Abhishek Srivastava

19BCE10071

Class - Test

Q-1) Minimise :

$$Z = 10x_1 + 6x_2 + 2x_3$$

Given $\quad -x + x_2 + x_3 \geq 1$

$\quad 3x + x_2 - x_3 \geq 2$

In standard form :

$$Z = -10x_1 + 6x_2 + 2x_3 + 0 \cdot x_4 + 0 \cdot x_5$$

$\therefore B = \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$ & $B^{-1} = \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$

$b = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$

$\therefore x_B = B^{-1}b = \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}\begin{bmatrix} 1 \\ 2 \end{bmatrix} = \begin{bmatrix} -1 \\ -2 \end{bmatrix}$

Also, $C_B = 0$ & $Z_j - C_j = -C_j \geq 0$, $j = 1, 2, 3.$

Using Dual-Simplex Method.

			C_j	-10	-6	-2	0	0
C_B	B	X_B	$B^{-1}b$	y_1	y_2	y_3	y_4	y_5
0	a_4	x_4	-1	1	-1	-1	1	0
0	a_5	x_5	-2	-3	-1	1	0	1
$Z_j - C_j$				10	6	2	0	0

$\therefore X_B = \text{Min}\{-1, -2\} = -2$

$\therefore a_5$ is leaving vector.

$$\frac{Z_K - C_K}{Y_{RK}} = \text{Max}\left\{-\frac{10}{3}, \frac{-1}{-1}\right\} = \frac{-10}{3}$$

$\therefore K = 1$ & a_1 is entering vector.

<u>Transformed Table.</u>

		C_j		-10	-6	-2	0	0
C_B	B	X_B	b	y_1	y_2	y_3	y_4	y_5
0	a_4	x_4	$-4/3$	0	$-4/3$	$-2/3$	1	$1/3$
-10	a_1	x_1	$2/3$	1	$1/3$	$-1/3$	0	$-1/3$
$Z_j - C_j$				0	$8/3$	$16/3$	0	$10/3$

Here, a_j is infeasable Bikvaoiable.

$\therefore \dfrac{Z_k - C_k}{y_k} = \text{Max}\left\{ \dfrac{8/3}{-4/3}, \dfrac{16/3}{-2/3} \right\} = -2$

$\Rightarrow a_2$ is the entering vector.

Now, Transformation table is –

			c_j	-10	-6	-2	0	0
C_B	B	x_B	b	y_1	y_2	y_3	y_3	y_3
-6	a_2	x_2	$5/4$	0	1	$1/2$	$-3/4$	$-1/4$
-10	a_1	x_1	$1/4$	1	0	$+1/2$	$1/4$	$-1/4$
$Z_j - C_j$				0	0	4	2	4

Here feasible solution is obtained as;

$x_1 = 1/4,\ x_2 = 5/4,\ x_3 = 0$ & $Z_{min} = 10$

A → 2

TO

FROM	A	B	C	D	E
A	∞	2	5	~~8~~ 7	1
B	6	∞	3	~~3~~ 8	2
C	8	7	∞	~~∞~~ 4	7
D	12	4	6	∞	5
E	1	3	2	8	∞

Row Minimizaⁿ

A	A	B	C	D	E
A	∞	1	4	6	0
B	4	∞		6	0
C	4	3	∞	0	3
D	8	0	2	∞	1
E	0	2	1	7	∞

Column Minizaⁿ

	A	B	C	D	E
A	∞	4	3	6	9
B	4	∞	0	6	0
C	1	9	∞	0	0
D	8	0	7	∞	4
E	0	2	0	4	∞

$N = n$, $5 = 5 \times 5$.

∞	1	3	6	[0]
4	∞	[0]	6	0
4	3	∞	[0]	3
8	[0]	1	∞	1
[0]	2	0	7	∞

A - E - A ⇒ B - C - D - 8

Cost = 1+3+4+4+1
= 13

As per sequence from above assignment, indicates to produce A, then E & then A without producing product B, C & D. It voinates restriction of producing each product.

Now, we have to ~~of~~ exmaine matrix for headsoln. assignming with C15 to C12 & C12 to C45.

∞	[1]	3	6	0
4	∞	[0]	6	0
4	3	∞	[0]	3
8	0	1	∞	
[0]	3	0	7	∞

Now sequence, A - B - C - D - E - A

$\therefore$ Cost $= 2 + 3 + 4 + 5 + 1 = 15$.

Here, the cost is increased by Rs. 2.

A → 3.

	fodder 1	fodder 2
Nutrient A	2	1
Nutrient B	2	3
Nutrient C	1	1

Cost of fodder 1 is ₹3 per unit & that of fodder 2 ₹2.

Let x unit of fodder 1 & y unit of fodder 2. (6)

$\therefore$ total cost $z := 3x + 2y$

Nutrient	fodder 1	fodder 2	Minimum requirement
A	2	1	14
B	2	3	22
C	1	1	1

$\therefore$ Constraints :

$2x + y \geq 14$

$2x + 3y \geq 22$

$x + y \geq 1$; $x \geq 0$; $y \geq 0$

$\therefore$ LPP will be :

Minimise : $z := 3x + 2y$

$2x + y \geq 14$, $2x + 3y \geq 22$, $x + y \geq 1$

$x \geq 0$, $y \geq 0$.

A → 4

No. of Supply Constraint = 3
No. of demand constraint = 3

	D1	D2	D3	Supply
S1	6	8	4	14
S2	4	9	3	12
S3	1	2	6	15
Demand	6	10	15	

In 1st row:
Smallest transforma^n cost is 4 in cell S,O.
allocation in this cell is min (14, 15) = 14.

So, table will be:

~~S1~~	D1	D	D3	Supply
S1	6	8	14	0
S2	4	9	3	12
~~Demand~~ S3	1	2	6	5
Demand	6	10	1	

In 2nd row, smallest transforma^n cost is 3 in S_2D_3
∴ Allocation in the cell will be min (12, 1) = 1

Now, table will be

	D1	D2	D3	Supply
S1	6	8	14	0
S2	4	9	1	11
S3	1	2	6	5
Demand	6	10	0	

In 2nd row, smallest transportation cost is 4 in cell S2D1. ∴ allocation to the cell will be min (11, 6) = 6

So,

	D1	D2	D3	Supply
S1	6	8	14	0
S2	6	9	1	5
S1	1	2	6	5
	0	10	0	

Similarly, S2D will be allocated by 5. & In 3rd row, smallest transportation cost is min S3D2 so it will be allocated min (5,5) = 5.

Initial feasible Solution Table

(T)

	D1	D2	D2	Supply
S1	6	8	14	14
S2	6	5	1	12
S3	1	5	6	5
	6	10	15	31/31

Minimum table transportan Cost

$= 4\times14 + 4\times6 + 9\times5 + 3\times1 + 2\times5$

$= 138.$

No. of allocated cells $= 5 = 3+3-1 = 5$

$\therefore$ solution is non-dengeoate.