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CLASS: BS(SE) 4th
SECTION: (B)
CLASS TIMING: WEDNESDAY

QNO 1:-

Jobs \ operators	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

Solution:-

Phase 1:- Row and column Reduction:-

Row Reduction

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

Step 1:- Subtract the minimum value of each row from the entries of that row.

Jobs \ operator	A	B	C	D	E
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

* Column Reduction:-

operator

Jobs	A	B	C	D	E
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
Column minimum :-	0	0	0	0	4

Step 2:- Subtract the Column minimum value of each column from the entries of that column.

operator

Jobs	A	B	C	D	E
1	3	9	0	8	8
2	3	1	6	0	5
3	1	4	3	0	0
4	0	3	106	7	1
5	4	0	2	1	1

phase 2:- optimition of the problum:-

Step 1:- Draw a minimum Number of Lines to cover all the zero's of matrix.

* Row and Column Scanning:-

operator

Jobs	A	B	C	D	E
1	3	9	[0]	8	8
2	3	1	6	[0]	5
3	1	4	3	0	[0]
4	[0]	3	106	7	1
5	4	[0]	2	1	1

Step II:-

Check when there the number of Square marked is equal to the number of rows of the matrix. if yes then go to Step 5. otherwise goto step 3.

* Here the number of lines crossing 0's are 5 time and total Number of rows is also 5.

$5 = 5$

So now we are going to step 5.

Step 5:-

The solution is optimal.

Jobs	operator	time
1	3	3
2	4	1
3	5	11
4	1	16
5	2	15

$3+1+11+16+5 = 36$

Total time = 36 Hours

Q.No 2:-

Q2)

$$\text{min } Z = 2x_1 + 3x_2$$

$$\text{Subj} = \left(\frac{1}{2}\right)x_1 + \left(\frac{1}{4}\right)x_2 \leq 4$$

$$x_1 + 3x_2 \geq 20$$

$$x_1 + x_2 = 10$$

$$x_1, x_2 \geq 0$$

Sol:- convert the system of inequalities to eqn-

Step1:- $\left(\frac{1}{2}\right)x_1 + \frac{1}{4}x_2 + S_1 = 4$ use SLACK var

$$x_1 + 3x_2 - S_2 + a_1 = 20$$

$$x_1 + x_2 + a_2 = 10$$

Step2:- $Z = -2x_1 - 3x_2$

$$Z = -2x_1 - 3x_2 - mA_1 - mA_2$$

$$Z + 2x_1 + 3x_2 + mA_1 + mA_2$$

$$2x_1 + 3x_2 + mA_1 + mA_2 + Z = 0$$

Step3:- Create a simple table:-

	x_1	x_2	S_1	S_2	a_1	a_2	Z	
R_1	$\frac{1}{2}$	$\frac{1}{4}$	1	0	0	0	0	4
R_2	1	3	0	−1	1	0	0	20
R_3	1	1	0	0	0	1	0	10
R_4	2	3	0	0	m	m	1	0

$R_4 + (-mR_3)$

	2	3	0	0	m	m	1	0
	−m	−m	0	0	0	−m	0	−10m
	2−m	3−m	0	0	m	0	1	−10m

Now we have manipulate this row in order to get 0 of M.

x_1	x_2	S_1	S_2	a_1	a_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
2−m	3−m	0	0	m	0	1	−10m

(5)

$R_4 + (-m R_2)$

$2-m$	$3-m$	0	0	m	0	1	$-10m$
$-m$	$-3m$	0	m	$-m$	0	0	$-20m$
$2-2m$	$3-4m$	0	m	0	0	1	$-30m$

step4: Slect the pivot Row and column.

step5:

step6:

	x_1	x_2	S_1	S_2	a_1	a_2	z	
	$\frac{1}{2}$	$\frac{1}{4}$	1	0	0	0	0	$4=16$
	1	3	0	-1	1	0	0	$20=6.66$
	1	1	0	0	0	1	0	$10=10$
	$2-2m$	$3-4m$	0	m	0	0	1	$-30m$

$\times 4$ to R_1

$\frac{1}{2} \times 4 = 2$ $\quad \frac{1}{4} \times 4 = 1$

step7:- perform row operation to make pivot equal to 1..

2 4 1 4 0 0 0 16

	x_1	x_2	S_1	S_2	a_1	a_2	z	
	2	1	4	0	0	0	0	16
	1	3	0	-1	1	0	0	20
	1	1	0	0	0	1	0	10
	$2-2m$	$3-4m$	0	m	0	0	1	$-30m$

(converted)

$R_2 + (-3R_1)$

1	3	0	-1	1	0	0	20
-6	-3	-12	0	0	0	0	-48
-5	0	-12	-1	1	0	0	-28

x_1	x_2	S_1	S_2	a_1	a_2	z	
2	-1	4	0	0	0	0	-16
$\frac{1}{3}$	1	0	$-\frac{1}{3}$	$\frac{1}{3}$	0	0	$20/3$
1	1	0	0	0	1	0	10
$2-2m$	$3-4m$	0	m	0	0	1	$-30m$

(6)

$\times \frac{1}{3}$ to R_2

$R_4 + (-mR_2)$

2	1	4	0	0	0	0	16
$-\frac{1}{3}$	-1	0	$\frac{1}{3}$	$-\frac{1}{3}$	0	0	$-\frac{20}{3}$

x_1	x_2	s_1	s_2	a_1	a_2	z	
0/3	0	4	$\frac{1}{3}$	$-\frac{1}{3}$	0	0	28/3
$\frac{1}{3}$	1	0	$-\frac{1}{3}$	$\frac{1}{3}$	0	0	20/3
1	1	0	0	0	1	0	10
2-2m	3-4m	0	m	0	0	1	-30m

$R_3 + (-1R_2)$

1	1	0	0	0	10	10
$-\frac{1}{3}$	-1	0	$\frac{1}{3}$	$-\frac{1}{3}$	0 0	$-\frac{20}{3}$
$\frac{2}{3}$	0	0	$\frac{1}{3}$	$-\frac{1}{3}$	1 0	$\frac{10}{3}$

convert these 2 value to 0:-

x_1	x_2	s_1	s_2	a_1	a_2	z	
5/3	0	4	$\frac{1}{3}$	$-\frac{1}{3}$	0	0	28/3
1/3	1	0	$-\frac{1}{3}$	$\frac{1}{3}$	0	0	20/3
2/3	0	0	$\frac{1}{3}$	$-\frac{1}{3}$	1	0	10/3
2-2m	3-4m	0	m	0	0	1	-30m

converted

$R_4 + (-(3-4m R_2)$

2-2m	3-4m	0	m	0	0	1	-30m
$-1+4m$	$-3+4m$	0	$2-4m$	$-2+4m$	0	0	$-10+8m$
1+2m	0	0	1-3m	$-1+4m$	0	1	$-10+8m$

(7)

	x_1	x_2	s_1	s_2	a_1	a_2	z	
x_2	5/3	0	4	1/3	-1/3	0	0	28/3
s_1	1/3	1	0	-1/3	1/3	0	0	20/3
a_1	2/3	0	0	1/3	-1/3	1	0	10/3
z	1+2m	0	0	1-3m	-1+4m	0	1	-10+50m

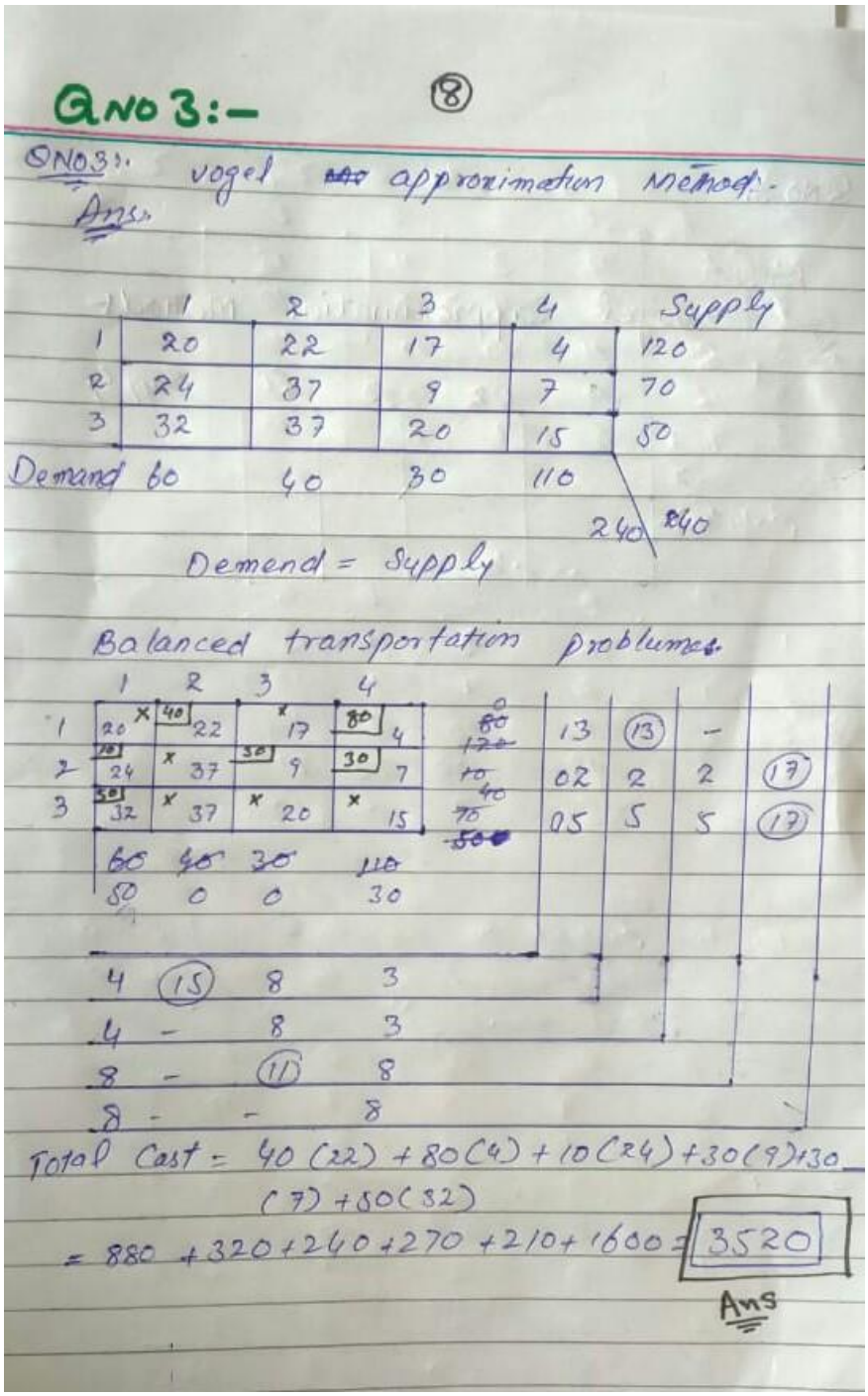
$x_2 = 28/3$

$s_1 = 20/3$

$a_2 = 10/3$

$z = -10 + 50m$

Ans



Q NO 3:- (8)

Q NO 3:- vogel approximation Method.

Ans:

	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	240 240

Demend = Supply

Balanced transportation problumes.

	1	2	3	4				
1	20 × 40	22	17 ×	80 4	80 120	13	(13)	-
2	20 24	37 ×	30 9	30 7	40	02	2	2 (17)
3	30 32	37 ×	20 ×	15 ×	70 50	05	5	5 (17)
	60 40 30 110							
	20 0 0 30							
4	(15)	8	3					
4	-	8	3					
8	-	(11)	8					
8	-	-	8					

Total Cost = 40 (22) + 80(4) + 10(24) + 30(9) + 30 (7) + 80(32)

= 880 + 320 + 240 + 270 + 210 + 1600 = 3520

Ans

$ END $

$ THANKS $