ii) Least cost method

	D_1	D_2	D_3	D_4	min
O_1	21	16	25	13	11
O_2	17	18	14	23	13
O_3	32	27	18	41	19 9
	6	10	12	15	13

$$X = \begin{pmatrix} 0 & 0 & 0 & 11 \\ 1 & 0 & 12 & 0 \\ 5 & 10 & 0 & 4 \end{pmatrix}$$

$Cost = 11 \times 13 + 1 \times 17 + 12 \times 14 + 5 \times 32 + 10 \times 27 + 4 \times 41$

$= Rs. 922$ (lesser than N-W corner method)

iii) Vogel's approx. method (VAM)

	D_1	D_2	D_3	D_4		Penalty
O_1	21	16	25	13	11	(16 - 13 = 3)
O_2	17	18	14	23	13	(17 - 14 = 3)
O_3	32	27	18	41	19	(27 - 18 = 9)
	6	10	12	15		
Penalty	4	2	4	10		

- Calculate the penalties for each row & column by taking the difference b/w the lowest & the second lowest cost.
- Identify the largest penalty and allocate the max possible units in the cell having the least cost in that row or column.
- Recalculate the penalties and repeat till no more allocation is possible.

✱ Look for max penalty & miss cost corresponding to the max penalty

miss cost

21	16	25	13	11	(3)	$\cancel{8}$	$\cancel{8}$	9	$\cancel{8}$	$\cancel{8}$
17	18	14	23	13	(13)	13 (3)	9 (3)	3 (4)	3
32	27	18	41	18	(19)	19 19	19 (9)	19 (9)	7

6   10   12   13   4
(4) (2) (4) (10) → max penalty ?

6   10   .12   4
(15) (9) (4) (18)

6   10   12 $\cancel{4}$

$\cancel{6}$ 10   12 $\cancel{4}$
        (9)   (4)

$\cancel{6}$ 10 $\cancel{12}$ $\cancel{4}$

$\theta x = \begin{pmatrix} 0 & 0 & 0 & 11 \\ 6 & 3 & 0 & 4 \\ 0 & 7 & 12 & 0 \end{pmatrix}$

Cost $= 17 \times 6 + 18 \times 3 + 11 \times 13 + 4 \times 23 + 18 \times 12$

$= 796$