Assignment 4 : Quantitative Management Modeling

1. Formulation of the transportation Problem

1st Approach:

Decision Variables:

Xab = No. of units shipped from Plant a ro Warehouse b.

XIW1 = No. of units shipped from Plant I to Warehouse 1.

XIW2 = No. of units shipped from Plant I to Warehouse 2.

XIW3 = No. of units shipped from Plant I to Warehouse 3.

XJW1 = No. of units shipped from Plant J to Warehouse 1.

XJW2 = No. of units shipped from Plant J to Warehouse 2.

XJW3 = No. of units shipped from Plant J to Warehouse 3.

Objective Function:

Min W = 22 XIW1 + 14 XIW2 + 30 XIW3 + 16 XJW1 + 20 XJW2 + 24 XJW3 + 600 XIW1 + 600 XIW2 + 600 XIW3 + 625 XJW1 + 625 XJW2 + 625 XJW3

= 622 XIW1 + 614 XIW2 + 630 XIW3 + 641 XJW1 + 645 XJW2 + 649 XJW3

Constraints:

S.t

Plant I supply : XIW1 + XIW2 + XIW3 <= 100

Plant J Supply : XJW1 + XJW2 + XJW3 <= 120

Warehouse 1 : XIW1 + XJW1 = 80

Warehouse 2 : XIW2 + XJW2 = 60

Warehouse 3 : XIW3 + XJW3 = 70

All Xab >= 0

2. a)

Formulation of Trans - shipment Problem:

Objective Function:

Min W = 1.52 X1X + 1.60 X1Y + 1.40 X1Z + 1.70 X2X + 1.63 X2Y + 1.55 X2Z + 1.45 X3X + 1.57 X3Y + 1.30 X3Z + 5.15 XXR1 + 5.69 XXR2 + 6.13 XXR3 + 5.63 XXR4 + 5.80 XXR5 + 5.12 XYR1 + 5.47 XYR2 + 6.05 XYR3 + 6.12 XYR4 + 5.71 XYR5 + 5.32 XZR1 + 6.16 XZR2 + 6.25 XZR3 + 6.17 XZR4 + 5.87 XZR5;

Wells to Pump Stations:

X1X = No. of units of oil barrels moved from Well 1 to Pump station X in TBD.

X1Y = No. of units of oil barrels moved from Well 1 to Pump station Y in TBD.

X1Z = No. of units of oil barrels moved from Well 1 to Pump station Z in TBD.

X2X = No. of units of oil barrels moved from Well 2 to Pump station X in TBD.

X2Y = No. of units of oil barrels moved from Well 2 to Pump Station Y in TBD.

X2Z = No. of units of oil barrels moved from Well 2 to Pump station Z in TBD.

X3X = No. of units of oil barrels moved from Well 3 to Pump station X in TBD.

X3Y = No. of units of oil barrels moved from Well 3 to Pump station Y in TBD.

X3Z = No. of units of oil barrels moved from Well 3 to Pump Station Z in TBD.

Pump Stations to Refineries:

XXR1 = No. of units of oil barrels moved from Pump Station X to Refinery 1 in TBD.

XXR2 = No. of units of oil barrels moved from Pump Station X to Refinery 2 in TBD.

XXR3 = No. of units of oil barrels moved from Pump Station X to Refinery 3 in TBD.

XXR4 = No. of units of oil barrels moved from Pump Station X to Refinery 4 in TBD.

XXR5 = No. of units of oil barrels moved from Pump Station X to Refinery 5 in TBD.

XYR1 = No. of units of oil barrels moved from Pump Station Y to Refinery 1 in TBD.

XYR2 = No. of units of oil barrels moved from Pump Station Y to Refinery 2 in TBD.

XYR3 = No. of units of oil barrels moved from Pump Station Y to Refinery 3 in TBD.

XYR4 = No. of units of oil barrels moved from Pump Station Y to Refinery 4 in TBD.

XYR5 = No. of units of oil barrels moved from Pump Station Y to Refinery 5 in TBD.

XZR1 = No. of units of oil barrels moved from Pump Station Z to Refinery 1 in TBD.

XZR2 = No. of units of oil barrels moved from Pump Station Z to Refinery 2 in TBD.

XZR3 = No. of units of oil barrels moved from Pump Station Z to Refinery 3 in TBD.

XZR4 = No. of units of oil barrels moved from Pump Station Z to Refinery 4 in TBD.

XZR5 = No. of units of oil barrels moved from Pump Station Z to Refinery 5 in TBD.

Constraints:

S.t

Supply Constraints:

X1X + X1Y + X1Z <= 93;

X2X + X2Y + X2Z <= 88;

X3X + X3Y + X3Z <= 95;

Trans-shipment Nodes:

X1X + X2X + X3X = XXR1 + XXR2 + XXR3 + XXR4 + XXR5 ;

X1Y + X2Y + X3Y = XYR1 + XYR2 + XYR3 + XYR4 + XYR5;

X1Z + X2Z + X3Z = XZR1 + XZR2 + XZR3 + XZR4 + XZR5;

Demand Constraints:

XXR1 + XYR1 + XZR1 = 30;

XXR2 + XYR2 + XZR2 = 57;

XXR3 + XYR3 + XZR3 = 48;

XXR4 + XYR4 + XZR4 = 91;

XXR5 + XYR5 + XZR5 = 48;

1. b) Network Diagram:

