assignment\_2

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library(lpSolve)

Problem <- matrix(c(22,14,30,600,100,  
 16,20,24,625,120,  
 80,60,70,"-","-"),ncol = 5,byrow = TRUE)  
colnames(Problem)<- c("Warehouse1","Warehouse2","Warehouse3","Production Cost","Production Capacity")  
rownames(Problem)<-c("Plant A","Plant B","Monthly Demand")  
Problem <-as.table(Problem)  
Problem

## Warehouse1 Warehouse2 Warehouse3 Production Cost  
## Plant A 22 14 30 600   
## Plant B 16 20 24 625   
## Monthly Demand 80 60 70 -   
## Production Capacity  
## Plant A 100   
## Plant B 120   
## Monthly Demand -

# Since production and demand is unbalanced, Dummy column is created  
#  
# Name of the column and rows:  
costs <- matrix(c(622,614,630,0,  
 641,645,649,0),ncol = 4,byrow = TRUE)  
colnames(costs)<- c("Warehouse1","Warehouse2","Warehouse3","Dummy")  
rownames(costs)<-c("Plant A","Plant B")  
costs <-as.table(costs)  
costs

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

# Setting up the row signs and production capacity values  
row.signs <- rep("<=",2)  
row.rhs<- c(100,120)  
# Setting up the column sign and demand values  
col.signs <- rep(">=",4)  
col.rhs <- c(80,60,70,10)

# Running lptrans to find minimum cost  
lptrans <- lp.transport(costs,"min",row.signs,row.rhs,col.signs,col.rhs)  
# Values of all variables  
lptrans$solution

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

# Objective function   
lptrans$objval

## [1] 132790

# Therefore

# x12 = 60

# x13 = 40

# x21 = 80

# x23 = 30

# Objective function is 132790.

$$ 2. \hspace{.2cm} formulate \hspace{.2cm} the\hspace{.2cm} transportation\hspace{.2cm} problem.$$

#Since the primal was to be minimized so that the transportation cost the dual of it would be to maximize the value added(VA).

$$ \text{Maximize VA} \hspace{.2cm}= 80 W\_{1} +60 W\_{2} +70W\_{3}- 100P\_{A}- 120P\_{B}$$

$$Subject\hspace{.2cm} to \hspace{.2cm} the \hspace{.2cm} following\hspace{.2cm} constraints $$

$$ \ Total \hspace{.2cm} Profit \hspace{.2cm} Constraints$$

$$Where\hspace{.2cm} MR\_{1} = Marginal\hspace{.2cm} Revenue\hspace{.2cm}from\hspace{.2cm} Warehouse 1$$

$$MR\_{2} = Marginal\hspace{.2cm}Revenue\hspace{.2cm} from\hspace{.2cm}Warehouse 2$$

$$MR\_{3} = Marginal\hspace{.2cm} Revenue\hspace{.2cm} from\hspace{.2cm}Warehouse 3$$

$$MC\_{1} = Marginal\hspace{.2cm} Cost\hspace{.2cm} from\hspace{.2cm}Plant 1$$

$$MC\_{2} = Marginal\hspace{.2cm} Cost\hspace{.2cm} from\hspace{.2cm}Plant 2$$

$$3.\hspace{.2cm}Economic\hspace{.2cm} Interpretation\hspace{.2cm} of\hspace{.2cm} the\hspace{.2cm} dual$$

#Reduced production and shipping costs are the aim of AED’s business. #In order to accomplish this, the company will need to employ a logistics firm to handle the transportation, which will involve buying the AEDs and shipping them to multiple warehouses in an effort to cut the cost of production and shipping overall.

$$MR\_{1} <= MC\_{1} + 621\hspace{.4cm}i.e.\hspace{.4cm} MR\_{1} >= MC\_{1}$$

#“Based on above interpretation,we can conclude that,profit maximization takes place if MC is equal to MR.”