zalshaye_5_Q2

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 Emp_level goal: 6x1 + 4x2 + 5x3 = 50
Earning_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: max: 20x1 + 15x2 + 25x3 - 6y1m -6y1p - 3y2m;

Constraints: Xj >=0, yi + >=0, yi - >=0 6x1 + 4x2 + 5x3 - y1p + y1m = 50; 8x1 + 7x2 + 5x3 - y2p + y2m = 75;

```
library(lpSolveAPI)
GoalProg <- read.lp("C:\\Users\\Z\\Desktop\\Emax.lp")
GoalProg

## Model name:
##             x1    x2    x3   y1m   y1p   y2m   y2p
## Maximize    20    15    25    -6    -6    -3     0
## R1           6     4     5     1    -1     0     0  =  50
## R2           8     7     5     0     0     1    -1  =  75
## Kind       Std   Std   Std   Std   Std   Std   Std
## Type      Real  Real  Real  Real  Real  Real  Real
## Upper      Inf   Inf   Inf   Inf   Inf   Inf   Inf
## Lower        0     0     0     0     0     0     0
```

```
solve(GoalProg)
## [1] 0
get.objective(GoalProg)
## [1] 225
get.constraints(GoalProg)
## [1] 50 75
get.variables(GoalProg)
## [1]  0  0 15  0 25  0  0
```