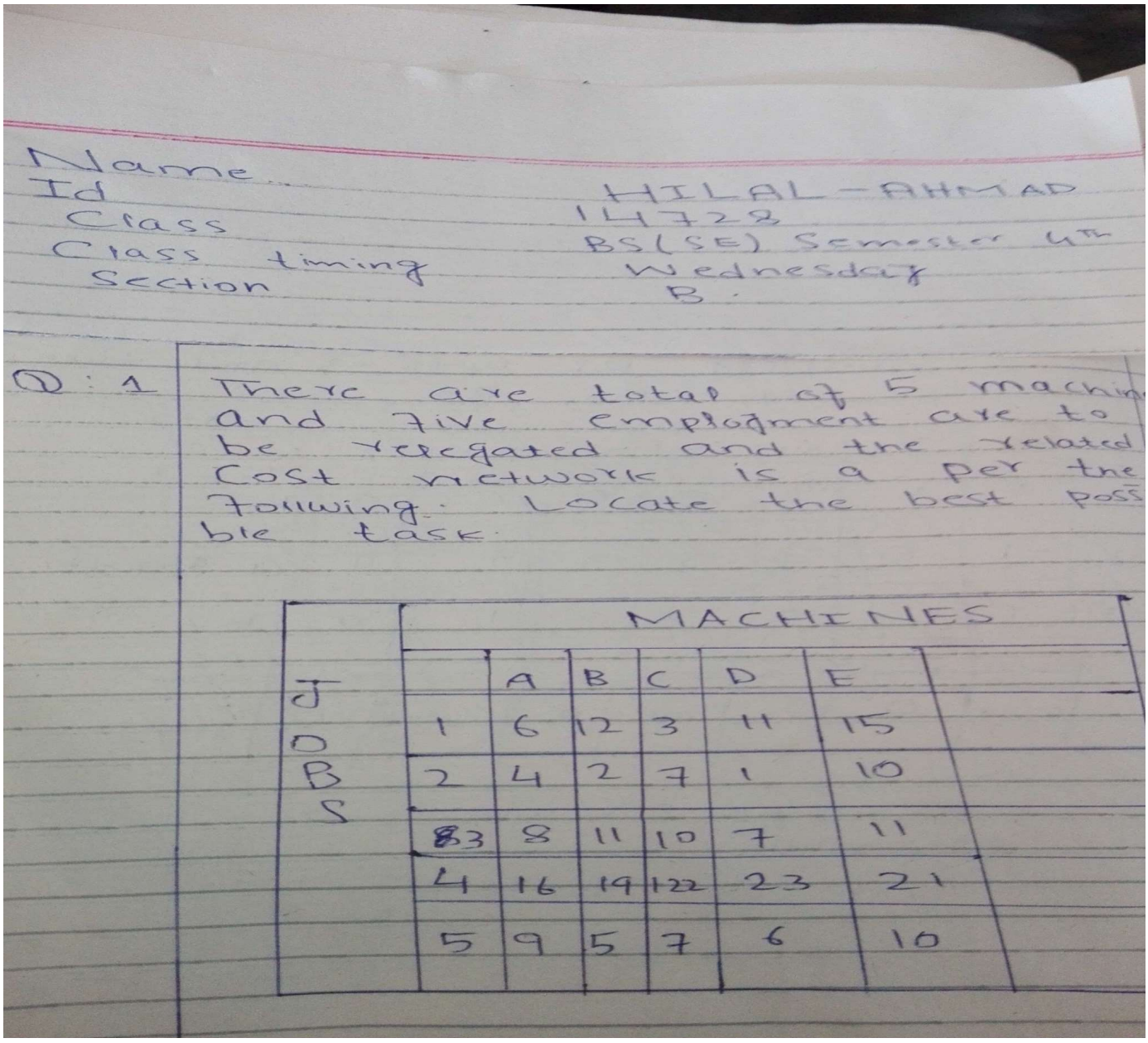
Name	Hilal Ahmad
Id	14728
Class timing	Wednesday 8-11
Class	bs (Se) 4th semester
Section	B
Subject name	opration research



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Id 14728
Class BS(SE) Semester 4TH
Class timing Wednesday
Section B.

Q: 1 There are total of 5 machin and five emplogment are to be reegated and the related Cost network is a per the follwing. Locate the best poss ble 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	14	22	23	21
	5	9	5	7	6	10

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Solving The problem by Hungerian Method

Balanced problem.

Phase-1:-

= Row and Colum Reduction

Step-1:- Substract the minimum value of each row from the enteries of the row-

Step-2:- Substract the minimum value of each Colum from the eneries of that Colum

operator

Jobs	1	2	3	4	5	row minim
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
6						

Substracting values from row minimum:-

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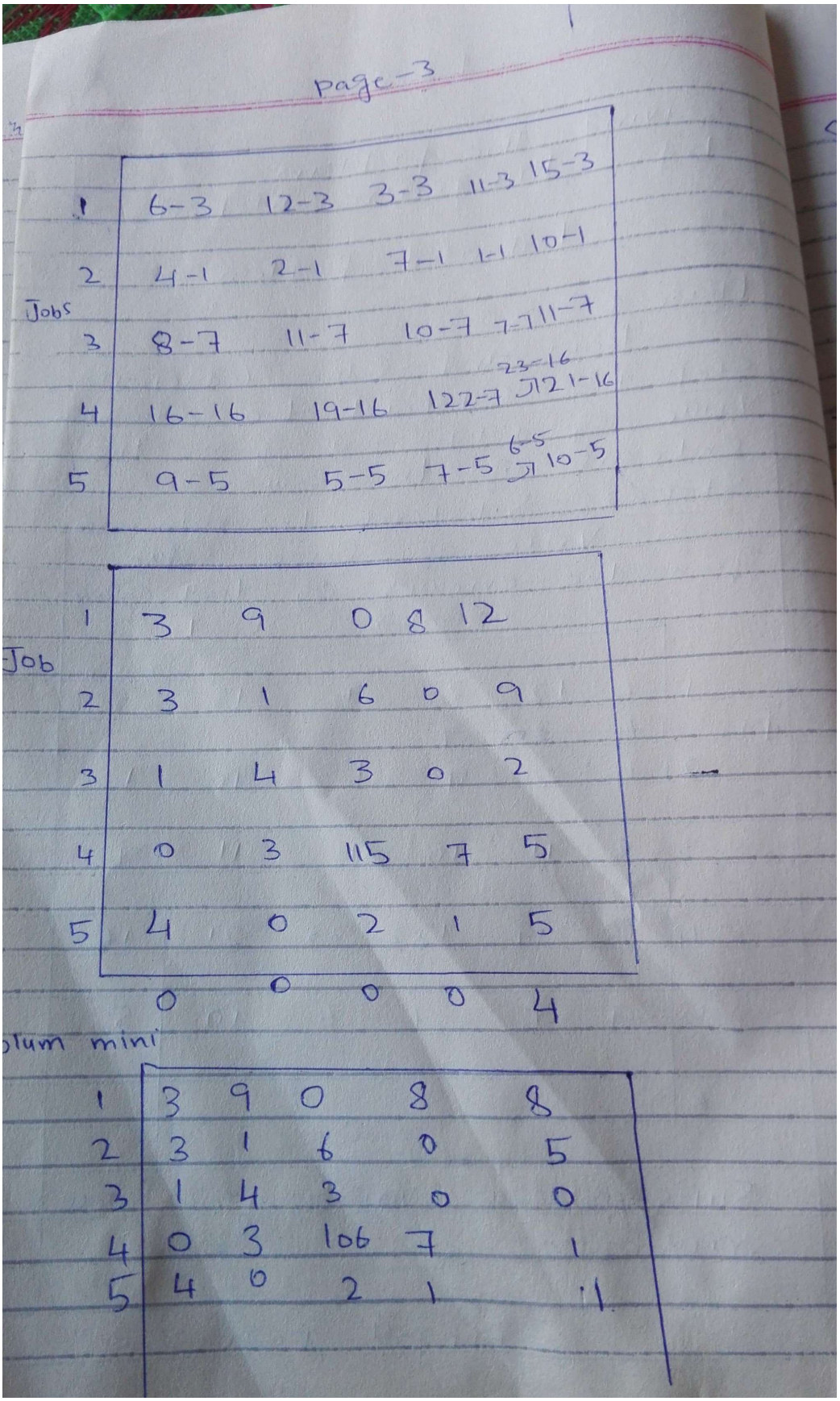
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Jobs
1 6-3 12-3 3-3 11-3 15-3
2 4-1 2-1 7-1 1-1 10-1
3 8-7 11-7 10-7 7-7 11-7
4 16-16 19-16 122-7 23-16 121-16
5 9-5 5-5 7-5 6-5 10-5
Job
1 3 9 0 8 12
2 3 1 6 0 9
3 1 4 3 0 2
4 0 3 115 7 5
5 4 0 2 1 5
0 0 0 0 4
lum mini
1 3 9 0 8 8
2 3 1 6 0 5
3 1 4 3 0 0
4 0 3 106 7 1
5 4 0 2 1 1

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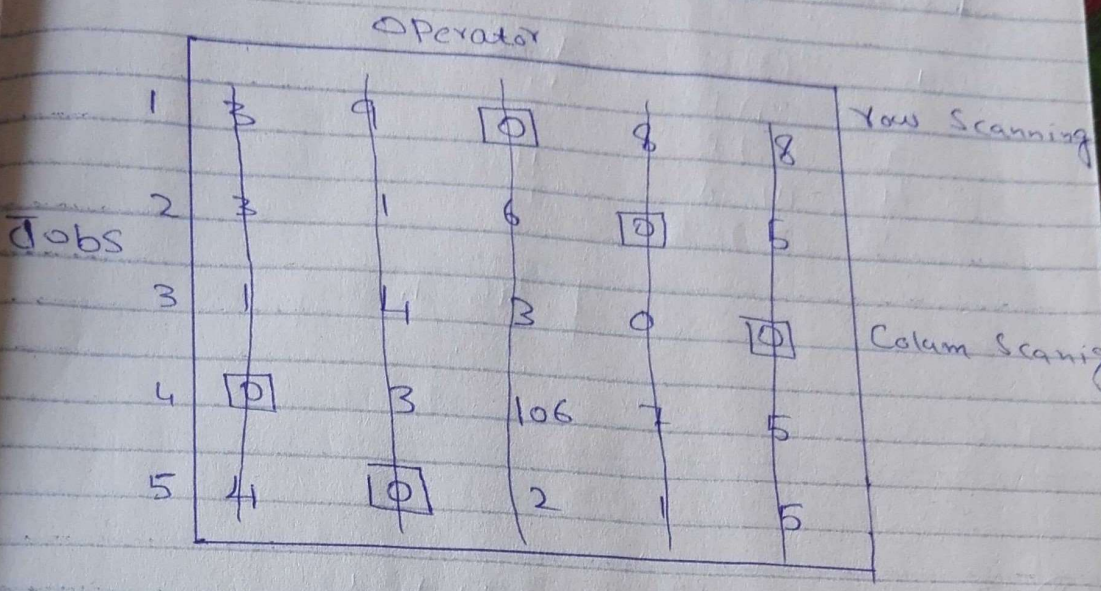
Step-1) After Scanning the last Colum Check wheter all the zero are Coverd with lines.



Step-2 :- Cheked wheter the no-if Sequen marked is equal to No if row if yes then go to 5- otherwise go to Step-3

Step-3 :- Identify the minimum value of undelcted Cells Value

Colum = row

5 = 5

Solution is oftimum.

Step-a add the minimum Undelcted cells values at interaction point of the present

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Summary:-

Solution is otimum and Feasible

Job	Machine operater	Time
1	(3) C	12
2	(4) D	1
3	(5) E	11
4	(1) A	16
5	(2) B	5

45 hour

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

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

$$x_1 + 3x_2 \geq 20$$

$$x_1 + x_2 = 10$$

$$x_1, x_2 \geq 0$$

Solution:-

By Big-M Method:-

Convert the problem of minimization to maximaization problem by multiplyng -ve sign to the right side of the objective function.

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~~Max $Z = -12x_1 - 20x_2$~~

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Max $Z = -2x_1 - 3x_2$

Step-1°:- Convert the System of inequal to equality using Slack variable, artificial Variable and surplus variable.

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

becomes

$\frac{1}{2}x_1 + \frac{1}{4}x + S_1 = 0$

Similarly

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

also

$x_1 + x_2 + a_1 = 10$

Step-2°:- Set the objective function equal to zero

$$\text{Max } Z = -2x - 3x_2 - MA_1 - mA_2$$
$$= Z + 2x_1 + 3x_2 + mA_1 + mA_2$$
$$= 2x_1 + 3x_2 + MA_1 + mA_2 + Z$$

Step-3°:- Creat a Simple table

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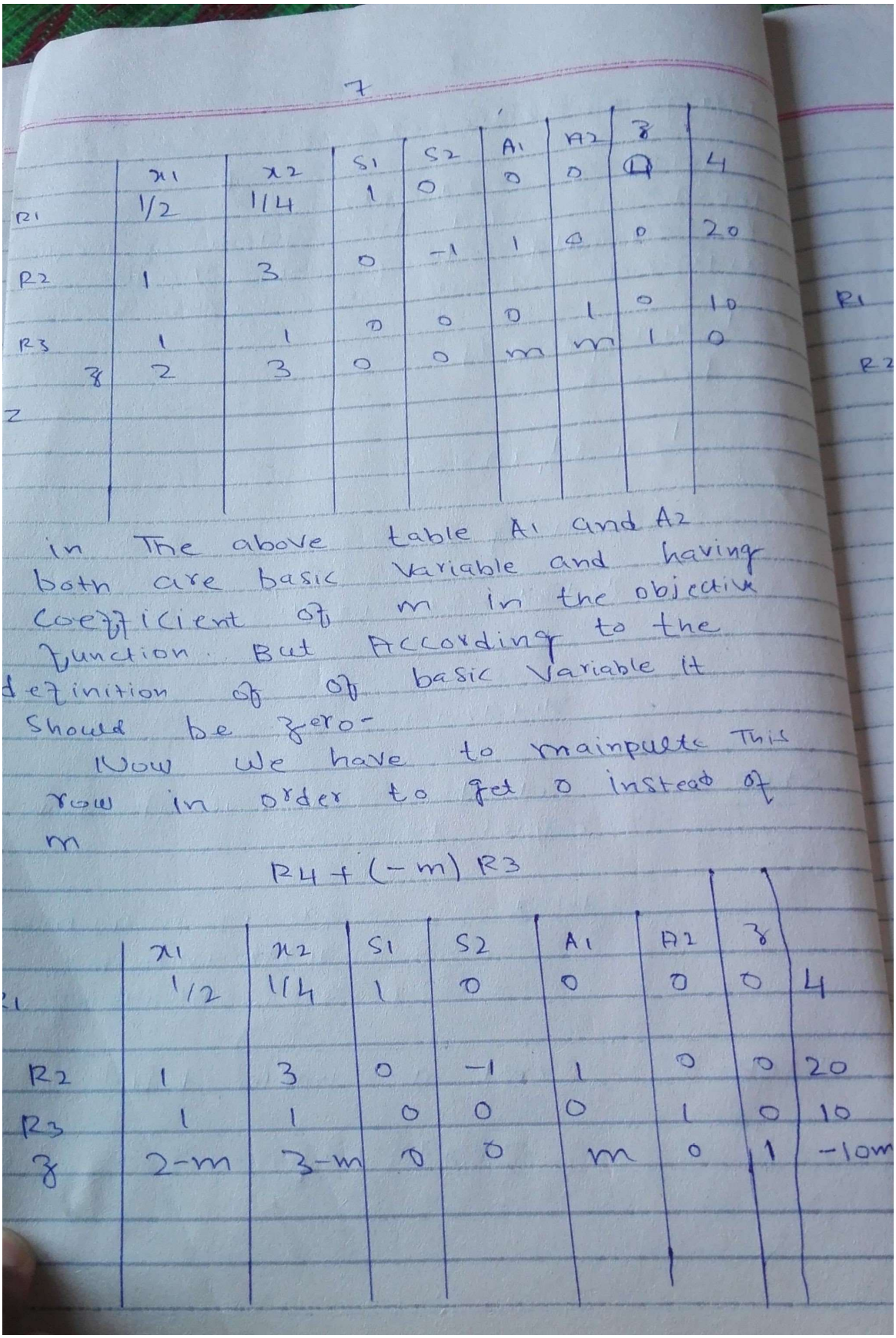

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	x_1	x_2	S_1	S_2	A_1	A_2	Z	
R_1	1/2	1/4	1	0	0	0	0	4
R_2	1	3	0	−1	1	0	0	20
R_3	1	1	0	0	0	1	0	10
Z	2	3	0	0	m	m	1	0

in The above table A_1 and A_2 both are basic variable and having coefficient of m in the objective function. But According to the definition of of basic variable it should be zero.

Now we have to mainpulate This row in order to get 0 instead of m

$R_4 + (-m) R_3$

	x_1	x_2	S_1	S_2	A_1	A_2	Z	
R_1	1/2	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
Z	2−m	3−m	0	0	m	0	1	−10m

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Also

$R4 + (-m)R2$

	x_1	x_2	S_1	S_2	A_1	A_2	Z	
R_1	$\frac{1}{4}$	$\frac{1}{2}$	1	0	0	0	0	4
R_2	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	$-30m$

Step – 4 :- Select the pivot Column

x_1	x_2	S_1	S_2	A_1	A_2	Z	
$\frac{1}{4}$	1/2	1	0	0	0	0	4
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	$-30m$

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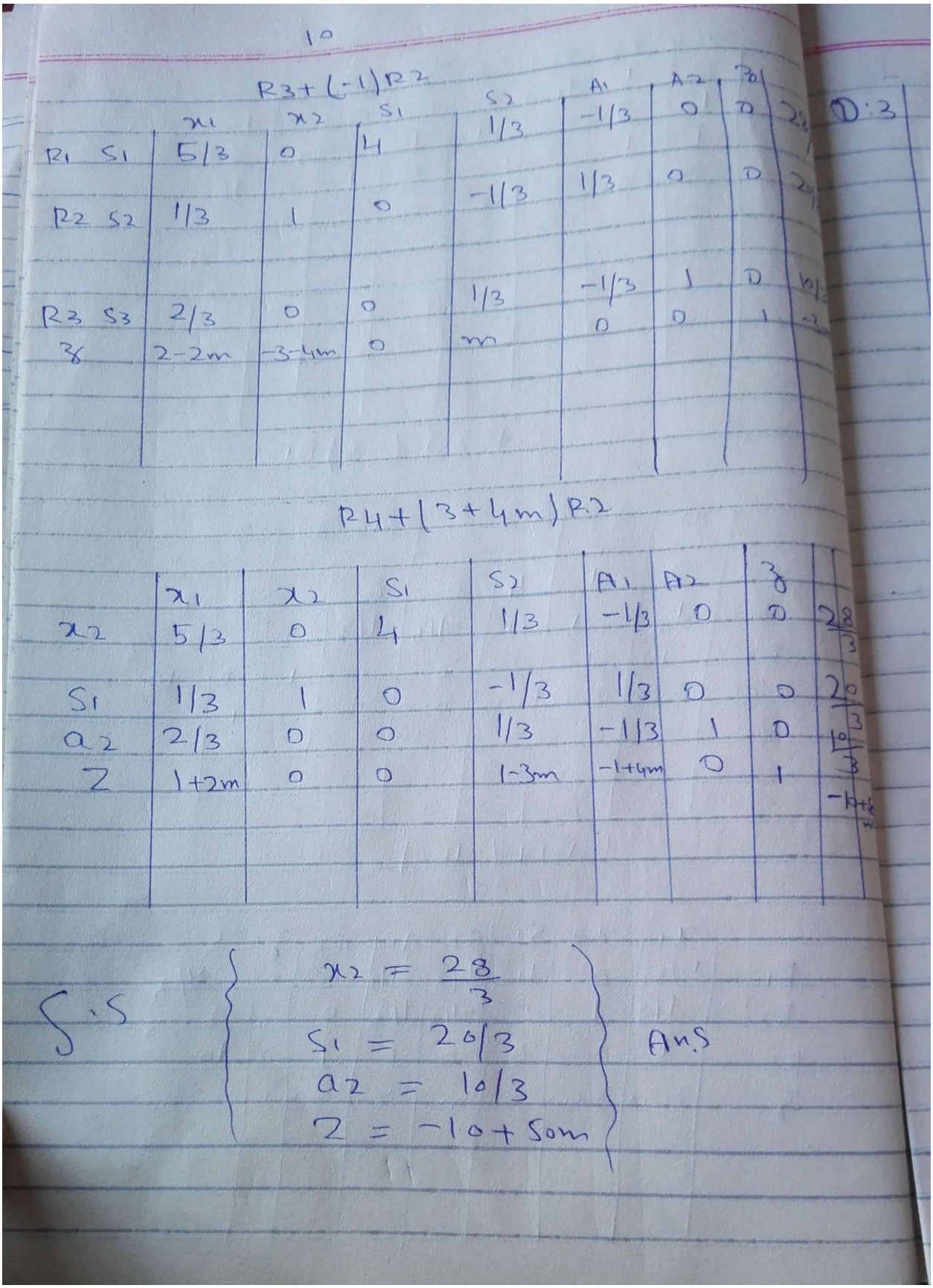
Step-5 :- Select the pivot row

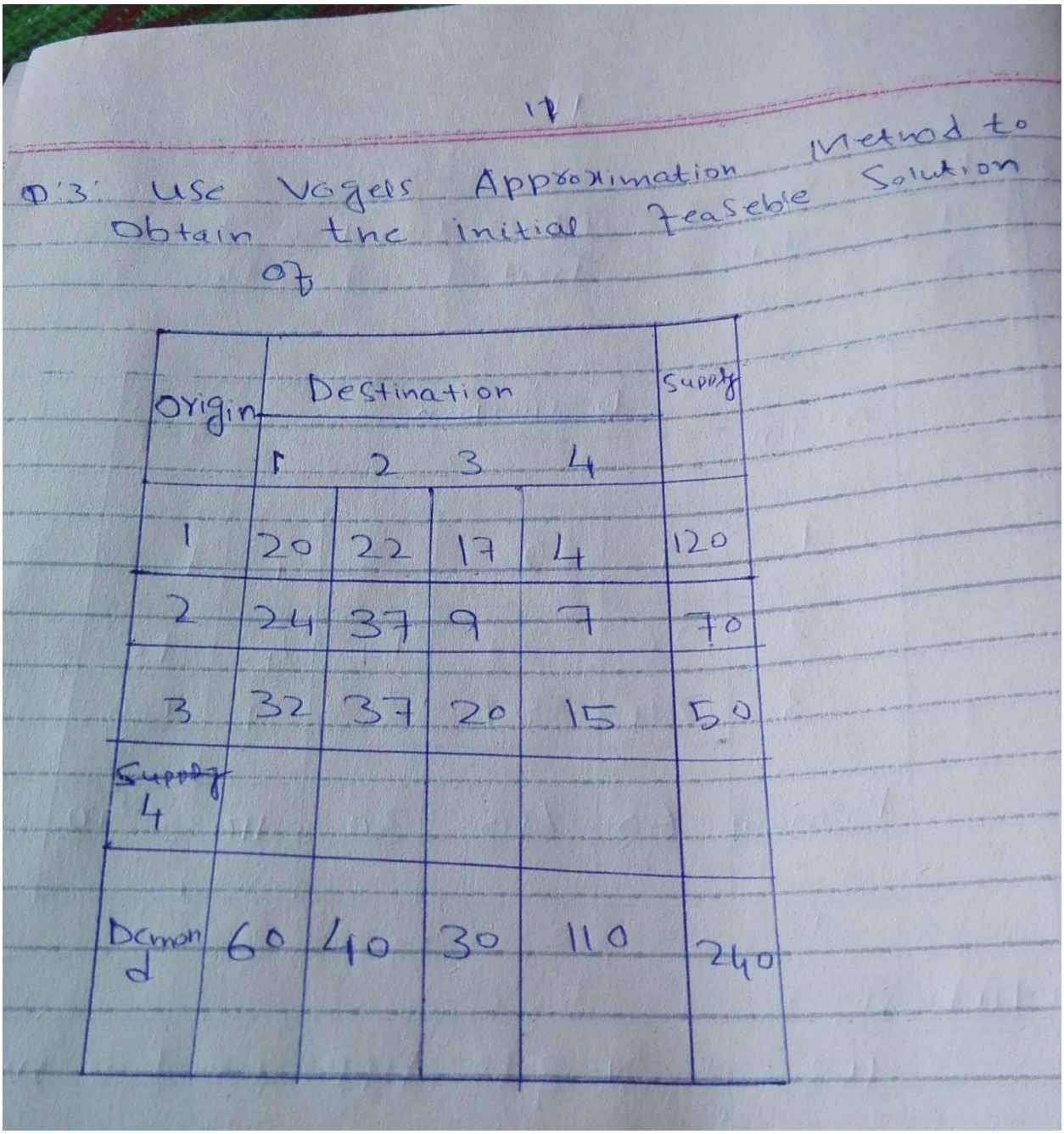
x_1	x_2	S_1	S_2	A_1	A_2	Z	
1/2	1/4	1	0	0	0	0	4/4 = 0
1	3	0	-1	1	0	0	20/3 = 6.6
1	3	0	-1	1	0	0	10/3 = 10
2-2m	3-4m	0	m	0	0	1	-30

Step-6 : Select the pivot which is the entry in the pivot Colu. and pivot row.

x_1	x_2	S_1	S_2	A_1	A_2	Z	
1/2	1/4	1	0	0	0	0	4
1	3	0	-1	1	0	0	20
1	3	0	-1	1	0	0	10
2-2m	3-4m	0	m	0	0	1	-30

Step-7 :- Perform row operation to make the pivot equal to 1 and the remaining elemet in the Pivot Colum and pivot row = 0


10
R3+(-1)R2
x1 x2 S1 S2 A1 A2 3
R1 S1 5/3 0 4 1/3 -1/3 0 0
R2 S2 1/3 1 0 -1/3 1/3 0 0
R3 S3 2/3 0 0 1/3 -1/3 1 0
3 2-2m -3-4m 0 m 0 0 1
R4+(3+4m)R2
x1 x2 S1 S2 A1 A2 3
x2 5/3 0 4 1/3 -1/3 0 0
S1 1/3 1 0 -1/3 1/3 0 0
a2 2/3 0 0 1/3 -1/3 1 0
Z 1+2m 0 0 1-3m -1+4m 0 1
∴S
x2 = 28/3
S1 = 20/3
a2 = 10/3
Z = -10+50m
Ans



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Q:3. Use Vogels 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
~~Supply~~ 4					
Demand	60	40	30	110	240

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Demond = Supply

Balanced.

	1	2	3	4	Supply	Row difference		
1	X 20	40 22	X 17	80 4	120	13	(13)	-
2	10 24	37 X	30 9	30 7	40	2	2	(17)
3	50 32	37 X	X 20	15 X	50	5	5	17
4								
Demond	60	40	30	40				
	4	(15)	8	3				
	4	—	8	3				
Column difference	8	—	(11)	8				
	8	—	—	8				

The initial feasible Solution:-

$$(40\times22)_{880} + (80\times4)_{320} + (10\times24)_{240} + (30\times9)_{270} + (30\times7)_{210} + (50\times32)_{1600}$$

$$\Rightarrow 880 + 320 + 240 + 270 + 210 + 1600$$

$$= \boxed{3520}$$

SS