

## QMM- 5

Emax Corporation Problem:

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.

$$P = 20x_1 + 15x_2 + 25x_3 \quad y_1 = 6x_1 + 4x_2 + 5x_3 - 50 \quad y_2 = 8x_1 + 7x_2 + 5x_3 - 75$$

$y_1+$  is going over the employment level goal and the weighted penalty is 6  $y_1-$  is going under the employment level goal and the weighted penalty is 6  $y_2+$  is going over the earnings goal for next year- no penalty  $y_2-$  is going under the earnings goal for next year and the penalty is 3.  $x_1$  is the quantity of product 1 to be produced  $x_2$  is the quantity of product 2 to be produced  $x_3$  is the quantity of product 3 to be produced

LP formulation: \_\_\_\_\_ // Objective function max:  $20x_1 + 15x_2 + 25x_3 - 6y_1p - 6y_1m - 3y_2m$ ;

// Constraints  $6x_1 + 4x_2 + 5x_3 + y_1p - y_1m = 50$ ;  $8x_1 + 7x_2 + 5x_3 + y_2p - y_2m = 75$ ;

```
library(lpSolveAPI)
Emax_GP <- read.lp("Emax.lp")
Emax_GP
```

```
## Model name:
##          x1      x2      x3      y1p      y1m      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 (Emax_GP)
```

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

```
get.objective(Emax_GP)
```

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

```
#Emax need to produce 15 units of product 3 and none of product 1 and 2 to achieve 225 millions in pro.
get.variables(Emax_GP)
```

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