		MACHINES				
		A	B	C	D	E
J	1	3	9	[0]	8	8
O	2	3	1	6	[0]	5
B	3	1	4	3	~~0~~	[0]
S	4	[0]	3	106	7	1
	5	4	[0]	2	1	1

No. of rows = No of assignment

5 = 5

1 - C	A = 16
2 - D	B = 5
3 - E	C = 3
4 - A	D = 1
5 - B	E = 11

Total = 36 units

$\frac{1}{4} R_2 + (-R_1) \rightarrow R_1$

	x_1	x_2	S_1	P_1	S_2	P_2	Z	
S_1	$-3/4$	0	-1	$1/4$	$-1/4$	$-1/2$	0	4
x_2	-1	1	0	1	-1	-2	0	0
P_2	1	1	0	0	0	1	0	10
Z	$-2M-2$	$-4M-3$	0	0	M	0	1	$-30M$

~~R_2~~ $R_3 - R_2 \rightarrow R_3$

x_1	x_2	S_1	P_1	S_2	P_2	Z	
$-3/4$	0	-1	$1/4$	$-1/4$	$-1/2$	0	4
-1	1	0	1	-1	-2	0	0
2	0	0	-1	1	3	0	10
$-2M-2$	$-4M-3$	0	0	M	0	1	$-30M$

Step 3

$-MR_2 + R_4 \rightarrow R_4$

x_1	x_2	S_1	P_1	S_2	P_2	Z	
$\frac{1}{2}$	$\frac{1}{4}$	1	0	0	0	0	4
1	3	0	1	-1	0	0	20
1	1	0	0	0	1	0	10
$-M-2$	$-3M-3$	0	0	M	M	1	$-20M$

Step 4:-

x_1	x_2	S_1	P_1	S_2	P_2	Z	
$\frac{1}{2}$	$\frac{1}{4}$	1	0	0	0	0	4
1	3	0	1	-1	0	0	20
1	1	0	0	0	1	0	10
$-2M-2$	$-4M-3$	0	0	M	0	1	$-30M$

↑ Pivot column

Step 5

x_1	x_2	S_1	P_1	S_2	P_2	Z	
$\frac{1}{2}$	$\frac{1}{4}$	1	0	0	0	0	4
Pivot row ← 1	3	0	1	-1	0	0	20
1	1	0	0	0	1	0	10
$-2M-2$	$-4M-3$	0	0	M	0	1	$-30M$

Step 6:-

x_1	x_2	S_1	P_1	S_2	P_2	Z	
$\frac{1}{2}$	$\frac{1}{4}$	1	0	0	0	0	4
1	[3]	0	1	-1	0	0	20
1	1	0	0	0	1	0	10
$-2M-2$	$-4M-3$	0	0	M	0	1	$-30M$

3 → Pivot value

P.T.O

OC

8

7:00

8:00

9:00

10:00

11:00

12:00

1:00

2:00

Total Cost:- 40(22) + 80(4) + 40(24) + 30(9) +
20(32) + 30(15) = 3520

Total cost = 3520

		MACHINES				
j		A	B	C	D	E
0	1	6	12	3	11	15
b	2	4	2	7	1	10
S	3	8	11	10	7	11
	4	16	19	122	23	21
	5	9	5	7	6	10

Step 1 Subtract the smallest element of a row on each element of a row

MACHINES

		A	B	C	D	E
j	1	30	9	0	8	12
0	2	93	1	6	0	9
B	3	1	4	3	0	4
S	4	0	3	106	7	5
	5	4	0	2	1	5

Step 2 :-

Now Subtract the smallest element of a column on each element of a Column

P_1	S_2	P_2	Z	
$-1/8$	$1/8$	$5/8$	0	$3/4$
$1/2$	$-1/2$	$-1/2$	0	5
$-1/2$	$1/2$	$3/2$	0	5
$4M+3$	$-3M-3$	$8M+6$	1	$-30M$

SECTION = A
SEMESTER = 4th

NAME = SHAYAN ID = 14487, Degree = BS(SE)

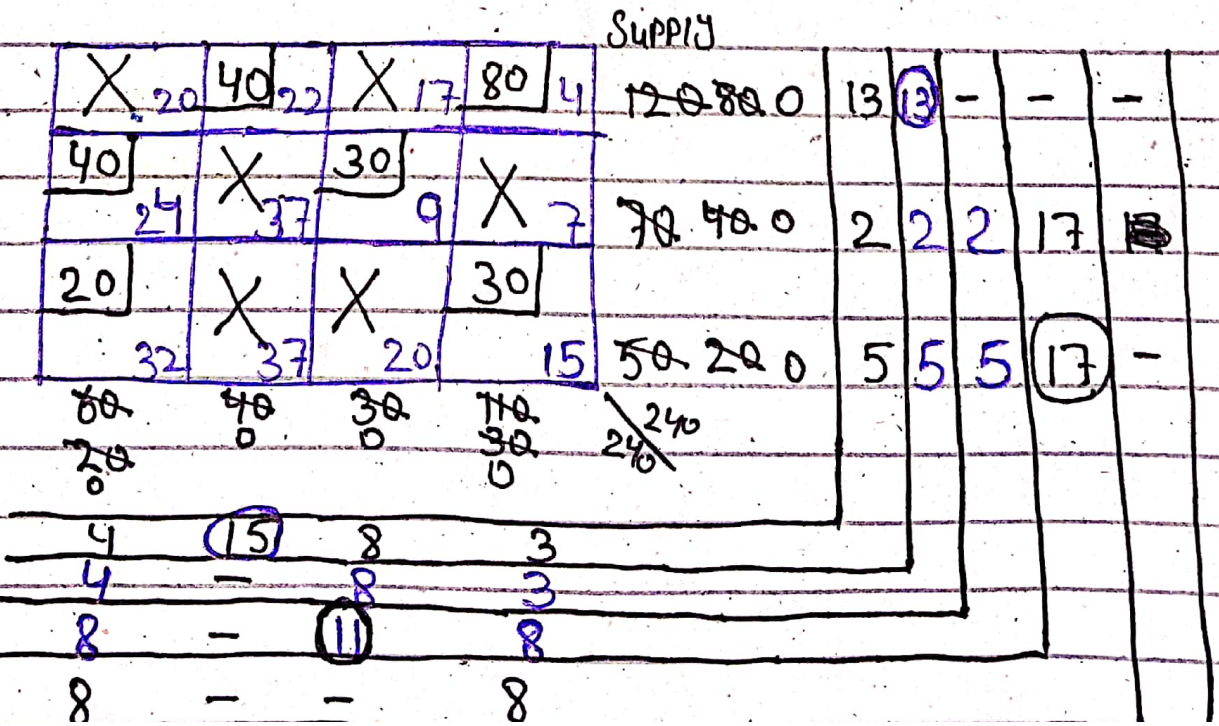
Q3:- Use Vogel's Approximation Method to obtain the initial feasible Solution of:

origin	Destination				Supply
	1	2	3	4	
1	20	22	17	4	120
2	24	37	9	7	70
3	32	37	20	15	50
Demand	60	40	30	110	240

Demand = Supply

So there is no the Possibility of Dummy row or Column.

This is Balanced transportation method



$R_2(4M+3) + R_4 \rightarrow R_4$

	x_1	x_2	S_1	P_1	S_2	P_2	Z	
S_1	-3/4	0	-1	1/4	-1/4	-1/2	0	4
x_2	-1	1	0	1	-1	-2	0	0
P_2	2	0	0	-1	1	3	0	10
Z	-6M-5	0	0	4M+3	-3M-3	8M+6	1	-30M

	x_1	x_2	S_1	P_1	S_2	P_2	Z	
S_1	-3/4	0	-1	1/4	-1/4	-1/2	0	4
x_2	-1	1	0	1	-1	-2	0	0
Pivot value P_2	2	0	0	-1	1	3	0	10 → Pivot row
Z	-6M-5	0	0	4M+3	-3M-3	8M+6	1	-30M

↓ Pivot column

	x_1	x_2	S_1	P_1	S_2	P_2	Z	
S_1	-3/4	0	-1	1/4	-1/4	5/8	0	31/4
x_2	-1	1	0	1	-1	-2	0	0
P_2	1	0	0	-1/2	1/2	3/2	0	5
Z	-6M-5	0	0	4M+3	-3M-3	8M+6	1	-30M

-3M-3

Q2:- Solve the following Linear Programming Problem

$$\min Z = 2x_1 + 3x_2$$

$$\text{s.t. } (1/2)x_1 + (1/4)x_2 \leq 4$$

$$x_1 + 3x_2 \geq 20$$

$$x_1 + x_2 = 10$$

$$x_1, x_2 \geq 0$$

Step 1:- first convert the system of inequalities using artificial and slack variable

$$\frac{1}{2}x_1 + \frac{1}{4}x_2 \leq 4$$

$$\frac{1}{2}x_1 + \frac{1}{4}x_2 + S_1 = 4$$

∴ where 'S_1' is a slack var

$$\Rightarrow x_1 + 3x_2 \geq 20$$

Now adding slack and artificial variable

$$x_1 + 3x_2 - S_2 + P_1 = 20$$

∴ where 'S_2' is slack variable and 'P_1' is artificial variable

$$x_1 + x_2 = 10$$

$$x_1 + x_2 + P_2 = 10$$

∴ 'P_2' is artificial variable.

Step 2:- creat a table

x_1	x_2	S_1	P_1	S_2	P_2	Z	
1/2	1/4	1	0	0	0	0	4
1	3	0	1	-1	0	0	20