Roll No. 2026d005

Assignment No. 5

GOODLUCK | Page No. 23
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Que. Find initial basic feasible solution of the following transportation problem by Northwest corner cell method & then find optimal solution using U-V method.

	D1	D2	D3	D4	Supply
S1	3	1	7	4	250
S2	2	6	5	9	350
S3	8	3	3	2	400
Demand	200	300	350	150	

→ Soln:- a) Finding initial basic feasible using North-west corner cell method.

	200	50			
	3	1	7	4	250/50/0
		250	100		
	2	6	5	9	350/100/0
			250	150	
	8	3	3	2	400/150/0
	200/0	300/50/0	350/100/0	150/0	1000
	0	250/0	250/0	0	
		0	0		

Total cost
$\therefore = 200\times3 + 50\times1 + 250\times6 + 100\times5 + 250\times3 + 150\times$

$\therefore$ **Total cost = ₹ 3700/-**

This is initial basic feasible soln.

b) Application of U-V method to optimize the solution:

$V_1 = 3 \quad V_2 = 1 \quad V_3 = 0 \quad V_4 = -1$

$U_1 = 0$	200	50		
	(-) ← 3	→ (+) 1	7	4
$U_2 = 5$	250	100		
	(+) 2	(-) 6	5	9
$U_3 = 3$			250	150
	8	3	3	2

find u_i & v_j using $u_i + v_j = c_{ij}$

Here, $m = 3$, $n = 4$ & $m+n-1 = 6 =$ No. of allocate cells

finding Penalties using, (for non-basic cells only)

$P_{ij} = u_i + v_j - c_{ij}$

$\therefore \quad P_{13} = 0+0-7 \Rightarrow P_{13} = -7$

$P_{14} = 0-1-4 \Rightarrow P_{14} = -5$

$P_{21} = 5+3-3 \Rightarrow P_{21} = 6$

$P_{24} = 5-1-9 \Rightarrow P_{24} = -5$

$P_{31} = 3+3-8 \Rightarrow P_{31} = -2$

$P_{32} = 3+1-3 \Rightarrow P_{32} = 1$

Here, P_{21} & $P_{32} > 0$ & $P_{21} > P_{32}$

Hence optimality is not reached.

∴ New table becomes.

	$v_1 = 3$	$v_2 = 1$	$v_3 = 0$	$v_4 = -1$
	0	250		
$u_1 = 0$	3	1	7	4
	200	50	100	
$u_2 = 5$	2	1 (−)	− (+)	9
		1	250	150
$u_3 = 3$	8	(+) 3	3 (−)	2

Finding penalties for non-basic cells.

$P_{11} = 0+3-3 = 0 \Rightarrow P_{11} = 0$

$P_{13} = 0 + 0 - 7 = -7$

$P_{14} = 0 - 1 - 4 = -5$

$P_{24} = 5 - 1 - 9 = -5$

$P_{31} = 3 + 1 - 8 = -4$

$P_{32} = 3 + 1 - 3 = 1.^{*}$

Here, P_{32} is +ve Hence optimality is not reached.

New table becomes:-

	$v_1 = -2$	$v_2 = 1$	$v_3 = 1$	$v_4 = 0$
$u_1 = 0$		250		
	3	1	7	4
	200		150	
$u_2 = 4$				
	2	6	5	9
		50	200	150
$u_3 = 2$				
	8	3	3	2

Finding penalties for non allocate cells.

$P_{11} = 0 - 2 - 3 = -5$

$P_{13} = 0 - 1 - 7 = -8$

$P_{14} = 0 + 0 - 4 = -4$

$P_{22} = 4 + 1 - 6 = -1$

$P_{24} = 4 + 0 - 9 = -5$

$P_{31} = 2 - 2 - 8 = -8$

Here all $P_{ij} < 0$, Hence optimality is reached.

∴ Optimal transportation cost is

$= 250 \times 1 + 200 \times 2 + 150 \times 5 + 50 \times 3 + 200 \times 3 + 150 \times 2$

$= 2450$ ₹