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Assignment of Operational Research

Calculate the cost effective transportation problem while on the given scenario independently.

(i) North West Method
(ii) Least Cost Method
(iii) Vogel Approximation Method

North - West Method

Table - 1

	D1	D2	D3	D4	Supply
S1	3	1	7	4	3
S2	2	6	5	9	4
S3	8	3	3	2	5
Demand	2	2	4	2	12

	D1	D2	D3	D4	D5	Supply
S1	3	1	7	4	0	3
S2	2	6	5	9	0	4
S3	8	3	3	2	0	5
Demand	2	2	4	2	2	12

Balance Transportation problem
Demand == Supply

	D_1	D_2	D_3	D_4	D_5	Supply
S_1	3(2)	1(1)	7	4	0	3 + 0
S_2	2	6(1)	5(3)	9	0	4 3 0
S_3	8	3	3(1)	2(2)	0(2)	5 4 2 0
Demand	2 0	2 1 0	4 1 0	2 0	2 0	12

Initial Basic feasible solution of given transportation problem is.

$x_{11} = 2$, $x_{12} = 1$, $x_{22} = 1$
$x_{23} = 3$, $x_{33} = 1$, $x_{34} = 2$
$x_{35} = 2$

And the minimum transportation cost is equal to.

$= 2\times3 + 1\times1 + 1\times6 + 1\times3 + 3\times5 + 2\times2 + 2\times0$
$= 6 + 1 + 6 + 3 + 15 + 4 + 0$

$= 35$ Rs

Table no. 2

	D_1	D_2	D_3	D_4	Supply
S_1	3	1	7	4	2
S_2	2	6	5	9	4
S_3	8	3	3	2	5
Demand	2	3	4	2	12

	D_1	D_2	D_3	D_4	Supply
S_1	3(2)	1	7	4	2 0
S_2	2	6(3)	5(1)	9	4 1 0
S_3	8	3	3(3)	2(2)	5 2 0
Demand	2 0	3 0	4 3 0	2 0	12

Initial base feasible solution of given transportation is.

$x_{11} = 2$, $x_{22} = 3$, $x_{23} = 1$

$x_{33} = 3$, $x_{34} = 2$.

And the minimum transportation Cost is equal to :-

$= 2 \times 3 + 3 \times 6 + 5 \times 1 + 3 \times 3 + 2 \times 2$

$= 6 + 18 + 5 + 9 + 4$

$= 42$ Rs

Table no. 3

	D_1	D_2	D_3	D_4	Supply
S_1	3	1	7	4	3
S_2	2	6	5	9	4
S_3	8	3	3	2	5
Demand	2	3	4	2	12

	D_1	D_2	D_3	D_4	D_5	Supply
S_1	3	1	7	4	0	3
S_2	2	6	5	9	0	4
S_3	8	3	3	2	0	5
Demand	2	3	4	2	1	12

	D_1	D_2	D_3	D_4	D_5	Supply
S_1	3(2)	1(1)	7	4	0	3+0
S_2	2	6(2)	5(2)	9	0	4+0
S_3	8	3	3(2)	2(2)	0(1)	5+0
Demand	2	3	4	2	1	12
	0	2	2	0	0	
		0	0			

Initial basic feasible solution of given transportation problem is:

$x_{11} = 2$, $x_{12} = 1$, $x_{22} = 2$, $x_{23} = 2$
$x_{33} = 2$, $x_{34} = 2$, $x_{35} = 1$

And the minimum transportation Cost is equal to

$2 \times 3 + 1 \times 1 + 2 \times 6 + 2 \times 5 + 3 \times 2 + 2 \times 2 + 1 \times 0$

$= 6 + 1 + 12 + 10 + 6 + 4 + 0$

$= 39$ Rs

Least Cost Method

Table no. 1

	D_1	D_2	D_3	D_4	Supply
S_1	3	1	7	4	3
S_2	2	6	5	9	4
S_3	8	3	3	2	5
Demand					
Supply	2	2	4	2	12

	D_1	D_2	D_3	D_4	D_5	Supply
S_1	3	1 (1)	7	4	0 (2)	$3 \neq 0$
S_2	2 (2)	6 (1)	5 (1)	9	0	$4 \neq 0$
S_3	8	3	3 (3)	2 (2)	0	$5 \neq 0$
Demand	$\neq 0$	$\neq 0$	4 1 0	$\neq 0$	$\neq 0$	12

Initial basic transportation of :-

$x_{12} = 1$, $x_{21} = 2$, $x_{23} = 1$

$x_{34} = 2$, $x_{15} = 2$, $x_{22} = 1$,

~~$x_{34} = 3$~~ $x_{33} = 3$

And the minimum transportation cost is equal to

$1X1 + 2X0 + 2X2 + 1X6 + 1X5 + 3X3 + 2X2$

$= 1 + 0 + 4 + 6 + 5 + 9 + 4$

$= 29$ Rs

Table no. 2

	D_1	D_2	D_3	D_4	Supply
S_1	3	1	7	4	2
S_2	2	6	5	9	4
S_3	8	3	3	2	5
Demand	2	3	4	2	12

Balance transportation problem
Demand = = Supply.

	D_1	D_2	D_3	D_4	Supply
S_1	3	1(2)	7	4	2 0
S_2	2(2)	6(1)	5(1)	9	4 2 1 0
S_3	8	3	3(3)	2(2)	5 3 0
Demand	2	3	4	2	12
	0	+	+	0	
		0	0		

Initial basic feasible solution of given transportation problem is:

$x_{12} = 2$, $x_{21} = 2$, $x_{22} = 1$,
$x_{23} = 1$, $x_{33} = 3$, $x_{34} = 2$

And the minimum transportation cost is equal to:

$= 2\times1 + 2\times2 + 1\times6 + 1\times5 + 3\times3 + 2\times2$
$= 2 + 4 + 6 + 5 + 9 + 4$

$= 30$ RS

Table no. 3

	D_1	D_2	D_3	D_4	Supply
S_1	3	1	7	4	3
S_2	2	6	5	9	4
S_3	8	3	3	2	5
Demand	2	3	4	2	12

	D_2	D_2	D_3	D_4	D_5	Supply
S_1	3	1	7	4	0	3
S_2	2	6	5	9	0	4
S_3	8	3	3	2	0	5
Demand	2	3	4	2	1	12

	D_1	D_2	D_3	D_4	D_5	Supply
S_1	3	1(2)	7	4	0(1)	3 ~~2~~ 0
S_2	2(2)	6(1)	5(1)	9	0	4 ~~2~~ 0
S_3	8	3	3(3)	2(2)	0	5 3 0
Demand	~~2~~ 0	~~3~~ + 0	~~4~~ + 0	~~2~~ 0	~~1~~ 0	12

Initial basic feasible solution of transportation is

$x_{12} = 2$, $x_{15} = 1$, $x_{21} = 2$, $x_{22} = 1$
$x_{23} = 1$, $x_{33} = 3$, $x_{34} = 2$.

And the minimum transportation cost is equal to.

$= 2\times1 + 1\times0 + 2\times2 + 1\times6 + 1\times5 + 3\times3 + 2\times2$
$= 2 + 0 + 4 + 6 + 5 + 9 + 4$

$= 30$ Rs

Vogel Approximation Method

	D1	D2	D3	D4	Supply
S1	3	1	7	4	3
S2	2	6	5	9	4
S3	8	3	3	2	5
Demand	2	2	4	2	12

	D1	D2	D3	D4	D5	Supply	Penalty
S1	3	1(2)	7	4	0(1)	3 ~~1~~ 0	1 3 - - / -
S2	2(2)	6	5(1)	9	0(1)	4 ~~2~~ 1 0	2 2 2 2 / 5 -
S3	8	3	3(3)	2(2)	0	5 ~~3~~ 3 0	2 2 2 3 / 3 3
Demand	~~2~~ 0	~~2~~ 0	4 ~~3~~ 0	~~2~~ 0	~~2~~ 1 0	12	
Penalty	1 / 1 / 6 / 6 / - / -	2 / - / - / - / - / -	2 / 2 / 2 / 2 / 2 / -	2 / 2 / 7 / - / - / -	0 / 0 / 0 / 0 / 0 / -		

Minimum transportation cost.

$= 2 \times 1 + 1 \times 0 + 2 \times 2 + 1 \times 5 + 1 \times 0 + 3 \times 3 + 2 \times 2$

$= 2 + 0 + 4 + 5 + 0 + 9 + 4$

$= 24$ Rs.

Table no. 2.

	D_1	D_2	D_3	D_4	Supply
S_1	3	1	7	4	2
S_2	2	6	5	9	4
S_3	8	3	3	2	5
Demand	2	3	4	2	10

	D_1	D_2	D_3	D_4	Supply	Penalty
S_1	3	1 (2)	7	4	20	2 3 - - - -
S_2	2 (2)	6	5 (2)	9	40	3 1 1 1 5 -
S_3	8	3 (1)	3 (2)	2 (2)	50	1 1 1 0 3 -
Demand	2	3	4	2		
	0	1	2	0		
		0	0			

Penalty

1	2	2	2
-	2	2	2
-	3	2	7
-	3	2	-
-	-	-	-

S_1

S_2

S_3

Minimum transportation cost.

$= 1X2 + 2X2 + 2X5 + 1X3 + 2X3 + 2X2$

$= 2 + 4 + 10 + 3 + 6 + 4$

$= 29$ Rs

Table no. 3

	D_1	D_2	D_3	D_4	Supply
S_1	3	1	7	4	3
S_2	2	6	5	9	4
S_3	8	3	3	2	5
Demand	2	3	4	2	12

	D_1	D_2	D_3	D_4	D_5	Supply	Penalty
S_1	3	1(3)	7	4	0	30	1 - - - - -
S_2	2(2)	6	5(1)	9	0(1)	4 2 1 0	2 2 2 5 5 -
S_3	8	3	3(3)	2(2)	0	5 3 0	2 2 3 3 3 3
Demand	2	3	4	2	1	12	
Penalty	1	2	2	2	0		
	6	-	2	7	0		
	6	-	2	-	0		
	-	-	2	-	0		
	-	-	2	-	-		

Minimum transportation Cost

$= 3 \times 1 + 2 \times 2 + 5 \times 1 + 1 \times 0 + 3 \times 3 + 2 \times 2$

$= 3 + 4 + 5 + 0 + 9 + 4$

$= 25$ Rs