Assignment – 4

Q 1:

From the given problem, the minimized cost of production and shipping together is formulated as below:

Objective Function,

$$\textbf{\textit{Min, } Z = 622 } X_{11} + 614 X_{12} + 630 X_{13} + 0 X_{14} + 641 X_{21} + 645 X_{22} + 649 X_{23} + 0 X_{24}$$

Here, there are ***6 decision*** variables and ***2 dummy*** variables are considered in order to equalize the demand(destination) and supply(source).

Subject to the constraints,

$$X_{11} + X_{12} + X_{13} + X_{14} = 100$$
$$X_{21} + X_{22} + X_{23} + X_{24} = 120$$

} Supply Constraints

$$X_{11} + X_{21} = 80$$
$$X_{12} + X_{22} = 60$$
$$X_{13} + X_{23} = 70$$
$$X_{14} + X_{24} = 10$$

} Demand Constraints

$$\textbf{\textit{Where, } } X_{ij} \textbf{\textit{ >=0 (i =1,2 and j = 1,2,3,4)}}$$

i = Plant, j = Warehouses.

Q 2a:

As given in the problem, the minimum objective function is formulated below:

$$\textit{Min, } Z = 1.52 X_{1A} + 1.60 X_{1B} + 1.40 X_{1C} + 1.70 X_{2A} + 1.63 X_{2B} + 1.55 X_{2C} + 1.45 X_{3A} + 1.57 X_{3B} + 1.30 X_{3C} + 5.15 X_{A4} + 5.12 X_{B4} + 5.32 X_{C4} + 5.69 X_{A5} + 5.47 X_{B5} + 6.16 X_{C5} + 6.13 X_{A6} + 6.05 X_{B6} + 6.25 X_{C6} + 5.63 X_{A7} + 6.12 X_{B7} + 6.17 X_{C7} + 5.80 X_{A8} + 5.71 X_{B8} + 5.87 X_{c8}$$

Subject to the constraints,

Supply Constraints

$$X_{1A} + X_{1B} + X_{1C} = 93$$

$$X_{2A} + X_{2B} + X_{2C} = 88$$

$$X_{3A} + X_{3B} + X_{3C} = 95$$

Demand Constraints

$$X_{A4} + X_{B4} + X_{C4} = 30$$

$$X_{A5} + X_{B5} + X_{C5} = 57$$

$$X_{A6} + X_{B6} + X_{C6} = 48$$

$$X_{A7} + X_{B7} + X_{C7} = 91$$

$$X_{A8} + X_{B8} + X_{C8} = 48$$

$$X_{A9} + X_{B9} + X_{C9} = 2$$

Constraints from pumps to refinery,

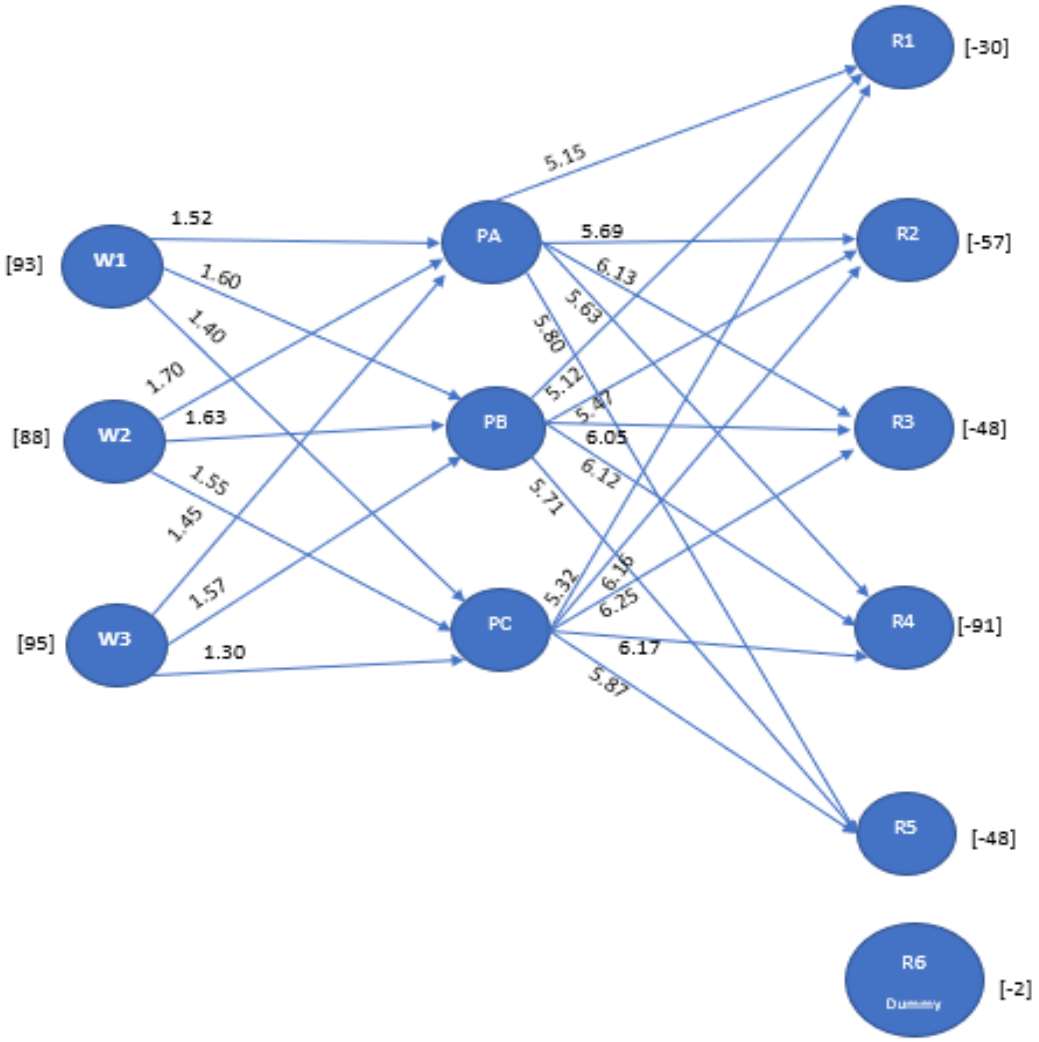
$$X_{1A} + X_{2A} + X_{3A} = X_{A4} + X_{A5} + X_{A6} + X_{A7} + X_{A8} + X_{A9}$$

$$X_{1B} + X_{2B} + X_{3B} = X_{B4} + X_{B5} + X_{B6} + X_{B7} + X_{B8} + X_{B9}$$

$$X_{1C} + X_{2C} + X_{3C} = X_{C4} + X_{C5} + X_{C6} + X_{C7} + X_{C8} + X_{C9}$$

Where, $X_{ij} >= 0$: ***i(pumps) = (A, B, C), j= 1,2,3(wells), 4:9(refineries)***

Q 2b: Network diagram



Using Ipsolve the optimal solution is **1966.68**. Well 3 has used to the capacity in the optimal schedule.