - y1-= 6x1 + 4x2 + 5x3 - 50

For the goal regarding earnings next year y2 = y2+ - y2-

y2+ - y2- = 8x1 + 7x2 + 5x3 -75

Final Formulation

Max P = 20x1 +15x2 + 25x3

6x1 + 4x2 + 5x3 - (y1+ - y1-) = 50

8x1 + 7x2 + 5x3 - (y2+ - y2-) = 75

Xj >=0, yi + >=0, yi - >=0

Part 2)

Objective Function:

Maximize Z = P - 6C - 3D

Objective function in terms of x1, x2, x3, y1+, y1- , y2+ and y2-

Maximize Z = 20x1 +15x2 + 25x3 - 6y1+ - 6y1- - 3y2-

Part 3)

Objective Function:

Maximize Z = 20x1 +15x2 + 25x3 - 6y1+ - 6y1- - 3y2-

Constraints:

6x1 + 4x2 + 5x3 - y1+ + y1- = 50

8x1 + 7x2 + 5x3 - y2+ + y2- = 75

Xj >=0, yi + >=0, yi - >=0

The linear programming model has been solved in R