Assignment-4

Solution-1:

Given data as in table below

	Unit Shipping Cost			*Unit*	*Monthly*
	Warehouse 1	*Warehouse 2*	*Warehouse 3*	*Production Cost*	*Production Capacity*
Plant A	*$22*	*$14*	*$30*	*$600*	*100*
Plant B	*$16*	*$20*	*$24*	*$625*	*120*
Monthly Demand	*80*	*60*	*70*		

Decision Variables:

Xa1- from plant A to warehouse 1.

Xa2- from plant A to warehouse 2.

Xa3- from plant A to warehouse 3.

Xb1- from plant B to warehouse 1.

Xb2- from plant B to warehouse 2.

Xb3- from plant B to warehouse 3.

Xd- dummy variable

Objective Function:

Min Z = 622Xa1 + 614 Xa2 + 630 Xa3 + 641 Xb1 + 645 Xb2 + 649 Xb3 + 0 Xad + 0Xbd

Constraints:

Xa1 + Xa2 + Xa3 + Xad = 100

Xb1 + Xb2 + Xb3 + Xbd = 120

Xa1 + Xb1 = 80

Xa2 + Xb2 = 60

Xa3 + Xb3 = 70

Xad + Xbd =10

All the decision variables are ≥ 0.

Solution-2:

Given data as shown in table below

Refinery	R1	R2	R3	R4	R5
Requirement (TBD)	30	57	48	91	48

To		Pump A	Pump B	Pump C
From	Well 1	1.52	1.60	1.40
	Well 2	1.70	1.63	1.55
	Well 3	1.45	1.57	1.30

To		R1	R2	R3	R4	R5
From	Pump A	5.15	5.69	6.13	5.63	5.80
	Pump B	5.12	5.47	6.05	6.12	5.71
	Pump C	5.32	6.16	6.25	6.17	5.87

Decision Variables:

Xij = from well i to pump j

i = 1, 2,3 for well1, well2, well3 respectively.

j = a, b, c for pump A, pumpB, pumpC respectively.

Xjk = from pump j to refinery k

j = a, b, c for pump A, pumpB, pumpC respectively.

k = 1, 2, 3, 4, 5, 6, for refinery R1, R2, R3, R4, R5, R6 respectively.

Dummy refinery – R6

Detail explanation for each decision variable.

X1a = from well 1 to pump A.

X1b = from well 1 to pump B.

X1c = from well 1 to pump C.

X2a = from well 2 to pump A.

X2b = from well 2 to pump B.

X2c = from well 2 to pump C.

X3a = from well 3 to pump A.

X3b = from well 3 to pump B.

X3c = from well 3 to pump C.

Xa1 = from pump A to refinery R1.

Xb1 = from pump B to refinery R1.

Xc1 = from pump C to refinery R1.

Xa2 = from pump A to refinery R2.

Xb2 = from pump B to refinery R2.

Xc2 = from pump C to refinery R2.

Xa3 = from pump A to refinery R3.

Xb3 = from pump B to refinery R3.

Xc3 = from pump C to refinery R3.

Xa4 = from pump A to refinery R4.

Xb4 = from pump B to refinery R4.

Xc4 = from pump C to refinery R4.

Xa5 = from pump A to refinery R5.

Xb5 = from pump A to refinery R5.

Xc5 = from pump A to refinery R5.

Objective Function:

Minimum Z = 1.52X1a + 1.70X2a + 1.45X3a + 1.60X1b + 1.63X2b + 1.57X3b + 1.40X1c + 1.55X2c + 1.30X3c + 5.15Xa1 + 5.12Xb1 + 5.32Xc1 + 5.69Xa2 + 5.47Xb2 +6.16Xc2 + 6.13Xa3 + 6.05Xb3 + 6.25Xc3 + 5.63Xa4+ 6.12Xb4 + 6.17Xc4 + 5.80Xa5 + 5.71Xb5 + 5.87Xc5 + 0Xa6 + 0Xb6 + 0Xc6.

Constraints:

X1a + X1b + X1c = 93

X2a + X2b + X2c = 88

X3a + X3b + X3c = 95

Xa1 + Xb1 + Xc1 = 30

Xa2 + Xb2 + Xc2 = 57

Xa3 + Xb3 + Xc3 = 48

Xa4 + Xb4 + Xc4 = 91

Xa5 + Xb5 + Xc5 = 48

Xa6 + Xb6 + Xc6 = 2

X1a + X2a + X3a = Xa1 + Xa2 + Xa3 + Xa4 + Xa5 + Xa6

$X1b + X2b + X3b = Xb1 + Xb2 + Xb3 + Xb4 + Xb5 + Xb6$

$X1c + X2c + X3c = Xc1 + Xc2 + Xc3 + Xc4 + Xc5 + Xc6$

Xij = from well i to pump $j \geq 0$

i = 1, 2,3 for well1, well2, well3 respectively.

j = a, b, c for pump A, pumpB, pumpC respectively.

Xjk = from pump j to refinery $k \geq 0$

j = a, b, c for pump A, pumpB, pumpC respectively.

k = 1, 2, 3, 4, 5, 6, for refinery R1, R2, R3, R4, R5, R6 respectively.

Well 1 is used to capacity optimal schedule.

Network Diagram