TRANSPORTATION PROBLEM

Assumption: destinations do not care from which source the items come, and sources do not care to which destinations they deliver.

Decision variables: x_{ij} = the number of items transported from the ***i***-th source to ***j***-th destination.

Objective: The goal is to **minimize** the total **cost** of **transportation**.

TYPES OF TRANSPORTATION MODEL

Transportation Model

There are two different types of transportation problems based on the initial given information **balanced** and **un-balanced** transportation problems.

Balanced transportation problems

Cases where the total supply is equal to the total amount demanded.

Factory	Transportation		Supply
	X	*Y*	
A	6	8	24
B	4	3	40
Demand	40	24	64 64

Un-balanced transportation problems

Cases where the total supply is less than or greater than to the total amount demanded.

- When the supply or availability is higher than the demand, a **dummy** destination is introduced in the equation to make it equal to the supply (with shipping costs of **0$**); the excess supply is assumed to go to inventory.

METHODS

Methods for obtaining initial feasible basic solution

To find the optimal solution we use two steps.

- First we need to find the initial basic feasible solution by using one of the following three methods

North-west corner , Least cost entry or Vogel's Approximation Method

- Then we obtain an optimal solution by making successive improvements in the initial basic feasible solution until no further decrease in transportation cost is possible. We can use on of the following two methods:

Stepping Stone or Modified Distribution Method

North-West Corner Method

<u>Step1</u>: Select the upper left (north-west) cell of the transportation matrix and allocate the maximum possible value to X_{11} which is equal to $\min(a_1,b_1)$.

<u>Step2</u>:

- If allocation made is equal to the supply available at the first source (a_1 in first row), then move vertically down to the cell (2,1).
- If allocation made is equal to demand of the first destination (b_1 in first column), then move horizontally to the cell (1,2).
- If $a_1=b_1$, then allocate $X_{11}= a_1$ or b_1 and move to cell (2,2).

<u>Step3</u>: Continue the process until an allocation is made in the south-east corner cell of the transportation table.

<u>Example</u>: Solve the Transportation Table to find Initial Basic Feasible Solution using North-West Corner Method.

Total Cost =19*5+30*2+30*6+40*3+70*4+20*14
= Rs. 1015

	D_1	D_2	D_3	D_4	Supply
S_1	19 (5)	30 (2)	50	10	7
S_2	70	30 (6)	40 (3)	60	9
S_3	40	8	70 (4)	20 (14)	18
Demand	5	8	7	14	34

Least Cost Method

Step1: Select the cell having lowest unit cost in the entire table and allocate the minimum of supply or demand values in that cell.

Step2: Then eliminate the row or column in which supply or demand is exhausted. If both the supply and demand values are same, either of the row or column can be eliminated.

In case, the smallest unit cost is not unique, then select the cell where maximum allocation can be made.

Step3: Repeat the process with next lowest unit cost and continue until the entire available supply at various sources and demand at various destinations is satisfied.

	D_1	D_2	D_3	D_4	Supply
S_1	19	30	50	10	7
S_2	70	30	40	60	9
S_3	40	8 (8)	70	20	18
Demand	5	8	7	14	34

	D_1	D_3	D_4	Supply
S_1	19	50	10 (7)	7
S_2	70	40	60	9
S_3	40	70	20	10
Demand	5	7	14	34

	D_1	D_3	D_4	Supply
S_2	70	40	60	9
S_3	40	70	20 [7]	10
Demand	5	7	7	34

	D_1	D_3	Supply
S_2	70	40 [7]	9
S_3	40	70	3
Demand	5	7	34

	D_1	Supply
S_2	70 / 2	2
S_3	40 / 3	3
Demand	5	34

The total transportation cost obtained by this method

= 8*8+10*7+20*7+40*7+70*2+40*3

= Rs.814

Here, we can see that the *Least Cost Method* involves a lower cost than the *North-West Corner Method*.

Thanks