# Goal programming-Assignment

Harish Kunaparaju

2022-11-05

The Research and Development Division of the Emax Corporation has developed three new products. A decision now needs to be made on which mix of these products should be produced. Management wants primary consideration given to three factors: total profit, stability in the workforce, and achieving an increase in the company's earnings next year from the $75 million achieved this year

#importing libraries

```
library(lpSolve)
library(lpSolveAPI)
library(goalprog)
```

objective function Maximize Z = P - 6C - 3D, where
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.

#lptable of each new product shown in the table

```
lp<- matrix(c("Total Profit", "Employment Level", "Earnings Next Year",
                        20,6,8,
                        15,4,7,
                        25,5,5,
                        "Maximize","=50",">=75",
                        "Millions of Dollars", "Hundreds of Employees", "Millions of Dollars"), ncol=6, 
colnames(lp) <- c("Factor","Product 1", "Product 2", "Product 3", "Goal", "Units")
as.table(lp)
```

```
##   Factor             Product 1 Product 2 Product 3 Goal
## A Total Profit       20        15        25        Maximize
## B Employment Level   6         4         5         =50
## C Earnings Next Year 8         7         5         >=75
##   Units
## A Millions of Dollars
## B Hundreds of Employees
## C Millions of Dollars
```

```
lp1<-read.lp("goal.lp")
lp1
```

```
## 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
```

#goal programming model

```
solve(lp1)
```

```
## [1] 0
```

*the return value of 0 indicates that the model was successfully solved.*

#-objective

```
get.objective(lp1)
```

```
## [1] 225
```

#-variable value

```
get.variables(lp1)
```

```
## [1]  0  0 15  0 25  0  0
```

#interpretation

1.The units of combination that maximize the objective function are X1, X2, and X3. X1 = Product1, X2 = Product2, and X3 = Product3. But X3 has undergone a shift. The company can only make 15 units of Product 3, which is the only product, in order to maximize profit. The intention was to stabilize employment levels with a cap of 50 hundred employees, however in this case, the firm's employment levels were surpassed by 250 employees, necessitating the payment of a penalty for the excess/rise in the employee count.

# 2.the goal of y2p and y2m was to see the deviation either in positive or negative in the next years earnings from the current level.

# 3.The profit that the firm maximizing is 225 Million Dollars.