Tutorial 3

Transportation problem

Date of the Session: ....

Learning outcomes:

- Understanding the problem of transporting/shipping the commodities from the industry to the destinations with the least possible cost while satisfying the supply and demand limits.

3.1 PRE-TUTORIAL

1. List out different types of transportation methods.

→ North-west Corner

→ Least Cost

→ Raw Minimum

→ Column Minimum

→ Vogel's Approximation.

2. List out the steps involved in solving the Transportation problem using North-West corner rule?

→ Setup problem

→ Initialize variables

→ Repeat Allocation

→ Calculate Total Cost

→ Optimality.

3. List out the steps involved in solving the Transportation problem using Row Minimum method.

→ Problem setup.

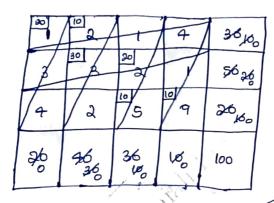→ Initialization

→ Allocation

→ Iterate

→ Total Cost

→ Optimality.

3.2 IN-TUTORIAL

1. Luminous lamps have three factories - F1, F2 and F3 with production capacity 30, 50 and 20 units per week respectively. These units are to be shipped to four warehouses W1, W2, W3, and W4 with requirement of 20, 40, 30 and 10 units per week respectively. The transportation costs (in Rs.) per unit between factories and warehouses are given below. Solve Transportation problem using NW corner rule.

Factory	Warehouse				Supply
	W1	W2	W3	W4	
F1	1	2	1	4	30
F2	3	3	2	1	50
F3	4	2	5	9	20
Demand	20	40	30	10	

Solution:

$1 \times 20 + 2 \times 10 + 3 \times 30 + 2 \times 20 + 5 \times 10 + 9 \times 10$
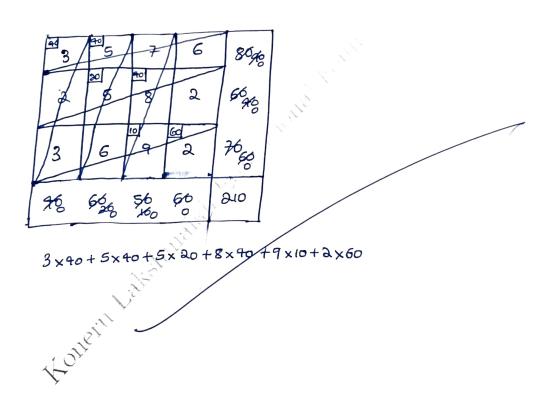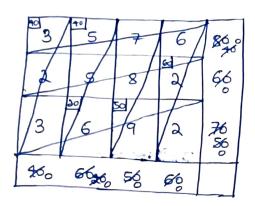
$= 20 + 20 + 90 + 40 + 50 + 90$

$= 310$

45

2 The Ushodaya departmental store has three plants located throughout a state with production capacity 80, 60 and 70 kilo grams of rice. Each day the firm must furnish its four retail shops R1, R2, R3, R4 with at least 40, 60, 50, and 60 gallons respectively. The transportation costs (in Rs.) are given below. Solve Transportation problem using Row Minimum method.

Store	Retailshop				Supply
	1	2	3	4	
1	3	5	7	6	80
2	2	5	8	2	60
3	3	6	9	2	70
Demand	40	60	50	60	

Solution:

$$3 \times 40 + 5 \times 40 + 5 \times 20 + 8 \times 90 + 9 \times 10 + 2 \times 60$$

3 [40]	5 [40]	7	6	80 ~~70~~
2	3	8	2 [60]	60
3	6 [20]	9 [50]	2	~~70~~ 50
80	60 ~~20~~	50	60	

$3 \times 40 + 5 \times 40 + 2 \times 60 + 6 \times 20 + 9 \times 50$
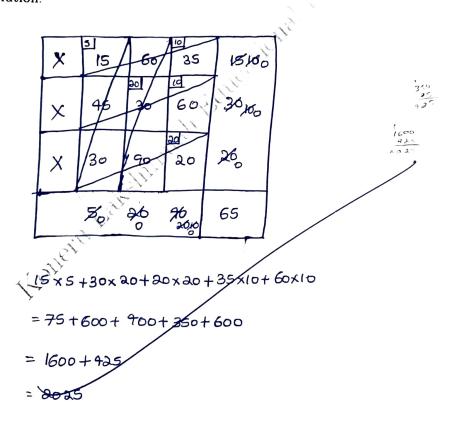
$= 120 + 200 + 120 + 120 + 450$

$= 910$

3.3 POST-TUTORIAL

1. KL University branches located at Vijayawada, Hyderabad, and Chennai. KL University provides course material in printed form at these locations with capacities 15, 30 and 20 units at Vijayawada, Hyderabad, and Chennai respectively. The university distributes the course material to students located at three locations Bangalore, Hyderabad and Coimbatore The demand of the students is 5, 20 and 40 units for Bangalore, Hyderabad and Coimbatore respectively. The cost of transportation per unit varies between different supply points and destination points. The transportation costs are given in the table. The management of KL University would like to determine minimum transportation cost. Solve Transportation problem using Column Minimum method in Linear Programming using python.

U/S	BGR	HYD	CON	Supply
BZA	15	60	35	15
HYD	45	30	60	30
CHE	30	90	20	20
Demand	5	20	40	

Solution:

$$15 \times 5 + 30 \times 20 + 20 \times 20 + 35 \times 10 + 60 \times 10$$

$$= 75 + 600 + 900 + 350 + 600$$

$$= 1600 + 425$$

$$= 2025$$
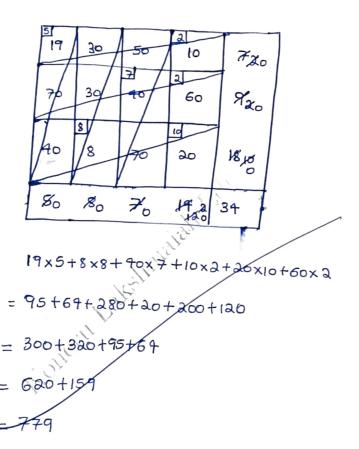
2. The distribution manager of a company needs to minimize global transport costs between a set of three factories (supply points) S1, S2, and S3 and a set of four distributors (demand points) D1, D2, D3 and D4. The following table shows the transportation cost from each supply point to every demand point, the supply of the product at the supply points, and the demand of the product at the demand points. Solve Transportation problem using Column Minimum method in Linear Programming.

F/D	D1	D2	D3	D4	Supply
S1	19	30	50	10	7
S2	70	30	40	60	9
S3	40	8	70	20	18
Demand	5	8	7	14	34

Solution:

$$19 \times 5 + 8 \times 8 + 40 \times 7 + 10 \times 2 + 20 \times 10 + 60 \times 2$$

$$= 95 + 64 + 280 + 20 + 200 + 120$$

$$= 300 + 320 + 95 + 64$$

$$= 620 + 159$$

$$= 779$$

For Evaluator's Use only

Evaluators Comments	Evaluator's Observation
	Marks Secured ..49.. out of 50
	Full Name of the Evaluator:
	Signature of the Evaluator:
	Date of Evaluation: