# *QMM Assignment: Module 4 –*

# *Solve LP Model Using R*

# Solving LP model using r  
library(lpSolve)

## Warning: package 'lpSolve' was built under R version 4.2.3

# Objective coefficients (profit per unit)  
f.obj <- c(420, 360, 300, 420, 360, 300, 420, 360, 300)

# Confusion Matrix

# *Rows correspond to plant capacity, storage space, and sales forecast constraints. Columns correspond to the sizes of each plant.*

f.con <- matrix(c(  
 1, 1, 1, 0, 0, 0, 0, 0, 0, # Plant 1 capacity  
 0, 0, 0, 1, 1, 1, 0, 0, 0, # Plant 2 capacity  
 0, 0, 0, 0, 0, 0, 1, 1, 1, # Plant 3 capacity  
 20, 15, 12, 0, 0, 0, 0, 0, 0, # Plant 1 storage space  
 0, 0, 0, 20, 15, 12, 0, 0, 0, # Plant 2 storage space  
 0, 0, 0, 0, 0, 0, 20, 15, 12, # Plant 3 storage space  
 1, 0, 0, 1, 0, 0, 1, 0, 0, # Sales forecasts for Large  
 0, 1, 0, 0, 1, 0, 0, 1, 0, # Sales forecasts for Medium  
 0, 0, 1, 0, 0, 1, 0, 0, 1 # Sales forecasts for Small  
), nrow = 9, byrow = TRUE)

f.con

## [,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9]  
## [1,] 1 1 1 0 0 0 0 0 0  
## [2,] 0 0 0 1 1 1 0 0 0  
## [3,] 0 0 0 0 0 0 1 1 1  
## [4,] 20 15 12 0 0 0 0 0 0  
## [5,] 0 0 0 20 15 12 0 0 0  
## [6,] 0 0 0 0 0 0 20 15 12  
## [7,] 1 0 0 1 0 0 1 0 0  
## [8,] 0 1 0 0 1 0 0 1 0  
## [9,] 0 0 1 0 0 1 0 0 1

# Right-hand side of constraints  
f.rhs <- c(750, 900, 450, 13000, 12000, 5000, 900, 1200, 750)

# Define the direction of inequalities (less than or equal)  
f.dir <- c("<=", "<=", "<=", "<=", "<=", "<=", "<=", "<=", "<=")

# Solve the LP problem  
f.sol = lp("max", f.obj,f.con,f.dir,f.rhs)  
f.sol$solution

## [1] 350.0000 400.0000 0.0000 0.0000 400.0000 500.0000 0.0000 133.3333  
## [9] 250.0000

#The optimal profit  
f.sol$objval

## [1] 708000