SUB - Transportation and Network flow problems

CLASS - B.Sc. Physical Science 3rd year

Transportation Problem :- Transportation problem is a special kind of Linear programming problem (LPP) in which goods are transported from a set of sources to a set of destinations subject to the supply and demand of the sources and destination respectively such that the total cost of transportation is minimized.

Types of transportation problem :-

(i) **Balanced Transportation problem :-** when both supplies and demands are equal then the problem is said to be a balanced transportation problem

i.e. demand = supply

(ii) **Unbalanced Transportation problem :-** when the supply and demand are not equal then it is said to be an unbalanced transportation problem.

In this type of problem, either a dummy row or a dummy column is added according to the requirement to make it a balanced problem.

Then it can be solved similar to the balanced problem.

Method to solve Transportation problems:-

To find the initial basic feasible solution there are three methods:-

(1.) Northwest Corner Cell method.
(2.) Least Cost Cell Method
(3.) Vogel's Approximation method (VAM)

Basic structure of Transportation Problem

Source \ Destination	D_1	D_2	D_3	D_4	Supply (s_i)
O_1	c_{11}	c_{12}	c_{13}	c_{14}	s_1
O_2	c_{21}	c_{22}	c_{23}	c_{24}	s_2
O_3	c_{31}	c_{32}	c_{33}	c_{34}	s_3
O_4	c_{41}	c_{42}	c_{43}	c_{44}	s_4
Demand (d_j)	d_1	d_2	d_3	d_4	

In the above table D_1, D_2, D_3 and D_4 are the destinations where the products/goods are to be delivered from different sources s_1, s_2, s_3 and s_4.

s_i is the supply from the source O_i. d_j is the demand of the destination D_j. c_{ij} is the cost when the product is delivered from source S_i to destination D_j.

(1.) North-West Corner method (NWC)

Algorithm for North-west corner method:

(i) Select the North-West (i.e. upper left) corner cell of the table and allocate the maximum possible units between the supply and demand requirements.

During allocation, the transportation cost is completely discarded (not taken into consideration)

(ii) Delete that row or column which has no values (fully exhausted) for supply or demand.

(iii) Now, with the new reduced table, again select the North-west corner cell and allocate the available values.

(iv) Repeat steps (ii) and (iii) until all the supply and demand values are zero

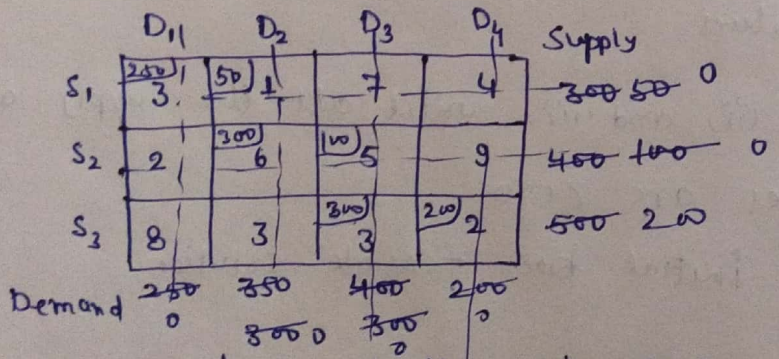
(v) Obtain the initial basic feasible solution.

Q.(1.) Solve the following Transportation problem using North-West corner method.

Destination

Source	D_1	D_2	D_3	D_4	Supply
S_1	3	1	7	4	300
S_2	2	6	5	9	400
S_3	8	3	3	2	500
Demand	250	350	400	200	

Soln:- Given Transportation problem is balanced, so apply NWCM



How we choose North-west cell c_{11}

$$\min.(250, 300) = 250$$

Now Again we choose North-west cell c_{12}

$$\min(50, 350) = 50$$

Again we choose North-west cell in remaining table

$$\min(300, 400) = 300$$

we choose North-west corner cell in remaining table

$$\min.(100, 400) = 100$$

$$\min.(300, 500) = 300$$

$$\min(200, 200) = 200$$

the Initial basic feasible solution

$= 250 \times 3 + 50 \times 1 + 300 \times 6 + 100 \times 5 + 300 \times 3 + 200 \times 2$

$= 750 + 50 + 1800 + 500 + 900 + 400$

$= \underline{4400}$ Ans

Q Solve the following T.P. using NWC Method.

Destinations

Source	D_1	D_2	D_3	D_4	Supply
O_1	8	2	8	2	100
O_2	7	3	5	3	150
O_3	4	6	3	6	250
Demand	200	50	100	150	