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Subject :- Operation Research

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Mid term Assignment

Sec - B

9th - Semister

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QUESTION No #1

There are total 5 machines on and five employed are to be relegated and the related cost network is a per the following. Locate the best possible task.

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	10	122	23	21
5	9	5	7	6	10

SOLUTION :=>

MACHINE

	A	B	C	D	E	Low max
1	6	12	[3]	11	15	3
2	4	2	7	[1]	10	1
3	8	11	10	7	[11]	7
4	[16]	10	122	23	21	16
5	9	[5]	7	6	10	5

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ROW REDUCTION

MACHINES

	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
	0	0	0	0	4

MACHINES

Column reduction

	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

5 = 5 optimal Solution

Jobs	Machine	Time
1	3	3
2	4	1
3	5	11
4	1	16
5	2	5
		36

Total processing time = 36 hours.

* QUESTION # 2

Q2) Solve the following linear programming Problems.

$$\text{Min } z = 2x_1 + 3x_2$$

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

$$x_1 + 3x_2 \geq 20$$

$$x_1 + x_2 = 10$$

$$x_1, x_2 \geq 0$$

* In Standard Form:

$$\min Z - 2x_1 - 3x_2 = 0$$
$$\text{S.t. } (1/2)x_1 + (1/4)x_2 + S_1 = 4$$
$$x_1 + 3x_2 - e_2 = 20$$
$$x_1 + x_2 = 10$$
$$x_1, x_2, S_1, e_2 \geq 0$$

* Add Artificial Variable in Constraint 2 and 3:

$$\min Z - 2x_1 - 3x_2 - Ma_2 - Ma_3 = 0$$
$$\text{S.t. } (1/2)x_1 + (1/4)x_2 + S_1 = 4$$
$$x_1 + 3x_2 - e_2 + a_2 = 20$$
$$x_1 + x_2 + a_3 = 10$$
$$x_1, x_2, S_1, e_2, a_2, a_3 \geq 0$$

* Tablean before "Clean Up":

Z	x_1	x_2	S_1	e_2	a_2
1	-2	-3	0	0	-m
0	1/2	1/4	1	0	0
0	1	3	0	-1	1
0	1	1	0	0	0

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* Tablean before "Clean-Up":

Z	x_1	x_2	S_1	e_2	a_2	a_3	RHS
1	-2	-3	0	0	-m	-m	0
0	1/2	1/4	1	0	0	0	4
0	1	3	0	-1	1	0	20
0	1	1	0	0	0	1	10

* First Tablean (after "clean-Up"):

Z	x_1	x_2	S_1	e_2	a_2	a_3	RHS
1	2m-2	4m-3	0	-m	0	0	30m
0	1/2	1/4	1	0	0	0	4
0	1	3	0	-1	1	0	20
0	1	1	0	0	0	1	10

* x_2 enters a_2 leaves the basic Next Tablean :⇒

Z	x_1	x_2	S_1	e_2	a_2
1	(2m-3)/3	0	0	(m-3)/3	(3-4m)/3
0	-5/12	0	-1	1/12	-1/12
0	1/3	1	0	-1/3	1/3
0	2/3	0	0	1/3	-1/3

a_3	RHS
0	$(60+10M)/3$
0	7/3
0	20/3
0	10/3
1	

* x_1 enters a_3 leaves the basic Next Tablean:

Z	x_1	x_2	S_1	e_2	a_2	a_3	RHS
1	0	0	0	-1/2	$(1-2M)/2$	$(3-2M)/2$	25
0	0	0	1	-1/8	1/8	-5/8	1/4
0	0	1	0	-1/2	1/2	-1/2	5
0	1	0	0	1/2	-1/2	3/2	5

* QUESTION # 3

Q3) Use Vogel's Approximatio method to obtain the initial feasible solution of:

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* ANISWER :-

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

* 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	60	40	30	110	240

Demand = Supply

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* "Balanced transportation problem."

	1	2	3	4					
1	X	40	X	80	086	13	(13)	-	
	20	22	17	4	126				
2	10	X	30	30	016	2	2	2	(17)
	24	37	9	7	40				
3	50	X	X	X	70	5	5	5	17
	32	37	20	15	500				
	60	40	30	110					
	60	0	0	300					

4 (15) 8 3

4 - 8 3

8 - (11) 8

8 - - 8

$880+320+240+270+210+(40\times22)+(8\times4)+(10\times24)+(30\times9)+(30\times7)+1600+(50\times32)$ F = 3520