Page # 10

Name :- M. Junaid

ID :- 14608

Section. BS (SE) sectio 'A'

Question NO # 1

Q:. There are total of 5 machine and five employments are to be relegated and the related cost network is as per the following locate the best possible task.

Jobs	Machines				
	A	B	C	D	E
1	6	12	3	11	15
2	4	2	7	1	10
3	8	11	10	7	11
4	16	19	122	23	21
5	9	5	7	6	10

Answer 1.

Solution:-

MACHINES

JOBS		1	2	3	4	5	Row Minimum
	1	6	12	[3]	11	15	3
	2	4	2	7	[1]	10	1
	3	8	17	10	7	[11]	7
	4	[16]	19	122	23	21	16
	5	9	[5]	7	6	10	5

Row Reduction

MACHINES

JOBS		1	2	3	4	5
	1	3	9	0	8	12
	2	3	1	6	0	9
	3	1	4	3	0	4
	4	0	3	106	7	5
	5	4	0	2	1	5
		0	0	0	0	4

Column Reduction.

MACINES

		1	2	3	4	5
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	

5 = 5 optimal Solution

JOBS	MACINES	Time
1	3	3
2	4	1
3	5	11
4	1	16
5	2	5
		36

total processing time = 36 hours.

Question NO # 2.

Q: Solve the following Linear programming problem.

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

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

$$x_1 + 3x_2 \geq 20$$

$$x_1 + x_2 = 10$$

$$x_1, x_2 \geq 0$$

Ans:-

Step 1:

Convert the system of inequalities to equation using slack variable artifical variable and surplus variable

$$(1/2)x_1 + (1/4)x_2 + S_1 = 4$$

$$x_1 + 3x_2 - S_2 + A_1 = 20$$

$$x_1 + x_2 - S_3 + A_2 = 10$$

$$Z = 2x_1 + 3x_2 + MA_1 + MA_2$$

$$Z = 2x_1 + 3x_2 - MA_1 - MA_2 = 0$$

Step 2:-

Set the objective function equal to zero

$Z - 2x_1 - 3x_2 + MA_1 + MA_2 = 0$

$Z - 2x_1 - 3x_2 - MA_1 - MA_2 = 0$

Step 3:-

Draw a simple table

x_1	x_2	S_1	S_2	S_3	A_1	A_2	Z	
1/2	1/4	1	0	0	0	0	0	4
1	3	0	-1	0	1	0	0	21
1	1	0	0	-1	0	1	0	10
2	-3	0	0	0	-M	-M	1	0

Step 4:-

Select the pivot column.

x_1	x_2	S_1	S_2	S_3	A1	A2	Z	
1/2	1/4	1	0	0	0	0	0	4
1	3	0	-1	0	1	0	0	20
1	1	0	0	-1	0	1	0	10
-2/M	3/M	0	0	0	1	1	-1/M	0

↓ Pivot Column

Dividing R4 by -M

Step 5 :-

Select the pivot ROW

x_1	x_2	S_1	S_2	S_3	A_1	A_2	Z	
1/2	1/4	1	0	0	0	0	0	4 → Pivot Row
1	3	0	-1	0	1	0	0	20
1	1	0	0	-1	0	1	0	10
-2/M	3/M	0	0	0	1	1	-1/M	0

Step 6 :-

Select the pivot. Which is the entry in the pivot column and pivot row.

x_1	x_2	S_1	S_2	S_3	A_1	A_2	Z	
1/2 (Pivot element)	1/4	1	0	0	0	0	0	4 → Pivot Row
1	3	0	-1	0	1	0	0	20
1	1	0	0	-1	0	1	0	10
-2/M	3/M	0	0	0	1	1	-1/M	0

↓ Pivot column.

Step 7 :-

Perform row operation to make pivot equal to 1 and the remain element in the pivot column equal to zero making the pivot equal to 1

x_1	x_2	S_1	S_2	S_3	A_1	A_2	Z	
1	1/2	2	0	0	0	0	0	8
1	3	-1	-1	0	1	0	0	20
1	1	0	0	-1	0	1	0	10
-2/M	3/M	0	0	0	1	1	-1/M	0

by $(R_1)2$

	x_1	x_2	S_1	S_2	S_3	A_1	A_2	Z	
x_1	1	1/2	2	0	0	0	1	0	8
A_1	0	5/2	-2	-1	0	1	0	0	12
A_2	0	1/2	-2	0	-1	0	1	0	2
2	0	4/M	4/M	0	0	1	1	-1/M	16/M

$R_2 \rightarrow R_2 - R_1$

$R_3 \rightarrow R_3 - R_1$

$R_4 \rightarrow (2/M)R_1 + R_4$

Question NO :- 3

Q:- Use Vogel's Approximation Method to obtain the initial feasible solution of.

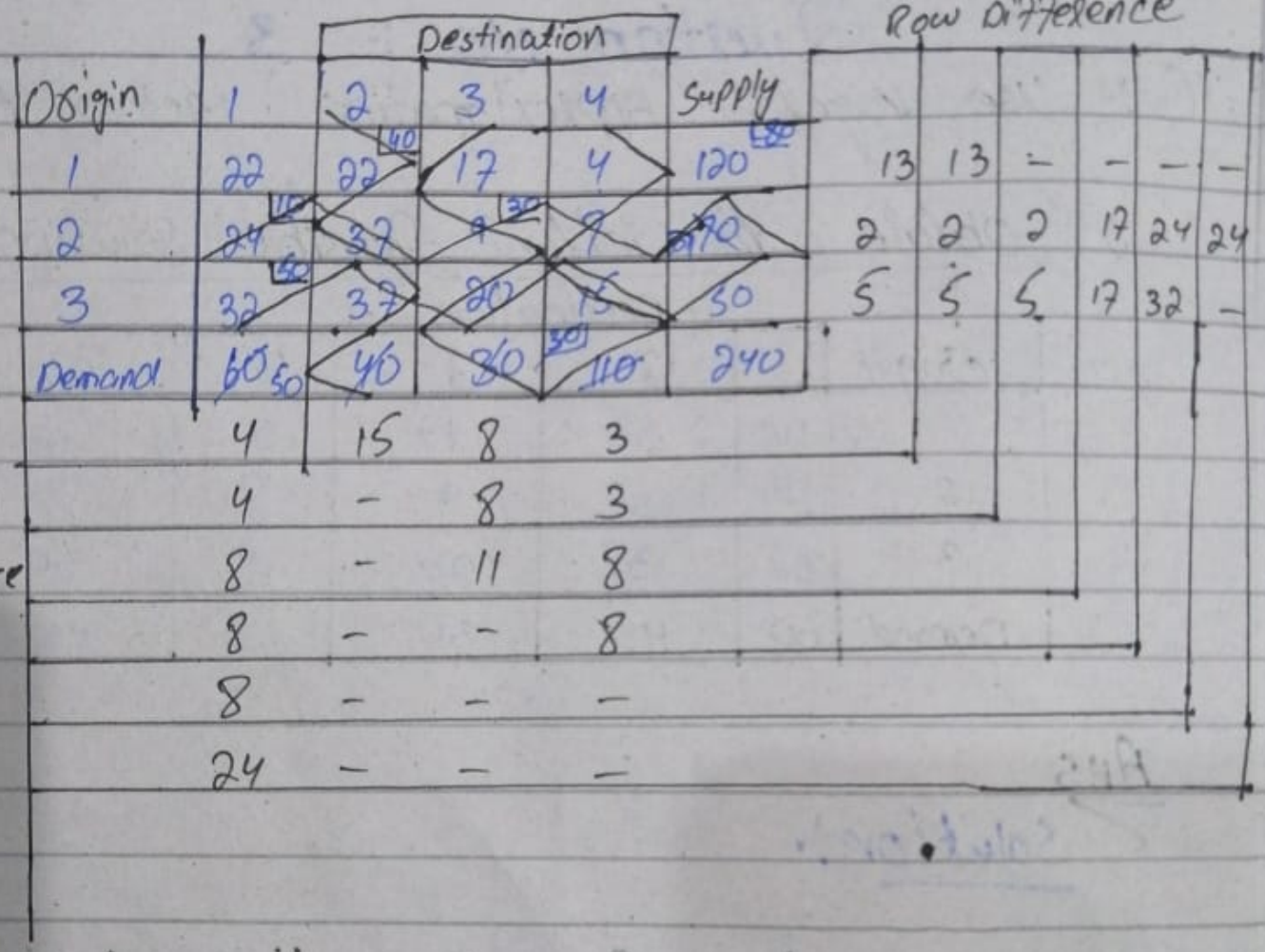
origin \ Destination	1	2	3	4	Supply
1	20	22	17	4	120
2	24	37	9	7	70
3	32	37	20	15	50
Demand	60	40	30	110	240

Ans

Solution:-

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

Demand = Supply


Destination
Row difference
Origin
1
2
3
4
Supply
1
22
22
17
4
120
13
13
-
-
-
-
2
24
37
9
7
90
2
2
2
17
24
24
3
32
37
20
15
50
5
5
5
17
32
-
Demand
60
50
40
30
110
240
4
15
8
3
Column difference
4
-
8
3
8
-
11
8
8
-
-
8
8
-
-
-
24
-
-
-