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Section B

Program BS. SE

Class Time Wednesday 8:00 to 11:00

Mid Assignment OPreation Research.

Q No#1:

There are total of 5 machines and five employment are to be relegated and the related Cost network is as per the following. Located the best possible task.

Solo=>

Machines.

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

This is

Balanced assignment problem

5 = 5

Hungerian method :=>

Phase I: Row and Colum reduction.

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

Step(2): Subtract the minimum value of each Colum from the entries of that colums

Phase 2 :=>

optimation of the Problem.

(a) Row Scaning.

(b) Colum Scaning.

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

Machines

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
		0	0	0	0	4

Colum minimum

Machines

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

P# 4

Jobs	Machinies 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

optimal Solution

Jobs	Machines	Time
1	B	5
2	C	3
3	D	1
4	E	11
5	A	16

Total hours.

Total Processing time = 36

P1

Question NO#2

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

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

$$x_1 + 3x_2 \geq 20$$

$$x_1 + x_2 = 10$$

$$x_1, x_2 \geq 0$$

Solo =>

By minimzation method:

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

$$Z = -2x_1 - 3x_2 - ma_1 - ma_2$$

$$Z + 2x_1 + 3x_2 + ma_1 + ma_2 = 0$$

$$2x_1 + 3x_2 + ma_1 + ma_2 + Z = 0$$

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

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

$$x_1 + x_2 + a_2 = 10$$

P_2

	x_1	x_2	S_1	S_2	a_1	a_2	Z	
S_1	1/2	1/4	1	0	0	0	0	4
a_1	1	1	0	-1	1	0	0	20
a_2	1	1	0	0	0	1	0	10
Z	2	3	0	0	m	m	1	0

m_1	m_2	S_1	S_2	a_1	a_2	Z
1/2	1/4	1	0	0	0	0
1	1	0	-1	1	0	0
1	1	0	0	0	1	0
-m+2	-m+3	0	m	0	m	1

R_4 : 2 3 0 0 m m 1 0

$-mR_2$ -m -m 0 m -m 0 0 -20m

-m+2 -m+3 0 m 0 m 1 -20m

P_3

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

R_4 : $-m+2$ $-m+3$ 0 m 0 m 1 $-20m$

$-mR_3$: $-m$ $-m$ 0 0 0 $-m$ 0 $-10m$

$-2m+2$ $-2m+3$ 0 m 0 0 1 $-30m$

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	1	0	-1	1	0	0	
1	1	0	0	0	1	0	
$-2m+2$	$-2m+3$	0	m	0	0	1	

P4

$4R_1$: 4/2 4/4 4 0 0 0 0 16

2 1 4 0 0 0 0 16

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x_1	x_2	S_1	S_2	a_1	a_2	Z	
2	[1]	4	0	0	0	0	16
1	1	0	-1	1	0	0	20
1	1	0	0	0	1	0	10
-2m+2	-2m+3	0	m	0	0	1	-30m

$R_2 - R_1$

R_2 : 1 1 0 -1 1 0 0 20

$-R_1$ -2 -1 -4 0 0 0 0 -16

-1 0 -4 -1 1 0 0 4

	$-m_1$	m_2	S_1	S_2	a_1	a_2	Z	
x_2	2	1	4	0	0	0	0	16
a_1	-1	0	-4	-1	1	0	0	4
a_2	1	1	0	0	0	1	0	10
Z	$-2m+2$	$-2m+3$	0	m	0	0	1	$-30m$

$R_3 - R_1$

R_3 : 1 1 0 0 0 1 0 10

$-R_1$: -2 +1 -4 0 0 0 0 -16

1 0 -4 0 0 1 0 -6

x_1	x_2	S_1	S_2	a_1	a_2	Z	
2	1	4	0	0	0	0	16
-1	0	-4	-1	1	0	0	4
-1	0	-4	0	0	1	0	-6
$-2m+2$	$-2m+3$	0	m	0	0	1	$-30m$

P6

$R_4 + (2m-3)R_1$

R_4 : $-2m+2 \quad -2m+3 \quad 0 \quad m \quad 0 \quad 0 \quad 1 \quad -30m$

$2m-3\,R_1$: $4m-6 \quad 2m-3 \quad 8m-12 \quad 0 \quad 0 \quad 0 \quad 0 \quad 32m-48$

$2m-4 \quad 0 \quad 8m-12 \quad m \quad 0 \quad 0 \quad 1 \quad 2m-48$

	x_1	x_2	s_1	s_2	a_1	a_2	Z	
x_2	2	1	4	0	0	0	0	16
a_1	-1	0	-4	-1	1	0	0	4
a_2	-1	0	-4	0	0	1	0	-6
Z	$2m-4$	0	$8m-12$	m	0	0	1	$2m-48$

P7

	x_1	x_2	s_1	s_2	a_1	a_2	z	
x_2	2	1	4	0	0	0	0	16
a_1	-1	0	-4	-1	1	0	0	4
a_2	-1	0	-4	0	0	1	0	-6
z	2m-4	0	8m-12	m	0	0	1	2m-48

$x_2 = 16$

$a_1 = 4$

$a_2 = -6$

$Z = 2m - 48$

$x_1 = 0$

$S_1 = 0$

S_2 0

Question NO # 3

Use vogel's Approximation Method to obtain the initail 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 / 240

Demand = Supply.

So it is

(Balanced ~~tan~~ transportion Problem)

Origin	Destination 1	2	3	4	Supply				
2	X 20	40 22	X 17	80 4	~~120~~ ~~80~~ 0	13	(13)	-	-
2	10 24	X 37	30 9	30 7	0 ~~70~~ ~~20~~ ~~40~~	2	2	2	(17)
3	50 32	X 37	X 20	X 15	~~50~~ 0	5	5	5	(17)
Demand	~~60~~ ~~50~~ 0	~~40~~ 0	~~30~~ 0	~~110~~ ~~30~~ 0	240				

4	(15)	8	3
4	-	8	3
8	-	(11)	8
8	-	-	8

$= 40 \times 22 + 80 \times 4 + 10 \times 24 + 30 \times 9 + 30 \times 7$

$+ 50 \times 32$

$= 3520$