Module 6 - The Transportation Model

tab <- matrix(c(22,14,30,0,16,20,24,0), ncol = 4,byrow = TRUE)  
# Set customers and suppliers' names  
colnames(tab) <- c("Warehouse 1", "Warehouse 2", "Warehouse 3","Dummy")  
rownames(tab) <- c("Plant A", "Plant B")  
tab

## Warehouse 1 Warehouse 2 Warehouse 3 Dummy  
## Plant A 22 14 30 0  
## Plant B 16 20 24 0

The above transportation problem can be formulated in the LP format as below:

Min TC = 22x11 + 14x12 + 30x13 +16x21 + 20x22 + 24x23

Subject to  
Production Capacity  
x11 + x12 + x13 ≤ 100 x21 + x22 + x23 ≤ 120

Demand constrain x11 + x21 ≥ 80 x21 + x22 ≥ 60 x21 + x22 ≥ 70

Non-negativity of the variables xij ≥ 0

where i = 1,2,3 and j = 1,2

This transportation problem is unbalanced one (demand is not equal to supply), that is demand is less than supply by 10, so I create a dummy variable in column 4 with transportation cost zero and demand 10

library(lpSolve)  
# Set up cost matrix  
costs <- matrix(c(22,14,30,0,16,20,24,0), ncol = 4,byrow = TRUE)  
# Set customers and suppliers' names  
colnames(costs) <- c("Warehouse 1", "Warehouse 2", "Warehouse 3","Dummy")  
rownames(costs) <- c("Plant A", "Plant B")  
costs

## Warehouse 1 Warehouse 2 Warehouse 3 Dummy  
## Plant A 22 14 30 0  
## Plant B 16 20 24 0

# Set up constraint signs and right-hand sides (supply side)  
row.signs <- rep("<=", 2)  
row.rhs <- c(100,120)  
#Demand (sinks) side constraints  
col.signs <- rep(">=", 4)  
col.rhs <- c(80,60,70,10)

# Run  
lptrans <- lp.transport(costs, "min", row.signs, row.rhs, col.signs, col.rhs)  
#Values of all 9 variables  
lptrans$solution

## [,1] [,2] [,3] [,4]  
## [1,] 30 60 0 10  
## [2,] 50 0 70 0

# Value of the objective function  
lptrans$objval

## [1] 3980

When solved the transportation problem, I got the values of the variables as x11 = 30 x12 = 50 x21 = 60 x32 = 70

The minimized value of the transportation cost is 3980