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To Determine the Minimum Transportation Cost by Comparing the Initial Basic Feasible Solution of a Transportation Problem by Various Methods

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Abstract:- In this research, we have applied North West Corner Rule (NWCR), Least Cost Method (LCM) Vogel's Approximation Method (VAM) and Modified Vogel's Approximation Method (MVAM) to determine an initial basic feasible solution for the balanced transportation problem. I have taken the same transportation model and apply ASM to compare its result with the above methods. But VAM, MVAM, and ASM produce the same minimum transportation cost better than NWCR and LCM.

Keywords:- *Transportation problem, Supply, Demand, Minimum transportation cost.*

I. INTRODUCTION

The transportation problem is one of the special kinds of Linear Programming Problems. A transportation problem deals with the transportation of a commodity from 'm' source to 'n' destination. A balanced transportation problem is considered. (i.e. Total Demand= Total Supply). The main objective is to determine the amounts shifted from 'm' source to 'n' destination that minimizes the total transportation cost while satisfying both the demand and the supply requirements.

A. Mathematical representation of a transportation problem

The transportation problem can be expressed Mathematical as

$$\text{Minimize } Z = \sum_{i=1}^{m}\sum_{j=1}^{n} c_{ij}x_{ij}$$

Subject to the constraints

$$\sum_{j=1}^{n} x_{ij} = a_i, i = 1,2,....m$$

$$\sum_{i=1}^{m} x_{ij} = b_j \; j = 1,2,....n$$

$$x_{ij} \geq 0, \forall i \,\&\, j$$

Where

a_i - Supply at source i

b_j - Demand at Destination j

c_{ij} - Unit transportation cost from source i to destination j

x_{ij} - Number of units shifted from source i to destination j

B. Transportation problem and its initial basic solution with various methods:

The following transportation problem is considered for solving with NWCR, LCM, VAM, MVAM and ASM methods.

	S1	S2	S3	S4	Supply
D1	21	16	25	13	11
D2	17	18	14	23	13
D3	32	27	18	41	19
Demand	6	10	12	15	43

For the above transportation problem NWCR is used, we get the following allocations

	S1	S2	S3	S4	Supply
D1	21 6	16 5	25	13	11
D2	17	18 5	14 8	23	13
D3	32	27	18 4	41 15	19
Demand	6	10	12	15	43

Total Minimum Transportation cost is

$$Rs\,21\times6+16\times5+18\times5+14\times8+18\times4+41\times15$$

$$= Rs\,1095$$

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By applying Least Cost Method, the allocations is as follows

	S1	S2	S3	S4	Supply
D1	21	16	25	13 11	11
D2	17 1	18	14 12	23	13
D3	32 5	27 10	18	41 4	19
Demand	6	10	12	15	43

Total Minimum Transportation cost is

$$Rs\,13\times11+17\times1+14\times12+32\times5+27\times10+41\times4$$
$$=Rs\,922$$

The same transportation problem will be considered and apply VAM we get the following allocations.

	S1	S2	S3	S4	Supply
D1	21	16	25	13 11	11
D2	17 6	18 3	14	23 4	13
D3	32	27 7	18 12	41	19
Demand	6	10	12	15	

Total Minimum Transportation cost is

$$13\times11+17\times6+18\times3+23\times4+27\times7+18\times12$$
$$=Rs\,796$$

Here also we consider the same transportation problem and applying Modified Vogel's Approximation method we get the following allocations.

	S1	S2	S3	S4	Supply
D1	21	16	25	13 11	11
D2	17 6	18 3	14	23 4	13
D3	32	27 7	18 12	41	19
Demand	6	10	12	15	43

Total Minimum Transportation cost is

$$13\times11+17\times6+18\times3+23\times4+27\times7+18\times12$$
$$=Rs\,796$$

Applying ASM method we get the following allocations

	S1	S2	S3	S4	Supply
D1	21	16	25	13 11	11
D2	17 6	18 3	14	23 4	13
D3	32	27 7	18 12	41	19
Demand	6	10	12	15	43

Total Minimum Transportation cost

$$Rs\,13\times11+17\times6+18\times3+23\times4+27\times7+18\times12$$
$$=Rs\,796$$

II. CONCLUSION

Here we have used North West Corner Method (NWCM), Least Cost Method (LCM), Vogel's Approximation Method (VAM) Modified Vogel's Approximation Method (MVAM) and ASM method to find an initial basic feasible solution for the above transportation problem. The result of MVAM, VAM and ASM gives the same transportation cost but better than NWCM and LCM.

S.No	Methods	Transportation Cost(Rs)
1	NWCR	1095
2	LCM	922
3	VAM	796
4	MVAM	796
5	ASM	796

Finally, we conclude that in the last three methods we get the same initial basic feasible solution for balanced transportation problem with minimum transportation cost better than the remaining two methods.

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