IQ4 - Transportation and MCFP

Due Dec 2 at 3pm **Points** 100 **Questions** 4
Available until Dec 2 at 3pm **Time Limit** 10 Minutes **Allowed Attempts** 3

Instructions

This Individual Quiz has 4 multiple selection questions regarding Transportation and MCFP. Each Question is worth 25 points (for a total of 100 points).

Attempt History

	Attempt	Time	Score
KEPT	Attempt 3	2 minutes	100 out of 100
LATEST	Attempt 3	2 minutes	100 out of 100
	Attempt 2	2 minutes	75 out of 100
	Attempt 1	10 minutes	25 out of 100

Correct answers are hidden.

Score for this attempt: **100** out of 100
Submitted Dec 2 at 2:22pm
This attempt took 2 minutes.

Question 1 **25 / 25 pts**

The general formulation of the transportation problem is as follows:

$$Min\ z = \sum_i \sum_j c_{ij} x_{ij}$$

$$\sum_j x_{ij} = s_i \qquad \forall i \in I$$

$$\sum_i x_{ij} = d_j \qquad \forall j \in J$$

$$x_{ij} \geq 0$$

Consider that the cost of transporting goods from supply nodes to demand nodes is going to be changed over the time horizon. How variables and parameters are needed to be changed in order to address the dynamic changes of cost through time.

- $x_{ijt},\ c_{ijt},\ s_i,\ d_{jt}$
- $x_{ij},\ c_{ijt},\ s_i,\ d_i$
- **$x_{ijt},\ c_{ijt},\ s_i,\ d_j$**
- $x_{ijt},\ c_{ijt},\ s_{it},\ d_{jt}$

Question 2

25 / 25 pts

Considering the same formulation from the previous question, which of the following answers are the correct constraint for the problem.

- $\sum_j x_{ijt} = s_i \quad \forall i \in I, \forall t \in T$
- **$\sum_i x_{ijt} = d_j \quad \forall j \in I, \forall t \in T$**
- $\sum_j x_{ijt} = s_{it} \quad \forall i \in I, \forall t \in t$
- $\sum_i x_{ijt} = d_{jt} \quad \forall j \in I, \forall t \in T$
- $\sum_t \sum_j x_{ijt} = \sum_t s_{it} \quad \forall i \in I$
- $\sum_t \sum_i x_{ijt} = \sum_t d_{jt} \quad \forall j \in I$

$\sum_t \sum_j x_{ijt} = s_i \quad \forall i \in I$

$\sum_t \sum_i x_{ijt} = d_j \quad \forall j \in I$

Question 3

25 / 25 pts

Consider the General formulation of the MCNFP:

$$Min\ z = \sum_{(i,j)\in A} c_{i,j} x_{ij}$$

$$\sum_{j:(i,\ j)\in A} x_{ij} - \sum_{j:(j,\ i)\in A} x_{ij} = b_i \quad \forall i \in N$$

$$l_{ij} \leq x_{ij} \leq u_{ij} \quad \forall (i,j) \in A$$

What would be the objective value if the total amount of supply is not equal to the total amount of demand?

- Infeasible
- Zero
- Unbounded
- The value that can be calculated using: $\sum_{(i,j)\in A} c_{i,j} x_{ij}$

Question 4

25 / 25 pts

Considering the previous question, what would be the formulation if we want to consider unmet demand and excessive supply.

δ_i^+ : variable for excessive supply

δ_i^-: variable fo unmet demand

$$Min\ z\ =\ \sum_{(i,j)\in A} c_{i,j}x_{ij} + \sum_{i\in N} M\delta_i^+$$

$$\sum_{j:(i,j)\in A} x_{ij} - \sum_{j:(j,i)\in A} x_{ij} = b_i - \delta_i^+ + \delta_i^- \qquad \forall i\ \in N$$

$$l_{ij} \le x_{ij} \le u_{ij} \qquad \forall (i,j) \in A$$

$$Min\ z\ =\ \sum_{(i,j)\in A} c_{i,j}x_{ij} + \sum_{i\in N} M\delta_i^+$$

$$\sum_{j:(i,j)\in A} x_{ij} - \sum_{j:(j,i)\in A} x_{ij} = b_i - \delta_i^+ \qquad \forall i\ \in N$$

$$l_{ij} \le x_{ij} \le u_{ij} \qquad \forall (i,j) \in A$$

$$\boldsymbol{Min\ z\ =\ \sum_{(i,j)\in A} c_{i,j}x_{ij} + \sum_{i\in N} M\left(\delta_i^+ + \delta_i^-\right)}$$

$$\boldsymbol{\sum_{j:(i,j)\in A} x_{ij} - \sum_{j:(j,i)\in A} x_{ij} = b_i - \delta_i^+ + \delta_i^- \qquad \forall i\ \in N}$$

$$\boldsymbol{l_{ij} \le x_{ij} \le u_{ij} \qquad \forall (i,j) \in A}$$

$$Min\ z\ =\ \sum_{(i,j)\in A} c_{i,j}x_{ij} + \sum_{i\in N} M\delta_i^-$$

$$\sum_{j:(i,j)\in A} x_{ij} - \sum_{j:(j,i)\in A} x_{ij} = b_i + \delta_i^- \qquad \forall i\ \in N$$

$$l_{ij} \le x_{ij} \le u_{ij} \qquad \forall (i,j) \in A$$

Quiz Score: **100** out of 100