

CSE

NAME - RAHUL

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SEC - A

1. NWM

	D ₁	D ₂	D ₃	Available
A	16	19(4)	12	14 0
B	22	13(11)	19(15)	16 0
C	14	28	8(12)	12 0
Demand	100	15 0	17 0	

Demand = supply

$$\text{Total cost} = 160 + 76 + 143 + 95 + 96$$

$$= 570$$

LCM

	D ₁	D ₂	D ₃	Available
A	16(90)	19	12(5)	14 0
B	22(1)	13(15)	19	16 0
C	14	28	8(12)	12 0
Demand	10 0	15 0	17 0	

$$\text{Total cost} = 144 + 60 + 22 + 195 + 96$$

$$= 517$$

VAM

	D ₁	D ₂	D ₃	Available	Penalty
A	16(9)	19	12(5)	14 0	4 4 3 16 16
B	22(1)	13(15)	19	16 0	6 6 9 22
C	14	28	8(12)	120	6
Demand	10 0	15 0	17 0		

Penalty	2	6	4
	6	6	7
	6	6	
	6		
	16		

$$\text{Total Cost} = 144 + 60 + 22 + 95 + 96$$

$$517 - \text{Optimal sol}^n$$

$m + n - 1$ allocations feasible
 $= 5$

checking for optimality

	$v_1 = 16$	$v_2 = 7$	$v_3 = 12$	
$u_1 = 0$	16 (9)	[-12]	12 [5]	$d_{ij} = u_i + v_j - c_{ij}$
$u_2 = 6$	22 (1)	13 [15]	[-1]	
$u_3 = -4$	[-2]	[-25]	8 (12)	

All $d_{ij} \leq 0 \therefore$ Total Cost = 517 is an Optimal Solⁿ

2. NWM

	1	2	3	4	Supply
1	21(6)	16(5)	25	13	15 0
2	17	18(5)	14(8)	23	13 0
3	32	27	18(4)	41(15)	14 80
Demand	60	10 86	12 40	180	

$D = 25$

$$\text{Total Cost} = 126 + 80 + 90 + 112 + 72 + 615 = 1095$$

LCM

	1	2	3	4	5
1	21	16	25	13(11)	15 0
2	17	18	14(12)	23	13 10
3	32	27(10)	18	41(4)	18 940
D	6 86	100	12 0	13 40	

$$\text{Total Cost} = 143 + 17 + 168 + 160 + 270 + 164 = 922$$

VAM

	1	2	3	4	5	Penalty
1	21	16	25	13(11)	15 0	3
2	17(6)	18(3)	14	23(4)	13 83	3 3 3 4 18
3	32	27(7)	18(12)	41	18 76	9 9 9 9 27
Demand	60	10 70	12 0	13 40		

Penalty	4	2	4	10
	15	9	4	18
	15	9	4	
		9	4	
		27		
		27		

6 allocations \therefore Feasible $\therefore m+n-1 = 3+4-1 = 6$

$$\text{Total Cost} = 143 + 102 + 54 + 92 + 189 + 216 = 796 - \text{optimal sum}$$

Checking for optimality

	$v_1 = 17$	$v_2 = 18$	$v_3 = 9$	$v_4 = 23$
$u_1 = -10$	$[-14]$	$[-8]$	$[26]$	$13(11)$
$u_2 = 0$	$17(6)$	$18(3)$	$[-5]$	$23(4)$
$u_3 = 9$	$[-6]$	$27(7)$	$18(12)$	$[-9]$

$\therefore dJ \leq 0$

Optimal solⁿ

3. NWM

	1	2	3	S
1	2(5)	7	4	5 6
2	3(2)	3(6)	1	8 40
3	5	4(3)	7(4)	7 40
4	1	6	2(14)	14 0
D	7 20	9 80	18 40	

D=S

$$\text{TOTAL COST} = 10 + 6 + 18 + 12 + 28 + 28 \\ = 102$$

LCM

	1	2	3	S
1	2	7(2)	4(3)	8 20
2	3	3	1(8)	8 0
3	5	4(7)	7	7 6
4	1(7)	6	2(7)	14 70
D	7 0	8 20	18 16	

$$\text{TOTAL COST} = 14 + 12 + 8 + 28 + 7 + 14 \\ = 83$$

VAM

	1	2	3	S
1	2(5)	7(2)	4	8 20
2	5	5		
3	4(4) 5	4(7)		
4	7 20	1(4)	8	

VAM

	1	2	3	5	penalty
1	2(5)	7(2)	4	5 6	2 2 5 5 7
2	5	5	1(8)	80	2
3	5	4(7)	7	70	1 1 1 1 4 4
4	1(4)	6	2(10)	14 40	1 1 5
D	730	970	18100		

Penalty	1	1	1
	1	2	2
	1	2	
	3	3	
		3	
		4	

6 allotment

feasible

$$\therefore m+n-1 = 6$$

$$\text{TOTAL COST} = 6 + 14 + 8 + 28 + 4 + 20 = 80$$

Checking for optimality

	$v_1=2$	$v_2=7$	$v_3=3$
$u_1=0$	2(3)	7(2)	[-1]
$u_2=-2$	[-3]	[2]	1(3)
$u_3=-3$	[-6]	4(7)	[-7]
$u_4=-1$	1(4)	[0]	2(10)

$\therefore \text{diff} \neq 0$

\therefore Not optimal soln

MODI method

	$v_1(2)$	$v_2(7)$	$v_3(3)$
$u_1(0)$	2-k	7-k	4
$u_2(-2)$	3	3	1-k
$u_3(-3)$	5	4	7
$u_4(-1)$	1-k	6	2-k

$$\min k = k \in \min\{8, 4, 2\}$$

$$= 2$$

	$V_1(-3)$	$V_2(0)$	$V_3(-2)$
$u_1(5)$	2	2	4
$u_2(3)$	3	3	1
$u_3(4)$	5	4	2
$u_4(4)$	1	6	2

$$\text{TOTAL COST} = 10 + 6 + 6 + 20 + 2 + 24$$

$$= 76 - 0 \text{ PHmax sol}^n$$

$$\therefore \text{dij} \leq 6$$

4. NW M

	A	B	C	D	q
X	10(16)	8(4)	11	7	20 40
Y	9	12(14)	14(26)	6	40 260
Z	8	9	12(5)	10(30)	30 50 6
b	160	180	310	200	

$$a = b$$

$$\text{TOTAL COST} = 160 + 132 + 168 + 364 + 60 + 300$$

$$= 1084$$

LCM

	A	B	C	D	q
X	10	8(8)	11(2)	7	20 20
Y	9	12	14(10)	6(30)	40 10 6
Z	8(10)	9	12(19)	10	30 10 6
b	180	180	250	200	

$$\text{TOTAL} = 144 + 22 + 140 + 180 + 120 + 220 = 842$$

VAM

	A	B	C	D	e	Penalty
x	10	8(18)	11(2)	2	3 20	1 2 2 1 11 11
y	9(10)	12	14	6(30)	4 6 18	3 3
z	8(6)	9	12(29)	10	3 8 25 0	1 1 1 4 12
b	18 0	18 0	31 0	3 0		9 - 6
Penalty	1	1	1	1		
	1	1	1			
	2	1	1			
	2		1			
			1			
			11			

$$\text{Total cost} = 144 + 22 + 96 + 186 + 48 + 248$$

$$832 - \text{Optimal soln}$$

checking for optimality

$$\begin{array}{lclclcl}
 v_1 = 7 & v_2 = 8 & v_3 = 11 & v_4 = 4 & & \\
 u_1 = 6 & [-3] & 8(18) & 11(2) & (-3) & \\
 u_2 = 2 & 9(10) & [-2] & [-1] & 6(30) & \\
 u_3 = 1 & 8(6) & [0] & 12(29) & (-5) &
 \end{array}$$

∴ All $d_{ij} \leq 0$ ∴ Optimal soln