Assignment - Module 6

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```
library(lpSolve)
```

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

```
# Formulate and solve the transportation Problem

# Set up problem matrix
Prob <- matrix(c(22, 14, 30, 600, 100,
                 16, 20, 24, 625, 120,
                 80, 60, 70, "-", "-"), nrow=3, byrow=TRUE)

colnames(Prob)=c("Warehouse 1","Warehouse 2","Warehouse 3","Production Cost","Production Capacity")

rownames(Prob)=c("Plant A","Plant B","Demand")

Prob
```

```
##         Warehouse 1 Warehouse 2 Warehouse 3 Production Cost Production Capacity
## Plant A "22"        "14"        "30"        "600"           "100"
## Plant B "16"        "20"        "24"        "625"           "120"
## Demand  "80"        "60"        "70"        "-"             "-"
```

```
# Minimize Z = 22X11 + 14X12 + 30X13 + 16X21 + 20X22 + 24X23

# supply Constraints
    # X11 + X12 + X13 <= 100
    # X21 + X22 + X23 <= 120

# Demand Constraints
    # X11 + X21 >= 80
    # X12 + X22 >= 60
    # X13 + X23 >= 70

# Non-negativity of the decision variables
#                   Xij >= 0 where i=1,2 and j=1,2,3



# Set up cost matrix
```

```r
costs = matrix(c(622, 614, 630, 0,
                 641, 645, 649, 0), nrow=2, byrow= TRUE)

# Production monthly Capacity = 100 + 120 = 220
# Demand (monthly) = 80 + 60 + 70 = 210
# Since Production capacity > Demand i.e.unbalanced, we are creating a dummy column of the value 10.

#Set up column names and row names
colnames(costs) = c("Warehouse 1","Warehouse 2","Warehouse 3","Dummy")
rownames(costs) = c("Plant A","Plant 2")

costs
```

```
##         Warehouse 1 Warehouse 2 Warehouse 3 Dummy
## Plant A         622         614         630     0
## Plant 2         641         645         649     0
```

```r
#Setting up constraint signs and right-hand sides
row.signs <- rep("<=",2)
row.rhs <- c(100,120)
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)

#Variables for the given Problem
lptrans$solution
```

```
##      [,1] [,2] [,3] [,4]
## [1,]    0   60   40    0
## [2,]   80    0   30   10
```

```r
# As per the above chart, to minimize the transportation cost, 80 units should be shipped from Plant B
# Min value = (80*641) + (60*614) + (40*630) + (30*649) + (10*0) = 132,790

# Objective function is
lptrans$objval
```

```
## [1] 132790
```