MB106
QUANTITATIVE TECHNIQUES

MODULE I

LECTURE 12

Transportation Problems-Feasible solution (VAM)

TRANSPORTATION MODEL

Example:

A company has four warehouses and six stores. The warehouses altogether have a surplus of 22 units of a given commodity divided among them as follows:

Warehouses	1	2	3	4
Surplus	5	6	2	9

The six stores altogether need 22 units of the commodity. Individual requirements at stores 1, 2, 3, 4, 5 and 6 are 4, 4, 6, 2, 4 and 2 units respectively.

Cost of shipping one unit of commodity from warehouse I to store j in rupees is given in the matrix below:

		STORES					
		1	2	3	4	5	6
WAREHOUSES	1	9	12	9	6	9	10
	2	7	3	7	7	5	5
	3	6	5	9	11	3	11
	4	6	8	11	2	2	10

How should the products be shipped from the warehouses to the stores so that the transportation cost is minimized.

VOGEL'S APPROXIMATION METHOD

Method :

1. Note the difference between the lowest and second lowest cost for each row and each column against the row and below the column respectively. This difference shows the penalty incurred due to inability to make an allocation in the least cost cell of that row or column.
2. Try to assign maximum possible to the least cost cell of the row or column having maximum penalty.
3. Eliminate the row or column whose supply or demand is satisfied completely and recalculate the penalties for the shrunken matrix.
4. Repeat steps (i), (ii) and (iii) till all demands are satisfied and supplies exhausted.

TRANSPORTATION PROBLEM-FINDING A BASIC FEASIBLE SOLUTION

Vogel's Approximation Method:

		STORES						Supply
		1	2	3	4	5	6	
WAREHOUSES	1	9	12	9	6	9	10	**5** [3]
	2	7	3	7	7	5	5 2	**6/4** [2]
	3	6	5	9	11	3	11	**2** [2]
	4	6	8	11	2	2	10	**9** [0]
Demand		**4** [0]	**4** [2]	**6** [2]	**2** [4]	**4** [1]	**2/0** [5]	

Since column 6 has the maximum penalty, maximum allocation is made to the lowest cost cell of this column. Column 6 gets cancelled as demand is fulfilled.

TRANSPORTATION PROBLEM-FINDING A BASIC FEASIBLE SOLUTION

Vogel's Approximation Method:

		STORES						Supply
WAREHOUSES		1	2	3	4	5	6	
	1	9	12	9	6	9	10	5 [3]
	2	7	3	7	7	5	5 2	6/4 [2]
	3	6	5	9	11	3	11	2 [2]
	4	6	8	11	2 2	2	10	9/7 [0]
Demand		4 [0]	4 [2]	6 [2]	2/0 [4]	4 [1]	2/0 [5]	

Since column 4 has the maximum penalty, maximum allocation is made to the lowest cost cell of this column. Column 4 gets cancelled as demand is fulfilled.

TRANSPORTATION PROBLEM-FINDING A BASIC FEASIBLE SOLUTION

Vogel's Approximation Method:

		STORES						Supply
WAREHOUSES		1	2	3	4	5	6	
	1	9	12	9	6	9	10	5 [3][0]
	2	7	3	7	7	5	5 2	6/4 [2]
	3	6	5	9	11	3	11	2 [2]
	4	6	8	11	2 2	2 4	10	9/7/3 [0][4]
Demand		4 [0]	4 [2]	6 [2]	2/0 [4]	4/0 [1]	2/0 [5]	

Since row 4 has the maximum penalty, maximum allocation is made to the lowest cost cell of this row. Column 5 gets cancelled as demand is fulfilled.

TRANSPORTATION PROBLEM-FINDING A BASIC FEASIBLE SOLUTION

Vogel's Approximation Method:

		STORES						Supply
WAREHOUSES		1	2	3	4	5	6	
	1	9	12	9	6	9	10	5 [3][0]
	2	7	3 4	7	7	5	5 2	6/4/0 [2][4]
	3	6	5	9	11	3	11	2 [2][1]
	4	6	8	11	2 2	2 4	10	9/7/3 [0][4][2]
Demand		4 [0]	4/0 [2]	6 [2]	2/0 [4]	4/0 [1]	2/0 [5]	

Since row 2 has the maximum penalty, maximum allocation is made to the lowest cost cell of this row. Column 2 and row 2 get cancelled as demand and supply are both fulfilled for them.

TRANSPORTATION PROBLEM-FINDING A BASIC FEASIBLE SOLUTION

Vogel's Approximation Method:

		STORES						Supply
WAREHOUSES		1	2	3	4	5	6	
	1	9	12	9	6	9	10	5 [3][0]
	2	7	3 4	7	7	5	5 2	6/4/0 [2][4]
	3	6	5	9	11	3	11	2 [2][1][3]
	4	6 3	8	11	2 2	2 4	10	9/7/3/0 [0][4][2][5]
Demand		4/1 [0]	4/0 [2]	6 [2][0]	2/0 [4]	4/0 [1]	2/0 [5]	

Since row 4 has the maximum penalty, maximum allocation is made to the lowest cost cell of this row. Row 4 gets cancelled as supply is exhausted.

TRANSPORTATION PROBLEM-FINDING A BASIC FEASIBLE SOLUTION

Vogel's Approximation Method:

		STORES						Supply
WAREHOUSES		1	2	3	4	5	6	
	1	9	12	9	6	9	10	**5** [3][0]
	2	7	3 4	7	7	5	5 2	**6/4/0** [2][4]
	3	6 1	5	9	11	3	11	**2/1** [2][1][3]
	4	6 3	8	11	2 2	2 4	10	**9/7/3/0** [0][4][2][5]
Demand		**4/1/0** [0][3]	**4/0** [2]	**6** [2][0]	**2/0** [4]	**4/0** [1]	**2/0** [5]	

Since row 3 and column 1 have the maximum penalty, maximum allocation is made to the lowest cost cell of column 1 and row 3 which intersect at cell 3,1. Column 1 gets cancelled as demand is fulfilled.

TRANSPORTATION PROBLEM-FINDING A BASIC FEASIBLE SOLUTION

Vogel's Approximation Method:

		STORES						Supply
WAREHOUSES		1	2	3	4	5	6	
	1	9	12	9 5	6	9	10	5/0 [3][0]
	2	7	3 4	7	7	5	5 2	6/4/0 [2][4]
	3	6 1	5	9 1	11	3	11	2/1/0 [2][1][3]
	4	6 3	8	11	2 2	2 4	10	9/7/3/0 [0][4][2][5]
Demand		4/1/0 [0][3]	4/0 [2]	6/1 [2][0]	2/0 [4]	4/0 [1]	2/0 [5]	

Since we are left with only 2 cells, rest of the allocations are made in these cells to satisfy demand and supply restrictions.

Therefore Z=5X9+4X3+2X5+1X6+1X9+3X6+2X2+4X2=112

- TILL WE MEET AGAIN IN THE NEXT CLASS……….