**Problem statement**

Kellwood, a company that produces a single product, has three plants and four customers. The three plants will produce 3000, 5000, and 5000 units, respectively, during the next time period. Kellwood has made a commitment to sell 4000 units to customer 1, 3000 units to customer 2, and at least 3000 units to customer 3. Both customers 3 and 4 also want to buy as many of the remaining units as possible. The profit associated with shipping a unit from each plant to each customer is given in the file P05\_80.xlsx. Determine how to maximize Kellwood’s profit.

**Discussion**

Our objective is to maximize the total profit. Since the unit profit of product shipped from each plant to each customer is not the same, we have to determine how much to ship from each plant to each customer differently, which makes it a classic network model. In this case, we need to make sure the quantity of product shipped from each plant will not exceed the capacity of the plant and the demand of each customer will also be satisfied.

**Model**

**Parameters:**

$$P\_{ij}:Unit profit of product ship from plant i to customer j, i ϵ \left\{1,2,3\right\}, j ϵ \{1,2,3,4\}$$

$$C\_{i}:Capacity of plant i, i ϵ \left\{1,2,3\right\}$$

$$D\_{j}:Demand of customer j, j ϵ \{1,2,3,4\}$$

**Decisions:**

$$X\_{ij}:How much to ship from plant i to customer j, i ϵ \left\{1,2,3\right\}, j ϵ \{1,2,3,4\}$$

**Objectives:**

$$ Maximize \sum\_{j=1}^{}\sum\_{i=1}^{}P\_{ij}×X\_{ij}$$

**Constraints:**

$$1) \sum\_{j}^{}X\_{ij} \leq C\_{i} , i ϵ \left\{1,2,3\right\}$$

$$2) \sum\_{i}^{}X\_{ij} = D\_{j} , j ϵ \{1,2\}$$

$$3) \sum\_{i}^{}X\_{ij} \geq D\_{j} , j ϵ \{3,4\}$$

$$4) X\_{ij} \geq 0 , i ϵ \left\{1,2,3\right\}, j ϵ \{1,2,3,4\}$$

**Optimal Solution**

