Transportation Problem

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What is Transportation Problem?

- The transportation problem is a special type of linear programming problem where the objective is to minimize the cost of distributing a product from a number of sources or origins to a number of destinations.
- Because of its special structure, the usual simplex method is not suitable for solving transportation problems. These problems require a special method of solution.

OBJECTIVE OF TRANSPORTATION

- To minimize the cost of distributing a product from a number of sources or origins to a number of destinations.

TWO TYPES OF TRANSPORTATION PROBLEM

- BALANCED TRANSPORTATION PROBLEM:-

  Where the total supply equally total demand.

- UNBALANCED TRANSPORTATION PROBLEM:-

  Where the total supply is not equally total demand.

- PHASES OF SOLUTION OF TRANSPORTATION PROBLEM:-

➢ PHASE I:- Obtains the Initial Basic Feasible Solution.

➢ PHASE II:-Obtains the Optimal Basic Solution.

INITIAL BASIC FEASIBLE SOLUTION:-

- NORTH-WEST CORNER RULE(NWCR)
- LEAST COST METHOD(LCM)
- VOGLE APPROXIMATION METHOD(VAM)

OPTIMUM BASIC SOLUTION:-

- MODIFIED DISTRIBUTION METHOD (MODI METHOD)
- STEPPING STONE METHOD

NORTH-WEST CORNER RULE (NWCR):-

- DEFINATION:- The North-West Corner Rule is a method adopted to compute the Initial Feasible Solution of the transportation problem. The name North-West Corner is given to this method because the basic variables are selected from the extreme left corner.
- It is most systematic and easiest method for obtaining Initial Feasible Basic solution.

STEPS IN NORTH-WEST CORNER METHOD

- STEP 1:- Select the upper left (north-west) cell of the transportation matrix and allocate minimum of supply and demand, i.e min(A1,B1) value in that cell.
- STEP 2:-
  - If A1<B1, then allocation made is equal to the supply available at the first source(A1 in first row), then move vertically down to the cell (2,1).
  - If A1>B1, then allocation made is equal to demand of the first destination (B1 in first column), then move horizontally to the cell (1,2).
  - If A1=B1, then allocate the value of A1 or B1and then move to cell (2,2).
- STEP 3:- Continue the process until an allocation is made in the south- east corner cell of the transportation table.

VOGEL APPROXIMATION METHOD (VAM METHOD)

The Vogel Approximation Method is an improved version of the Minimum Cell Cost Method and the Northwest Corner Method that in general produces better initial basic feasible solution, that report a smaller value in the objective (minimization) function of a balanced Transportation Problem. (sum of the supply = sum of the demand).

Applying the Vogel Approximation Method requires the following STEPS:

- Step 1: Determine a penalty cost for each row (column) by subtracting the lowest unit cell cost in the row (column) from the next lowest unit cell cost in the same row (column).

- Step2:

Identify the row or column with the greatest penalty cost. Break the ties arbitrarily (if there are any).Allocate as much as possible to the variable with the lowest unit cost in the selected row or column. Adjust the supply and demand and cross out the row or column that is already satisfied. If a row and column are satisfied simultaneously, only cross out one of the two and allocate a supply or demand of zero to the one that remains.

- Step 3:

I) If there is exactly one row or column left with a supply or demand of zero, stop.

II) If there is one row (column) left with a positive supply (demand), determine the basic variables in the row (column) using the Minimum Cell Cost Method. Stop.

III)If all of the rows and columns that were not crossed out have zero supply and demand (remaining), determine the basic zero variables using the Minimum Cell Cost Method.

MODI METHOD(Modified Distribution Method)

1. Determine an initial basic feasible solution using any one of the three methods given below:

- North West Corner Method
- Matrix Minimum Method
- Vogel Approximation Method

2. Determine the values of dual variables, u_i and v_j, using $u_i + v_j = c_{ij}$

3. Compute the opportunity cost using $c_{ij} – (u_i + v_j)$.

4. Check the sign of each opportunity cost. If the opportunity costs of all the unoccupied cells are either positive or zero, the given solution is the optimal solution. On the other hand, if one or more unoccupied cell has negative opportunity cost, the given solution is not an optimal solution and further savings in transportation cost are possible.

5. Select the unoccupied cell with the smallest negative opportunity cost as the cell to be included in the next solution.

6. Draw a closed path or loop for the unoccupied cell selected in the previous step. Please note that the right angle turn in this path is permitted only at occupied cells and at the original unoccupied cell.

7. Assign alternate plus and minus signs at the unoccupied cells on the corner points of the closed path with a plus sign at the cell being evaluated.

8. Determine the maximum number of units that should be shipped to this unoccupied cell. The smallest value with a negative position on the closed path indicates the number of units that can be shipped to the entering cell. Now, add this quantity to all the cells on the corner points of the closed path marked with plus signs, and subtract it from those cells marked with minus signs. In this way, an unoccupied cell becomes an occupied cell.

THANK YOU