- -> Optimulty Test for Transportation Problem;
 - There are basically two methods
- [) Modified distribution method (MODI)
- Stepping stone method
- -> Modified distribution method: The modified distribution method is also known as MODI method or u-v method, which provides a minimum book cost solution (optimum solution) to the transportation problem: following are the steps invalved in this
- step1! Find out the basic feasible solution of the transportation problem using any of the following
 - i) North-east corner method. method.
 - ii) Least cost method.
 - iii) Vogelis approximation method.
- Step 2: Introduce dual variables corresponding to the row constraints I the column constraints. If there are m supply points and n destination points then there will be m+n dual variables. Dual variable corres bonding to row wariable are represented by Ui, i=1,2--m, whereas the dual variable corresponding to column

are represented by V_i , j=1,2,--n. The value of dual variable is calculated from the equation $U_i + V_j = C_{ij}$ if $z_{ij} > 0$

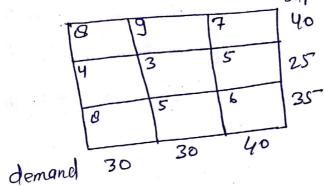
Step 3! Any basic feasible solution has m+n-1 occupied cell ris>0. There will be m+n-1 no. of equations to determine m+n dual variables. One of the dual variables can be chosen arbitrarily. It is also to be noted that as the primal constraints are equations, the dual variables are unrestricted in sign.

Step 4: Calculate Cij-Ui-V; bor all unoccupied cells (i.e bor 26ij=0). If all Cij-Ui-V; >0, then by the theorem of complementary slackness it can be shown that the corresponding solution of the transpotation problem is optimum. If one or more Cij-Ui-V; is less than zero (Cij-Ui-V; <0) we select the cell with the least value of Cij-Ui-V; and allocate as much as posible subject to the row and column constraints. The allocations of the number of adjacent cell are adjusted so that a basic variable becomes nonbasic.

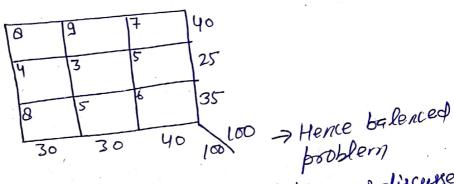
Step 5! A fresh-set of dual variables are calculated and repeat the entire procedure.

Set us consider a problem and discuss the above method in detail.

Problem: The transportion cost per unit of a product is given below. Find out the optimal transportation cost.



Salution



First determine basic feasible solution as discursed in the previous section.

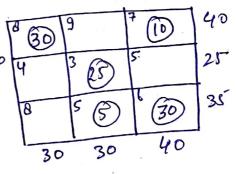
1) North-east corner method Cost = ax30+9x10+3x20+5x5+6x35 = Rs 625/-

(30)	(O) E	7	140
4	3 29	5 (5)	25
8	5	⁶ 33	35
30	30	40	

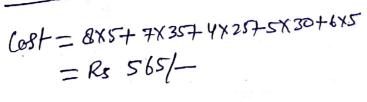
2) Solution by Least cost method

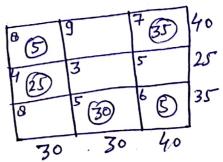
(est = 8x30+7x10+3x25+5x5+6x30)

= Rs 590/-



3) Solution by Vogel's Approximation method! - Clenalty method!





Note! There is no need to obtain basic feasible solution by all methods. We have to use just one method to get basic flosible solution and then proceeds to get optimal solution by the given method

Mow set us consider the basic feasible solution by by least cost method.

	V,	Us.	U3	Supply
4,	8 (30)	9	7 10	40
42	4	3	5	25
	8	5	6 (30)	35
43	30	30	40	1

Now calculate the dual variables $u_i + v_j$ using $u_i + v_j = Cij$

$$\begin{aligned} v_j &= \text{Cij} \\ u_1 + u_1 &= 8 \\ u_2 + v_2 &= 5 \end{aligned}$$

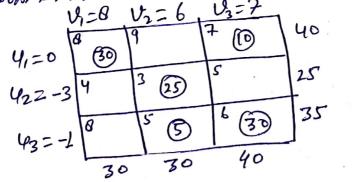
$$\begin{aligned} u_3 + v_2 &= 5 \\ u_3 + v_3 &= 6 \end{aligned}$$

$$\begin{aligned} u_4 + v_3 &= 7 \\ u_2 + v_2 &= 3 \end{aligned}$$

$$\begin{aligned} u_4 + v_3 &= 6 \\ u_4 + v_3 &= 6 \end{aligned}$$

$$\begin{aligned} u_5 + v_4 &= 6 \\ u_4 + v_5 &= 6 \end{aligned}$$

Choose any one of dual variables arbitrarily is zero, let 41=0 \Rightarrow 41=0, 42=-3, 43=-1 100=0, let 100=0 100=0 100=0 100=0 100=0

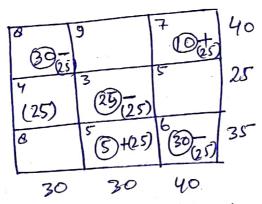


Now compute Cij-4i-V; for unallocated positions

$$A_{23} \rightarrow 5 - (-3) - 7 = 1$$

	(3)	
(-1)	^	ريا
(3)		

We observe that there is a -ve value (Cij-uj-U) here and hence there is a gain and so we can but something in that cell. So put maximum amount (as much as posible) in that cell.



Hence New table obtainedis!

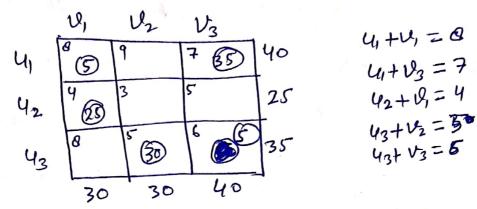
Now balencing the supply and demand we have put as much as posible in the -ve cell. we can put there the amount of 25. Hence put there 25 and adjust other cell accor-

40 (35) 28 35 40

dingly. Huis is a new solution we obtained. Now we have need to check whether this solution is the best solution or whether some more gain is posible.

* We have to repeat this complete procedure unill all Cij-Ui-Vi in unoccupied cell are greater than or equal to zero.

So check again



Jet
$$4_{1}=0 \Rightarrow 4_{1}=0$$
, $4_{2}=-4$, $4_{3}=-1$
 $4_{1}=0$, $4_{2}=-4$, $4_{3}=-1$

Now evaluate Cij-Uj-Vj for unallocated positions.

$$A_{12} \rightarrow 9 - 0 - 6 = 3$$

All these values of Cis-Ui-Vi>0 and hence solution is optimum.