page 1

Shiraz Baigash ID= 14539 Section = A

Q1)

Machines

	1	2	3	4	5	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

Machines Row Reduction

	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
Column	0	0	0	0	4

Machines

column production

Jobs	1	2	3	4	5
1	3	4	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

$S = 5$

optimal solution

Q1) page 2#

jobs	Machines	Times
1	3	3
2	4	1
3.	5	11
4	1	16
5	2	5
		36

Total processing Time 36 hr.

Shiraz Bangash ID = 14539 Section = A

page = 1

Q = 2

Step 1 (Introduce artificial variable in each row

Step 2 Put artitical variable into objective fuction

for max problem max z = $c'x - Ma_1 - Ma_2 - \cdots - Ma_n$

for min $c'x + Ma_1 + Ma_2 + \cdots Ma_n$

Step 3 = "clean up" objective function

Step 4 = Solve LP by simplex

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

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

$$x_1 + 3x_2 \geq 20$$

$$x_1 + x_2 = 10$$

$$x_i, x_2 \geq 0$$

$$\text{Min } z - 2x_1 - 3x_2 = 0$$

$$\text{s.t } (1/2)x_1 + (1/4)x_2 + S_1 = 4$$

$$x_1 + 3x_2 - e_2 = 20$$

$$x_1 + x_2 = 10$$

$$x_1, x_2, S_1, e_2 \geq 0$$

Add artifial variable in constant 2/3

$$\text{Min } z - 2x_1 - 3x_2 - Ma_2 - Ma_3 = 0$$

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

$$x_1 + 3x_2 - e_2 + a_2 = 20$$

$$x_1 + x_2 + a_3 = 10$$

$$x_1, x_2, S_1, e_2, a_2, a_3 \geq 0$$

P.T.O

Page # 2
Q # 2

Table 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

(MR_3+R_1)

After clean up

z	x_1	x_2	s_1	e_2	a_2	a_3	RHS
1	-2	-3	0	0	-M	-M	30 M
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

(MR_4+R_1)

x_2 enters a_2 leaves the basic

z	x_1	x_2	s_1	e_2	a_2	a_3	RHS
1	$(2m-3)/3$	0	0	$(m-3)/3$	$(3-4m)/3$	0	$(60+10m)/3$
0	5/12	0	1	1/12	-1/12	0	7/3
0	1/3	1	0	-1/3	-1/2	0	20/3
0	2/3	0	0	1/3	1/3	1	10/3

x_1 enters a_3 leaves the basic

z	x_1	x_2	s_1	e_2	a_2	a_3	RHS
1	0	0	0	-1/2	$(1-2m)$	$(3-2m)/2$	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

R_3+R_4
$-\frac{1}{11}R_3+R_2$

$z = 25$, $e_2 = 0$, $a_2 = 0$, $a_3 = 0$

$x_1 = 5$, $x_2 = 5$, $s_1 = 1/4$

Shiraz Bangash ID=14539 Section=4

Page # 1

Q3

	1	2	3	4	Supple
1	20	22	17	4	120
2	24	37	9	7	70
3	32	37	20	15	50
Demand	60	40	30	16	240

Demand = Supply

Balanced transportation problems

	1	2	3	4					
1	x 20	40 22	x 17	80 4	~~120~~ ~~120~~ 0	13	13	–	
2	10 24	x 37	30 9	30 7	~~40~~ 46 76	2	2	2	17
3	50 32	x 37	x 20	x 15	~~50~~	5	5	5	17
	~~60~~ ~~50~~	~~40~~ 0	~~30~~ 0	~~16~~ ~~30~~					

~~4 15 8 3~~

4 – 8 3

8 – 11 8

8 – – 8

880 + 320 + 240 + 270 + 210

(40×20) + (80×4) + (10×24) + (30×9) + (30×7) +

1600

(50×32) = $\boxed{3520}$