Assignment 3

Name: Sahil Mahendra Mody

CWID: 20007262

QUESTION 1

a) We can use list to store the number of retailers, warehouse capacity and retailer's demand and dictionary to store transportation cost between supply and demand.

c) Let Xij be the amount supplied from location I to location j

Constraints:

Min (Z) = ΣCijXij

Minimize Z (cost) where Z=

$2X_{11} + 4X_{12} + 5X_{13} + 2X_{14} + X_{15} + 3X_{21} + X_{22} + 3X_{23} + 2X_{24} + 3X_{25}$

Supply Constraints:

$X_{11}+X_{12}+X_{13}+X_{14}+X_{15}<=2000$

$X_{21} +X_{22}+X_{23}+X_{24}+X_{25}<=3000$

Demand Constraints:

$X_{11} +X_{21}=500$

$X_{12} +X_{22}=800$

$X_{13}+ X_{23}=1800$

$X_{14}+X_{24} =300$

$X_{15} + X_{25}=700$

Non-Negativity Constraints:

$X_{1j}>=0$

$X_{2j}>=0$

QUESTION 2:

Let Xij be the amount supplied from location I to location j and Cij be the transportation cost of supplying one unit of product from location I to location j

Min (Z) = ΣCijXij

$Min(Z) = 9X_{11} + 14X_{12} + 12X_{13} +17X_{14}+11X_{21} + 10X_{22} +6X_{23} +10X_{24} + 12X_{31} + 8X_{32} +15X_{33}+ 7X_{34}$

Supply Constraints:

$X_{11}+X_{12}+X_{13} + X_{14} <=200$

$X_{21} +X_{22} +X_{24} <=200$

$X_{31} +X_{32}+X_{33} +X_{34} <=200$

Demand Constraints:

$X_{11}+X_{21} +X_{31} =130$

$X_{12}+X_{22} +X_{32} =170$

$X_{13}+X_{23} +X_{33} =100$

$X_{14}+X_{24} +X_{34} =150$

Where Xij>=0

QUESTION 3:

Let Xij be the amount supplied from location I to location j and Cij be the transportation cost of supplying one unit of product from location I to location j

Step 2:

Min (Z) = ΣCijXij

Min(Z) = $16X_{14} + 21X_{15} + 18X_{24} + 16X_{25} + 22X_{34} + 25X_{35} + 23X_{46} + 15X_{47} + 29X_{48} + 20X_{56} + 17X_{57} + 24X_{58}$

Supply Constraints:

$X_{14}+X_{15}=72$

$X_{24}+X_{25}=105$

$X_{34}+X_{35}=83$

Transhipment Constraints:

$X_{14}+X_{24}+X_{34}=X_{46}+X_{47}+X_{48}$

$X_{15}+X_{25}+X_{35}=X_{56}+X_{57}+X_{58}$

Demand Constraints:

$X_{46}+X_{56}<=90$

$X_{47}+X_{57}<=80$

Where Xij>=0

QUESTION 4:

c. Let Xij be the selection of caterers to the events and for simplicity I belongs to {A,B,C,D,E,F,G} and J belongs to {1,2,3,4,5,6}

Minimize Z =

$12.6X_{A1} + 10.3X_{A2} +14.0X_{A3} + 19.5X_{A4} +25.0X_{A5}+ 30.0X_{A6} +$

$14.5X_{B1} +13.0X_{B2} + 16.5 X_{B3} +17.0X_{B4}+ 22.5X_{B5}+32.0X_{B6} +$

$13.0X_{C1}+ 14.0X_{C2}+ 17.6X_{C3}+ 21.5X_{C4} + 23.0X_{C5} +35.0X_{C6}+$

$11.5X_{D1}+ 12.6X_{D2}+13.0X_{D3}+ 18.7X_{D4}+ 26.2X_{D5}+ 33.5X_{D6}+$

$10.8X_{E1}+ 11.9X_{E2}+ 12.9X_{E3}+ 17.5X_{E4}+ 21.9X_{E5}+ 28.5X_{E6}+$

$13.5X_{F1}+ 13.5X_{F2}+ 15.5X_{F3}+ 22.3X_{F4}+ 24.5X_{F5}+ 36.0X_{F6} +$

$12.5X_{G1}+ 14.3X_{G2}+ 16.0X_{G3}+ 22.0X_{G4}+ 26.7X_{G5}+ 34.0X_{G6}$

Subject to:

Constraints:

Supply Constraint

$X_{A1}+ X_{A2}+X_{A3}+X_{A4}+X_{A5}+X_{A6}<=1$

$X_{B1}+X_{B2}+X_{B3}+X_{B4}+X_{B5}+X_{B6}<=2$

$X_{C1}+X_{C2}+X_{C3}+X_{C4}+X_{C5}+X_{C6}<=2$

$X_{D1}+X_{D2}+X_{D3}+X_{D4}+X_{D5}+X_{D6}<=1$

$X_{E1}+X_{E2}+X_{E3}+X_{E4}+X_{E5}+X_{E6}<=1$

$X_{F1}+X_{F2}+X_{F3}+X_{F4}+X_{F5}+X_{F6}<=1$

$X_{G1}+X_{G2}+X_{G3}+X_{G4}+X_{G5}+X_{G6}<=2$

Demand Constraint

$X_{A1}+ X_{B1}+X_{C1}+X_{D1}+X_{E1}+X_{F1}+X_{G1}=1$

$X_{A2}+ X_{B2}+X_{C2}+X_{D2}+X_{E2}+X_{F2}+X_{G2}=1$

$X_{A3}+ X_{B3}+X_{C3}+X_{D3}+X_{E3}+X_{F3}+X_{G3}=1$

$X_{A4}+ X_{B4}+X_{C4}+X_{D4}+X_{E4}+X_{F4}+X_{G4}=1$

$X_{A5}+ X_{B5}+X_{C5}+X_{D5}+X_{E5}+X_{F5}+X_{G5}=1$

$X_{A6}+ X_{B6}+X_{C6}+X_{D6}+X_{E6}+X_{F6}+X_{G6}=1$

Where Xij>=0