603

Sequencing

(1) Sequencing problem:-

Suppose there are n jobs which is to be done m machine. The order and time of the product for each machine is given. Then our problem is to find a sequence out of $(\underline{n})^m$. So that job will be complete in minimum time and minimum cost.

There are four type of sequencing problem.

(i) n-jobs and two machines A and B.
(ii) n-jobs and three " A, B and C.
(iii) n-jobs and m machines
(iv) Two jobs and m machines.

Such type of sequencing problem can be solved by Johnsons Method -

P611
Q.15

Machines \ job	1	2	3	4	5	6	7
A	5	7	3	4	6	7	12
B	2	6	7	5	9	5	8

First find job sequence -

3	4	5	7	2	6	1

Select the minimum time in machine A and B. If min. time is of machine B then their corresponding job is written in the end of sequence and other job

corresponding to machine B is written from right to left from end of machine.
If min. time is of machine A then corresponding job is written in begining of job sequence and other job corresponding to A machine is written from left to right from the begining of sequence.
If min. time tie in machine A and B then take difference of machine A and B corresponding to tie time and job corresponding to less difference time is written first and then second min. time and so on. corresponding to machine A and B.

(2)

To find total Elapse time -

Job Sequence	Machine A		Machine B		Ideal time for B machine
	In time	out time	In time	Out time	
3	0	3	3	10	3
4	3	7	10	15	
5	7	13	15	24	1
7	13	25	25	33	
2	25	32	33	39	
6	32	39	39	44	
1	39	44	44	46	

max

difference

Total elapse time = 46
Total elapse time for A machine = 44
Ideal time for A machine = 46-44
= 2
Ideal time for B = 3+1
= 4

Q.9

	Jobs	1	2	3	4	5	6	7
machine	M_1	3	12	15	6	10	11	9
	M_2	8	10	10	6	12	1	3

This is 7 jobs and two machine problem.

$M_1 \rightarrow$ ... $\leftarrow M_2$

1	5	3	2	4	7	6

To find total elapse time

Job Sequence	Machine A		Machine B		Ideal rest Time for B
	In time	Out Time	In time	Out time	
1	0	3	3	11	3
5	3	13	13	25	2
3	13	28	28	38	3
2	28	40	40	50	2
4	40	46	50	56	
7	46	55	56	59	7
6	55	[66]	66	[67]	

Total elapse time = 67

Total elapse time for machine A = 66

Ideal time for machine A = 67 - 66
= 1

Ideal time for machine B = 3 + 2 + 3 + 2 + 7
= 17

n-jobs and three machine -

Ques. 16

Jobs	1	2	3	4	5
A	4	9	8	6	5
B	5	6	2	3	4
C	8	10	6	7	11

(4)

This is the 3 machine and 5 jobs problem.
Now convert, 3 machine into 2 machine.
If any one or both condition is satisfy.

(i) $\min(A) \geq \max(B)$
(iii) $\min(C) \geq \max(B)$

i.e $\min(A) = 4$, $\max(B) = 6$, $\min(C) = 6$

Hence $\min(C) \geq \max(B)$

Then 3 machine can be convert into 2 machine G and H.

i.e $G = A+B$
$H = B+C$

Jobs	1	2	3	4	5
G = A+B	9	15	10	9	9
H = B+C	13	16	8	10	15

It's become 5 jobs and 2 machine problem.
Now to formed job Sequence -

G →				H ←
4	1	5	2	3

To find elapse Time -

Jobs sequence	Machine A		Machine B		Machine C		Ideal time for C
	I.T	O.T	I.T	O.T	I.T	O.T	
4	0	6	6	9	9	16	9
1	6	10	10	15	16	24	(5)
5	10	15	15	19	24	35	
2	15	24	24	30	35	45	
3	24	32	32	34	45	51	

Total elapse time = 51

Ideal time for A = 51 - 32

= 19

Ideal time for B = 6+1+0+5+2+(51-34)

= 31

Ideal time for C = 9

Q.10

Machine	Jobs	A	B	C	D	E
	A	6	2	10	4	11
	B	3	7	8	9	5

First find job sequence

A →

B	D	C	E	A

← B

To find total elapse time -

Jobs seq.	Machine A		Machine B		Ideal time for B
	I.T	O.T	I.T	O.T	
B	0	2	2	7	2
D	2	4	7	16	
C	4	10	16	24	
E	10	11	24	29	
A	11	6	29	32	

(6)

Total elapse time = 32

Ideal time for A = 32 - 6
= 26

Ideal time for B = 2

Q.11

Jobs	1	2	3	4	5	6
Machine I	4	8	3	6	7	5
Machine II	6	3	7	2	8	4

First find job sequence

I →

3	1	5	6	2	4

← II

To find total elapse time

Job sequence	Machine I		Machine II		Ideal time for II
	I.T	O.T	I.T	O.T	
3	0	3	3	7	3
1	3	4	7	13	
5	4	7	13	21	
6	7	5	21	25	
2	5	8	25	28	
4	8	6	28	30	

Q.10

Jobs	A	B	C	D	E
Machine A	6	2	10	4	11
Machine B	3	7	8	9	5

First find job sequence -

A →

B	D	C	E	A

← B

Job Seq.	Machine A		Machine B		– Ideal Time for B
	I·T	O·T	I·T	O·T	
B	0	2	2	9	2
D	2	6	9	18	
C	6	16	18	26	(7)
E	16	27	27	32	1
A	27	[33]	33	[36]	

Total elapse time = 36 hours

Ideal time for A = 36 - 33

= 3 hours

Ideal time for B = 4 hours

Q.11

Jobs	1	2	3	4	5	6
Machine I	4	8	3	6	7	5
Machine II	6	3	7	2	8	4

first find job seq.

I → II ←

3	1	5	6	2	4

To find total elapse time

Job seq.	Machine I		Machine II		Ideal Time for II
	I·T	O·T	I·T	O·T	
3	0	3	3	10	3
1	3	7	10	16	
5	7	14	16	24	
6	14	19	24	28	
2	19	27	28	31	2
4	27	[33]	33	[35]	

(8)

-- Total elapse time = 35 hour

Ideal time for A = 35 - 33

= 2

Ideal time for B = 5

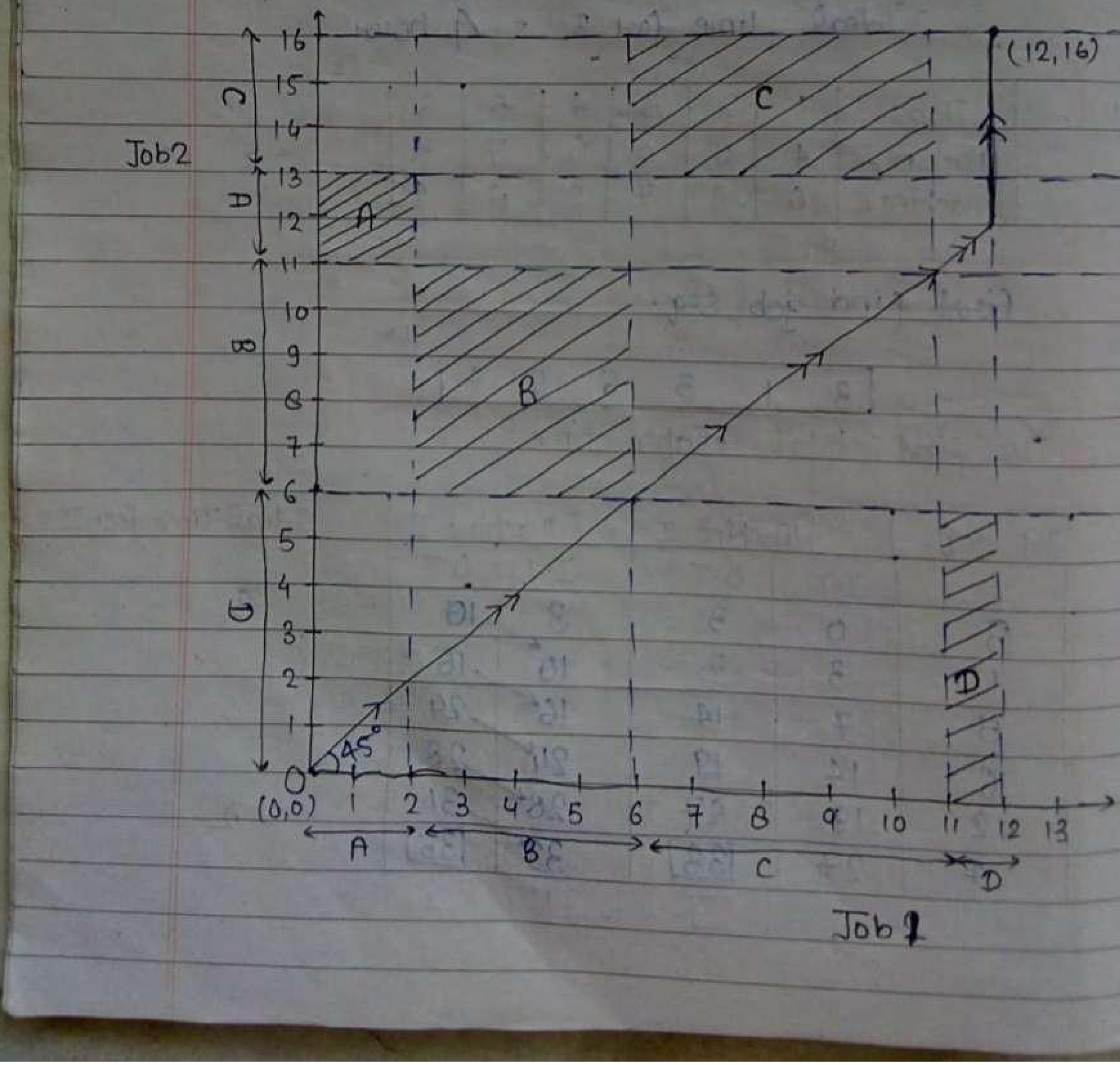
2- jobs and m- machine problem-

Q.31

	A	B	C	D
Job 1	2	4	5	1
Job 2	2	5	3	6

A B C D

D B A C



Total elapse time for job 1
= working time + rest time
= 12+4 = 16

(9)

Total elapse time for job 2
= working time + rest time
= 12+4 = 16

This is 2 job and 4 machine problem then it is solved by graphical method. Taking job 1 on X-axis and job 2 on Y-axis. Then ~~block~~ draw the blok of machine for job 1 and job 2 with corresponding to job sequence of machine according to their given time.
Then find common blok of machine A, B, C, D. on the graph; which is represented by blok A, B, C, D. Then find starting point or O(0,0) and finishing point F(12,16). 12 is the last value of X on job 1 and 16 is the last value of Y on job 2. We have to start from O and goes to F through a line which 45°. This line may touch on more the boundry of blok but does not cross the blok. The time corresponding to job 1 is 0 for job 2 and vice-versa. Then find total elapse time, which is obtain by i.e total ellapse time for job 1
= working time + rest time
= 12 + 4 = 16

Total elapse time for job 2
= working time + rest time
= 12 + 4 = 16

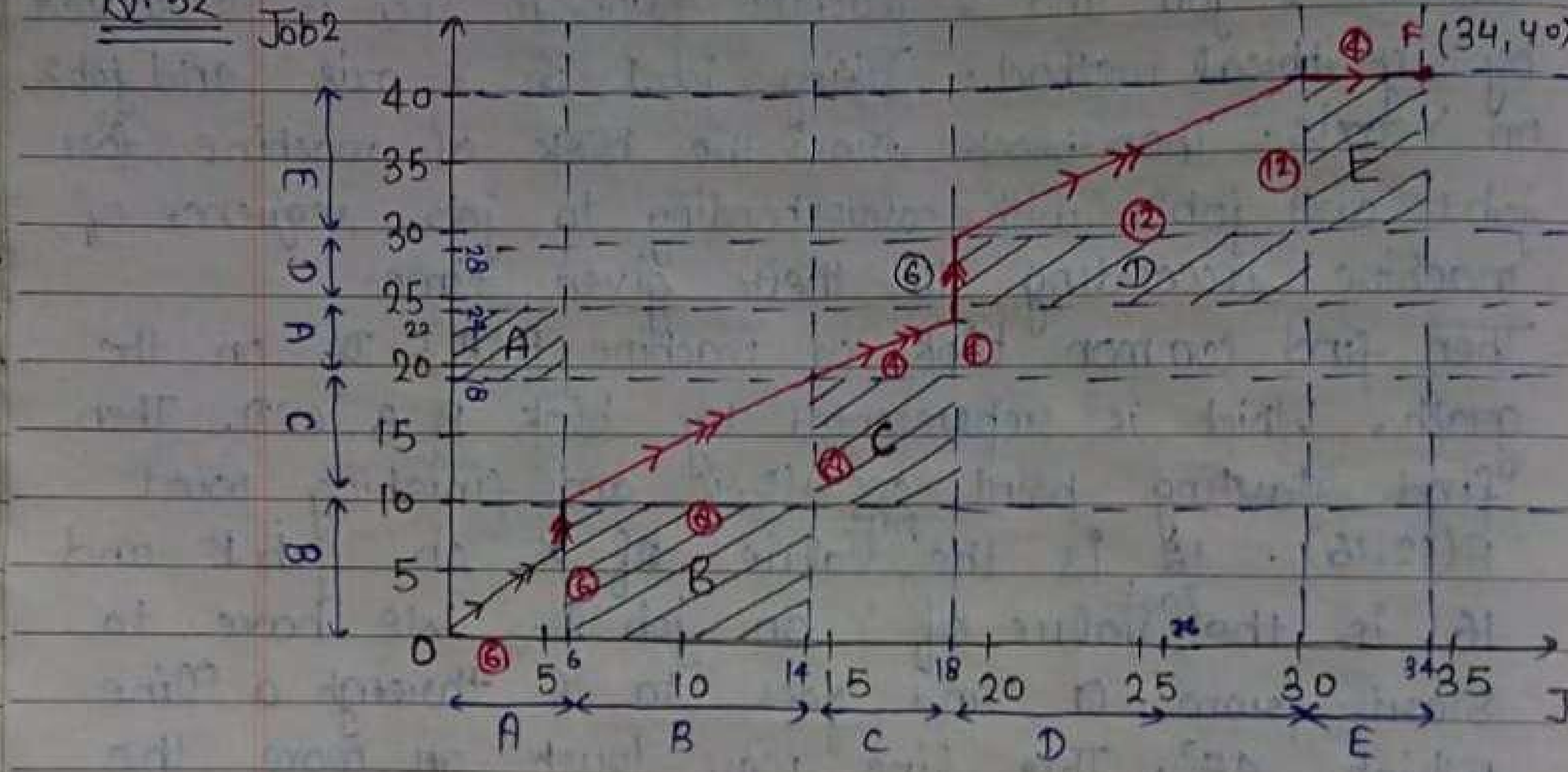
At 45° line both job work sym on job 1 job 2 is at rest, on job 2, job 1 is at rest.
The 45° lies which is past first in blok corresponding

to job, that job work first before the second job.

(10) i.e Job 1 work first on A before job 2
Job 1 work first on B before job 2
Job 1 work first on C before job 2
Job 2 work first on D before job 1

P.48

Q. 32



Total elapse for Job 1 = (6+8+4+12+4)+(4+6)
= 44

Job 2 = 6+4+8+4+6+12+4
= 44

Job1 work first on A before job 2.
Job2 work first on B before job1
Job 2 work first on C before job 1
Job 2 work first on D before job1
Job2 work first on E before job1.