



University Of Technology
Building and Construction Eng. Dept.
Final Exam – First Attempt – 2012 / 2013

Subject : planning & construction management
Branch : Building and construction management
Eng.

Class: 4th
Time : 3 Hours



Examiner :Dr. Tariq A. Khalil

Date :

Note: Answer four questions only.

Q1) a- seven precast concrete samples, a non-destructive and destructive tests must be done on each sample. Determine the sequence for these samples to be tested to achieve minimum time for testing, and calculate this time.

Sample No.	1	2	3	4	5	6	7
non-destructive test (min)	3	12	15	7	10	11	1
destructive test (min)	8	10	10	6	12	1	3

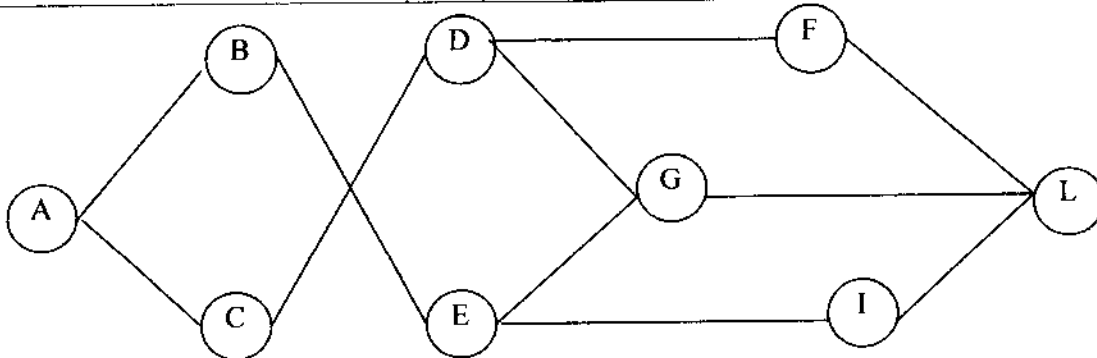
b- Six contractors bid for five contracts, the following matrix represents their bidding prices in millions ID, if the profit that was added by the contractors A, B, C, D, E, and F are 1, 2, 3, 2, 1, 1 million dinars respectively, assign one contract to one contractor, and exclude one of them to achieve minimum cost for the 5 contracts, and calculate this cost.

Contract No.	Contractor label					
	A	B	C	D	E	F
1	13	12	18	24	19	9
2	11	20	28	17	17	13
3	12	12	6	10	6	10
4	7	16	13	15	14	13
5	9	14	14	9	14	11

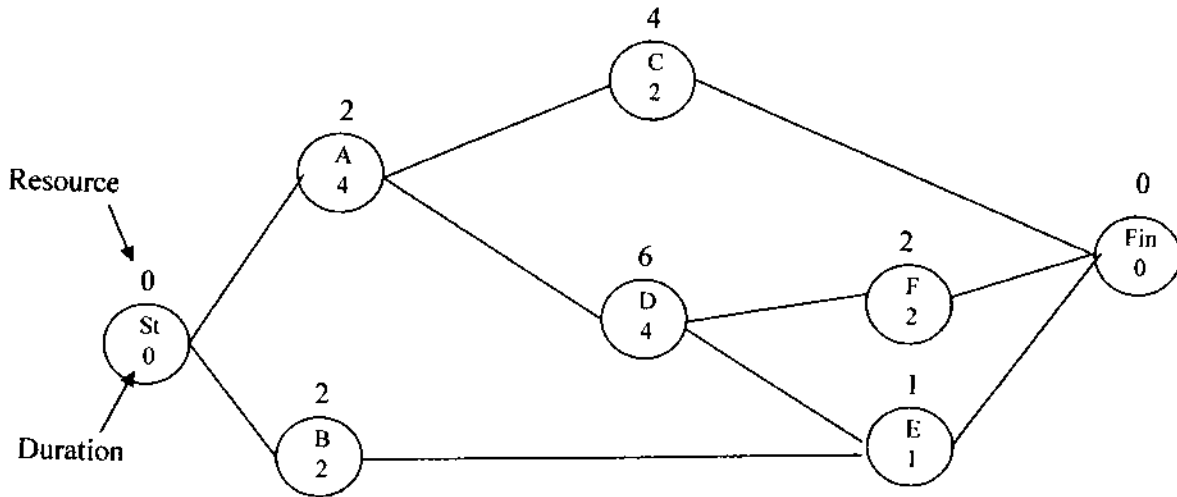
Q2) A time-cost relationship must be done for the following project, the following table and precedence network represents the project data, if 20 million dinars was estimated as an indirect cost per month. Determine the followings:

- 1- Draw total cost curve.
- 2- What is the duration of the project to be completed with minimum total cost
- 3- What is the minimum total cost of the project when the project will be completed within minimum duration?

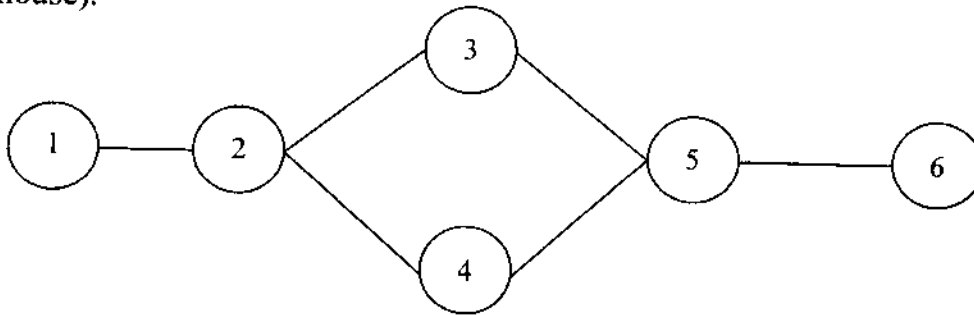
Activity	A	B	C	D	E	F	G	I	L
Normal duration (month)	2	5	3	2	4	2	3	1	2
Crashed duration (month)	2	3	1	2	2	1	2	1	1
Normal cost (million ID)	40	56	72	32	48	24	64	24	32
Crashed cost (million ID)	40	104	120	32	120	80	80	24	48



Q3) the following precedence network represents activities for a small project, make resource leveling for this network and draw the resource histograms before and after leveling.



Q4) A site for a project consisting of 60 houses will become available for construction. A handover rate of 5 houses per week is required. The contractor will be working a 6-day week at 8 working hours per day. The following precedence network and table show the details for one unit (house).



Act. No.	Act. description	Man.hour/one (M)	Men/team (Q)	Min buffer (day)
1	Excavation and casting for foundation	95	5	3
2	Walls building and roof casting	400	7	15
3	Interior finishing	110	4	2
4	Exterior finishing	115	4	2
5	Roof and floor finishing	150	4	2
6	Painting and services	175	6	-

Determine the following:

- 1- Draw line of balance diagram, and pinpoint start and finish date for each activity on it and time of project completion.
- 2- Find expected date of roof casting completion for 40 houses.
- 3- When will the first team leave the activity no. 3
- 4- Which team will leave first, activity 3?
- 5- When 70% of the work was completed in activity 3, what is the total percentage of completion for the entire project?

Q5) for the following table, draw the overlapped precedence network and calculate the project duration, total float, free float for each activity, and pinpoint critical path for the network.

activity	Duration (month)	Description and relationship
A	2	Begins the work
B	3	Should start after 4 months from start date of (A)
C	2	Can be finished after 6 months from the finish date of (A)
D	4	Can start after 2 months from the finish date of (A)
E	4	Can starts as soon as activities (B & D) finished, and requires 6 months to be finished after 2 months from the start date of activity (c)
H	2	Can start after 2 months from the finish date of (C) and requires 2 month to be finished after the finish date of activity (D) and required 3 months to be finished after 2 months from the start date of (B)
I	3	Can starts after the finish date of (H) and can be finished after 3 months form the finish date of (E).
J	2	Can starts as soon as (H) finished
F	3	Can starts as soon as (I) finished, and can be finished after 2 months from the finish date of (J) and can start after 1 month from the finish date of (J)

دولت (G) ۲۰۲۰

Q.1 (a)

1	3	8
2	12	10
3	15	10
4	7	6
5	10	12
6	11	1
7	1	3

7	1	5	2	3	4	6
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	S	F	S	F
7	1	3	0	4
1	3	8	4	12
5	10	12	14	26
2	12	10	26	36
3	15	10	41	51
4	7	6	48	57
6	11	1	59	60

(b)

13	12	18	24	19	9
11	10	28	17	17	13
12	12	6	10	6	10
7	16	13	15	14	13
9	14	14	9	14	11

	A	B	C	D	E	F
1	12	10	15	22	18	8
2	10	18	25	15	16	12
3	11	10	3	8	5	9
4	6	19	10	13	13	12
5	8	12	11	7	13	10
DR	0	0	0	0	0	0

	A	B	C	D	E	F
1	4	2	7	14	10	0
2	0	8	15	5	6	2
3	8	7	0	5	2	6
4	X	8	4	7	7	6
5	1	5	4	0	6	3
DR	X	0	X	X	X	X

6	2	7	14	10	0
0	6	13	3	4	X
X	7	0	5	2	6
X	6	2	5	5	4
3	5	4	0	6	3
X	0	X	X	X	X

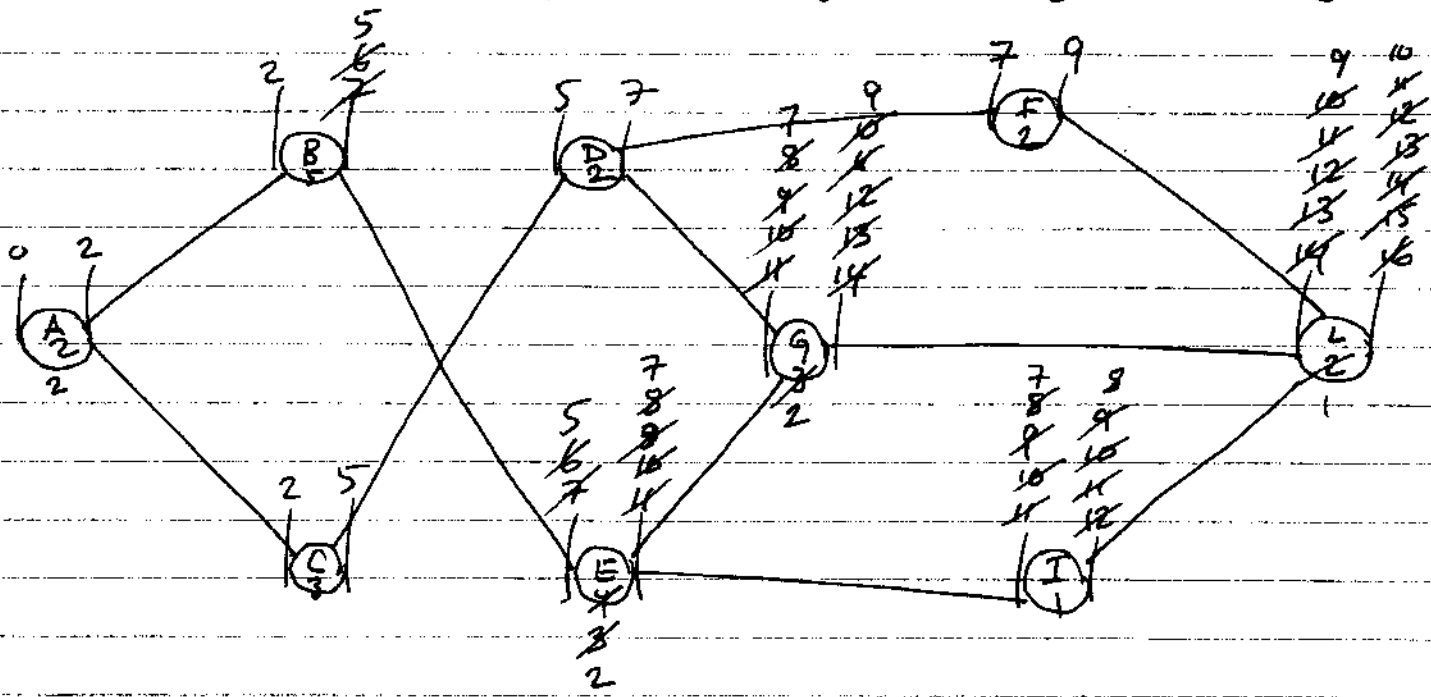
	A	B	C	D	E	F
1	6	0	5	12	8	X
2	X	4	11	1	2	0
3	12	7	0	5	2	8
4	0	4	X	3	3	4
5	5	5	4	0	6	5
6	4	X	X	X	0	2

A	→ 4	6
B	→ 1	10
C	→ 3	3
D	→ 5	7
E	→ DR	-
F	→ 12	12

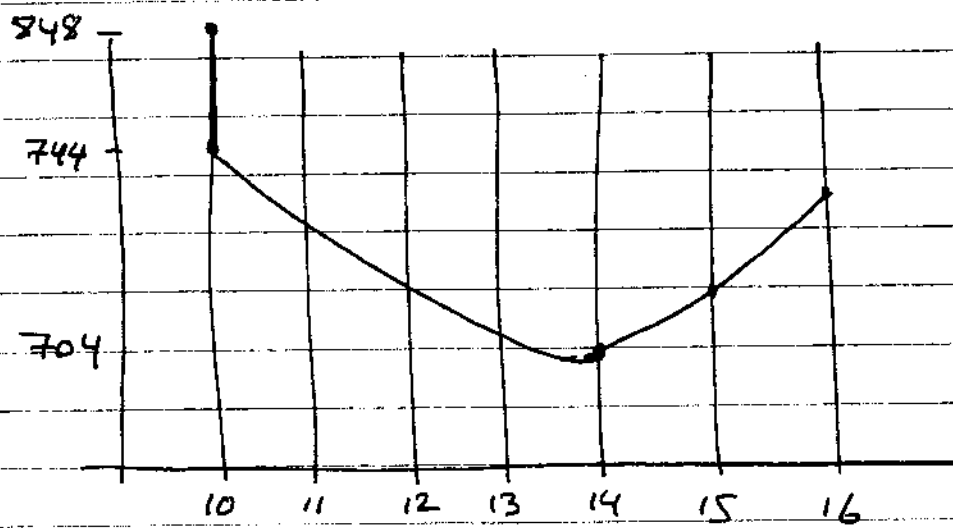
38 MID

Q.2

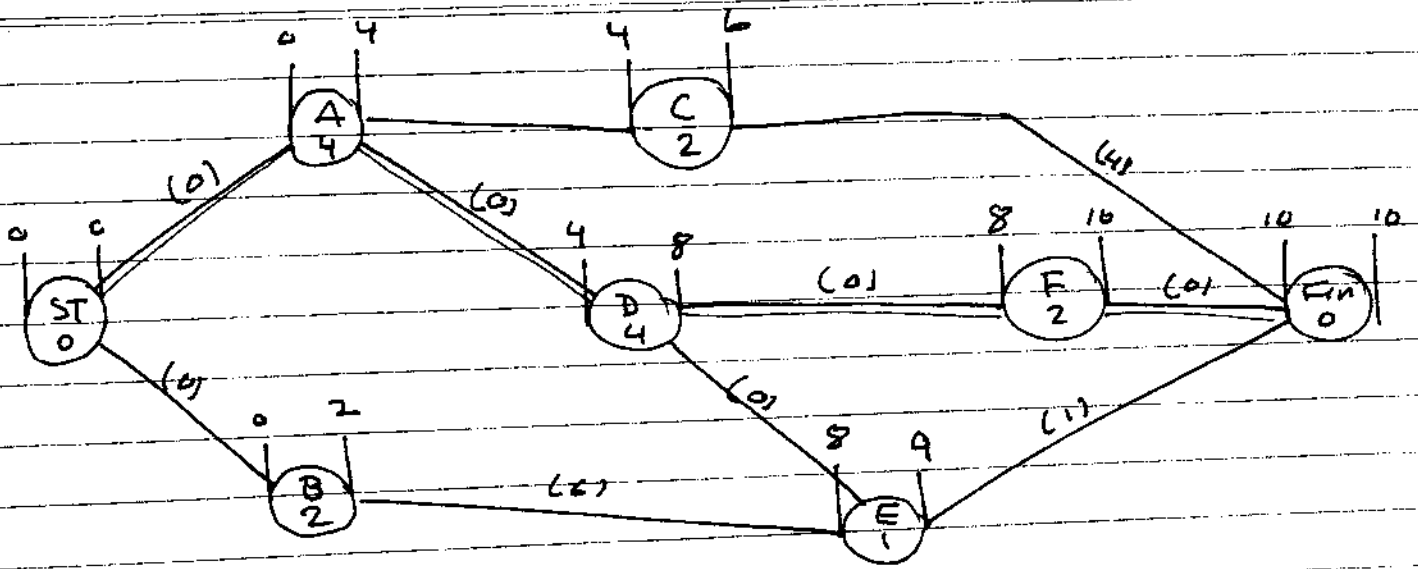
	A	B	C	D	E	F	G	I	L
	2	5	3	2	4	2	3	1	2
	2	3	1	2	2	1	2	1	1
	40	56	72	32	48	24	64	24	32
	40	104	120	32	120	80	80	24	48
Rate	-	24	24	-	36	56	16	-	16



normal st	16	392	320	712
Act L ←	15	408	300	708
" G ←	14	424	280	704
" B ←	13	448	260	708
" B ←	12	472	240	712
" E ←	11	508	220	728
" E ←	10	544	200	744
All Crash	10	648	200	848



Q3



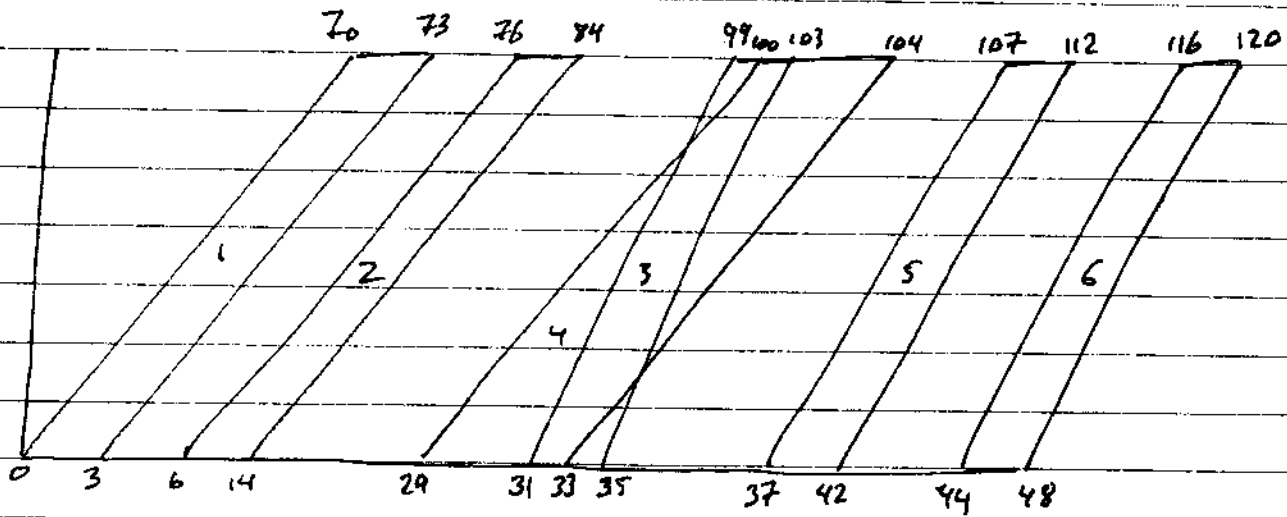
	1	2	3	4	5	6	7	8	9	10
A	2	2	2	2						
B					6	6	6	6		
F									2	2
B	2	2	-	-	-	-	-	-		
C					4	4	-	-	-	-
E										1
ER	4	4	2	2	10	10	6	6	2	3

ES	EF	LS	LF	Float
0	4	0	4	0
0	2	0	2	0
4	6	4	6	0
4	8	4	8	0
8	9	8	9	0
8	10	8	10	0

Sol. For Q.4

act	Q	Q	g	u	T	S
	(SM/48)			$\frac{g}{Q} \times 5$	$(\frac{14}{80})$	$\frac{(n-1)g}{u}$
1	9.9	5	10	5.05	3	70
2	41.6	7	42	5.05	8	70
3	11.45	4	12	5.24	4	68
4	11.98	4	12	5.00	4	71
5	15.62	4	16	5.12	5	70
6	18.72	6	18	4.94	4	72

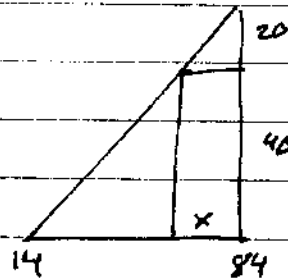
①



②

$$\frac{x}{84-14} = \frac{20}{60} \therefore x = 23.3$$

$$\text{date} = 84 - 23.3 = \boxed{61}$$



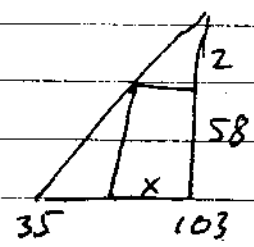
③

$$\frac{60}{3} = 20$$

60	3
59	2
58	1

$$\frac{x}{103-35} = \frac{2}{60} \therefore x = 2.26$$

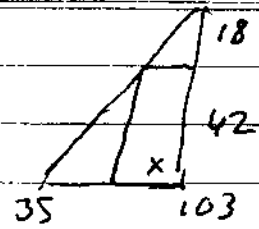
$$\text{date} = 103 - 2.26 = 101$$



$$5- \quad 70\% \times 60 = 42$$

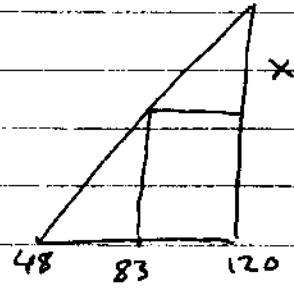
$$\frac{x}{103-35} = \frac{18}{60} \quad \therefore x = 20.4$$

$$103 - 20.4 = 83$$

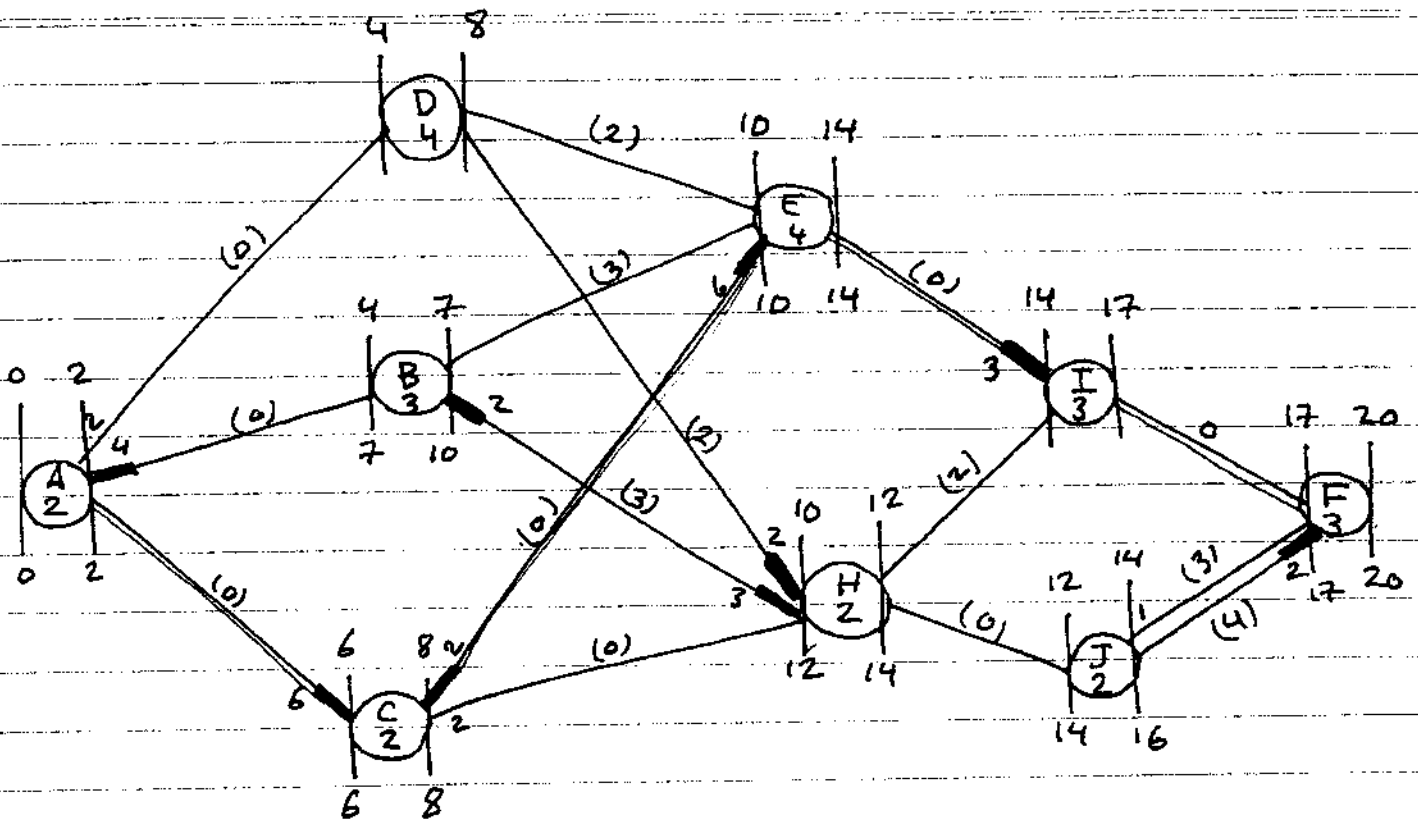


$$\frac{x}{60} = \frac{120-83}{120-48} \quad \therefore x = 29$$

$$\frac{20}{60} = 48.3 \bar{6} = 48.3 \bar{6} \text{ min}$$



Q.5



Act	EF	TF
D	2	2
B	3	3
H	0	2
J	2	2