Assignment 3

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The given problem belongs to Unbalanced Transportation Problem,here the supply is higher than the demand:

Let, a and b are the variables for quantities of product for Plant A and Plant B.

a1, be the quantity produced by Plant A to Warehouse 1

b1, be the quantity produced by Plant B to Warehouse 1

a2, be the quantity produced by Plant A to Warehouse 2

b2, be the quantity produced by Plant B to Warehouse 2

a3, be the quantity produced by Plant A to Warehouse 3

b3, be the quantity produced by Plant B to Warehouse 3

In the given problem,the supply and demand are unequal, so a dummy destination is introduced in the equation to make it equal to the supply and demand.We can assume the dummy variable as Storage here.Thus,

a4, be the quantity produced by Plant A to Storage

b4, be the quantity produced by Plant B to Storage

The Objective function of combined cost of production and shipping is:

Z=(622)a1+(614)a2+(630)a3+(0)a4+(641)b1+(645)b2+(649)b3+(0)b4

The Constraints are:

Supply Constraints for Plant A and Plant B:

a1+a2+a3+a4=100

b1+b2+b3+b4=120

Total Production capacity of supply is:100+120=220

Demand Constraints for Warehouse 1,2 and 3 are:

x1+x2=80

y1+y2=60

z1+z2=70

Total Demand on monthly is: 80+60+70=210

Therefore,(220-210)=10(Dummy source)

Non-negative constraints are:

a1,a2,a3,a4,b1,b2,b3,b4>=0

```r
library(lpSolve)
```

#Set up costs matrix

```r
Cost <- c(22,14,30,16,20,24)

rhs <- c(100,120,80,60,70)

#The Objective function matrix of combined cost of production and shipping:
costs <- matrix(c(622,614,630,0,
                  641,645,649,0),nrow = 2,byrow = TRUE)

#The Column and Row names of the matrix are:
colnames(costs) <- c("Warehouse1","Warehouse2","Warehouse3","Dummy Source")
rownames(costs) <- c("Plant A","Plant B")

costs
```

```
##         Warehouse1 Warehouse2 Warehouse3 Dummy Source
## Plant A        622        614        630            0
## Plant B        641        645        649            0
```

#Set up constraint signs and right-hand sides

```r
row.signs <- rep("=", 2)
row.rhs <- c(100,120)
col.signs <- rep("=", 4)
col.rhs <- c(80,60,70,10)
```

#Getting the Minimum output of combined cost by using lp.transport function

```r
lptrans <- lp.transport(costs, "min", row.signs, row.rhs, col.signs, col.rhs)

#Optimal solution of variables
lptrans$solution
```

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

It means the matrix is giving the optimal solution in a way that,to send 60 units of production to Warehouse 2 and 40 units of production to Warehouse 3 out of 100 units supply from Plant A and out of 120 units supply from Plant B,it is better to send 80 units of production to Warehouse 1 and 30 units of production to Warehouse 3 and 10 units of production to Storage,it is Dummy source.

#Getting the Objective Function of model

```r
lptrans$objval
```

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

```
lptrans
```

```
## Success: the objective function is 132790
```

It is clear that the minimum combined cost of production and shipping of AEDs of both Plant A and Plant B is: $ 132,790.