

OR Assignment #2

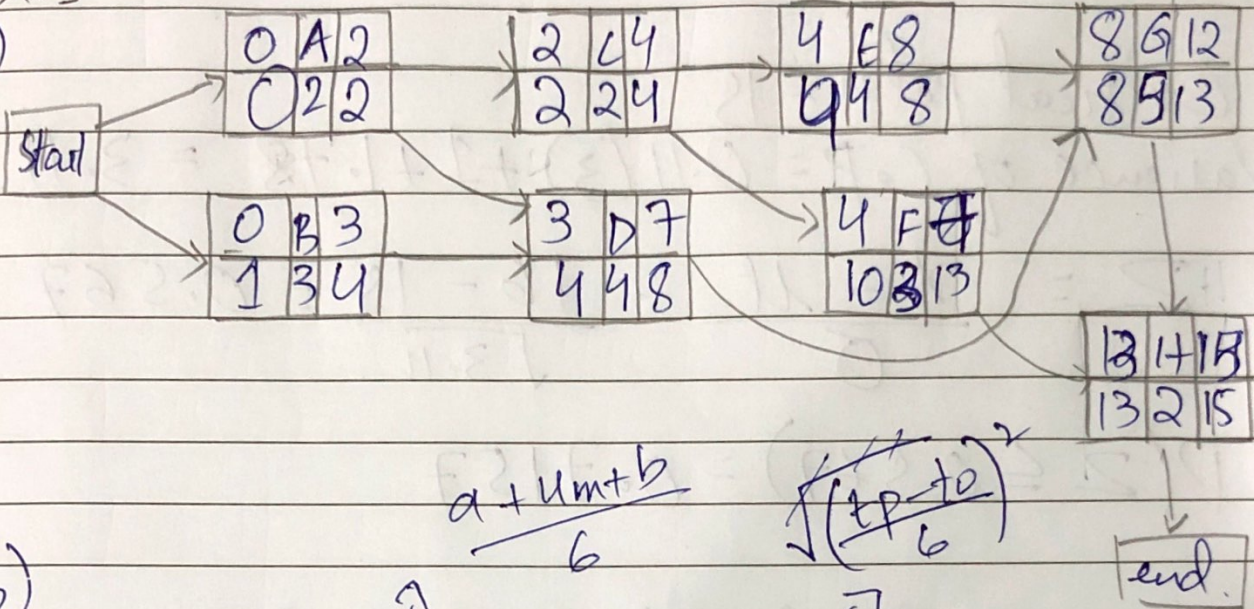
K20-1052
S.M. Hassem Al?

Date:

BSE-413

Q.1

a)



b)

Activity

Most likely ~~Variant~~

Variance

A

2

0.11

B

3

0.11

C

2

0.11

D

4

0.44

E

4

1

F

3

1.78

G

5

1.78

H

2

0.11

K20-1052

Date:

a) Expected time of [F] = 3
variance of [F] = 1.78

c) Critical path = 15
variance of C.P = $0.11(3) + 1 + 1.78 = 3.11$

$$Z = \frac{x - \mu}{\sigma} = \frac{16 - 15}{\sqrt{3.11}} = 0.567$$

$$P(Z \leq 0.567) = 0.7157$$

2c) The critical path is formed by
A, C, E, G, H

From the table we see that activity
A can be reduced to 1 week from 2
having cost per week = 750

and E can be reduced to 3 weeks from 4
having cost per week = 1000.

Combining A + E of 2 crash weeks
we have least additional cost of
 $= 1000 + 750 = 1750.$

K20-1052

Date:

Q.2. Using Assignment Model (Hungarian)

1)

Person	Job1	Job2	Job3	Job4	
1	\$1	\$4	\$6	\$3	→ 1
2	\$9	\$7	\$10	\$9	→ 7
3	\$4	\$5	\$11	\$7	→ 4
4	\$8	\$7	\$8	\$5	→ 5

Row Reduction.

0	3	5	2
2	0	3	2
0	1	7	3
3	2	3	0
↓ 0	↓ 0	↓ 3	↓ 0

Col Reduction

0	3	2	2
2	0	0	2
0	1	4	3
3	2	0	0
⇒	0	2	1
3	0	0	2
0	0	3	2
4	2	0	0

 $q = 1$

$$= \$1 + \$10 + \$5 + \$5$$

$$= \$21$$

K20-1050

Date:

Machine J1 J2 J3 J4

M-1	\$5	\$13	\$12	\$15	→ 5
M-2	\$15	\$18	\$20	\$6	→ 6
M-3	\$24	\$19	\$20	\$16	→ 16
M-4	\$24	\$8	\$6	\$8	→ 6

Row Reduction

0	8	7	10
9	12	14	0
8	3	4	0
18	2	0	2
↓	↓	↓	↓
0	2	0	0

0	6	7	10
9	10	14	0
8	1	4	0
18	0	0	2

 \Rightarrow

0	5	6	10
9	9	13	0
8	0	3	0
19	0	0	3

 $q=1$

$$= 5 + 6 + 19 + 6$$

$$= \$36$$

Q.3
1)

	5	10	10	Supply
	55			55
	20	30	20	80
	10	20	30	75
Demand	70	100	40	210
	150	380	0	

• NW corner.

$$= 5(55) + 15(20) + 65(30) + 35(20) + 30(40)$$

$$= \$4425$$

• LCM

	5	10	10	Supply
	55			55
	20	30	20	80
	10	20	30	75
Demand	70	100	40	
	150	40	0	

$$= 5(55) + 30(40) + 40(20) + 10(15) + 20(60)$$

$$= \$3625$$

• Vogel's approximation.

	5	10	10	Supply
	55			55
	20	30	20	80
	10	20	30	75
Demand	70	100	40	
	95	45	0	

R1, R2, C1, C2

$10 - 5 = 5$ | $10 - 10 = 0$ | $10 - 5 = 5$ | $20 - 10 = 10$
 $30 - 20 = 10$ | $30 - 20 = 10$ | $20 - 10 = 10$ | $30 - 20 = 10$
 $20 - 10 = 10$ | $30 - 20 = 10$ | $20 - 10 = 10$ | $30 - 20 = 10$

$$= 10(10) + 55(10) + 40(30) + 20(5) + 20(40) = \$3350$$

20-1052

Dummy value for balancing.

Date: Supply:

	1 Mills	2	3		
Supply	2 (40) → 1 (15)	2	0	55	150
2	9	4 (5) → 10 (20)	0 (55)	80	75 550
3	1	2	10 (75)	75	0
Demand	40	20	20	130	210
	0	50	0		

• NWS corner.

$$= 2(40) + 1(15) + 4(5) + 10(20) + 0 + 0$$

$$= \$315$$

• Least-Cost-Method.

	2	1 (5)	20	0 (5)	55 35 150
	9	4	10	0 (5)	800
	1 (40)	2	10	0 (75)	75 350
D	40	20	20	130	
	0	0	0		

$$= 40 + 20 + 40 = \$100.$$

Vogel approximation

	2 (5)	1 (5)	20	0	55 0
	9	4	10	0 (5)	800
	1 (20)	2	10	0 (75)	75
D	40	20	20	130	

R_1	R_2	R_3	C_1	C_2
$2-0=2$	$2-0=2$	$2-0=2$	$2-1=1$	$9-1=8$
$9-4=5$	$4-0=4$	$10-0=10$	$2-1=1$	$4-2=2$
$2-1=1$	$2-0=2$	$10-0=10$	$10-2=8$	$10-10=0$

$$= (2 \times 15) + (1 \times 20) + (2 \times 20) + (9 \times 80) + (1 \times 25) + 0 \times 50$$

$$= 115.$$

ALBA