



University Of Technology
Building and Construction Eng. Dept.
Final Exam – First Attempt – 2014 / 2015

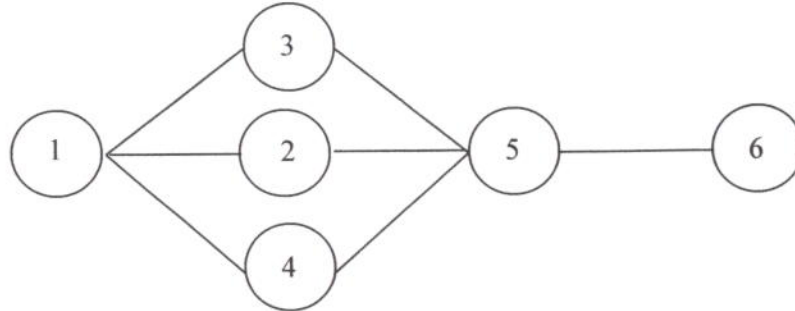
Subject : planning & construction management
Branch : Building and construction management Eng.
Examiner : Dr. Tariq A. Khalil

Class: 4th
Time : 3 Hours
Date :



Note: Answer four questions only.

Q1) 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 and floor finishing completion for 40 houses.
- 3- When will the first team leave the activity no. 5
- 4- Which team will leave first, activity 5?
- 5- When 70% of the work was completed in activity 3, what is the total percentage of completion for the entire project?

Q2) A contract was awarded to a contractor with a price of 4256 million IQD. This contract must be finished within 8 months according to the following bar-chart:

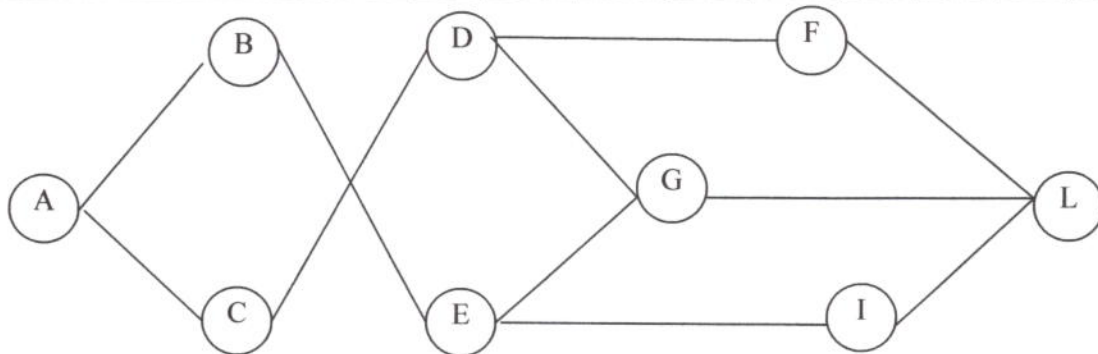
Act.	Duration (month)	1	2	3	4	5	6	7	8	Price of Activity (Million IQD)
A	2									784
B	2									672
C	4									1120
D	4									1344
E	2									336

If you know that the profit will be equal to 12%. What is the maximum deficit, and when it will be occur during the life of the project. Draw the cash flow forecasting curve if the payment will be paid to the contractor the next month from its maturity.

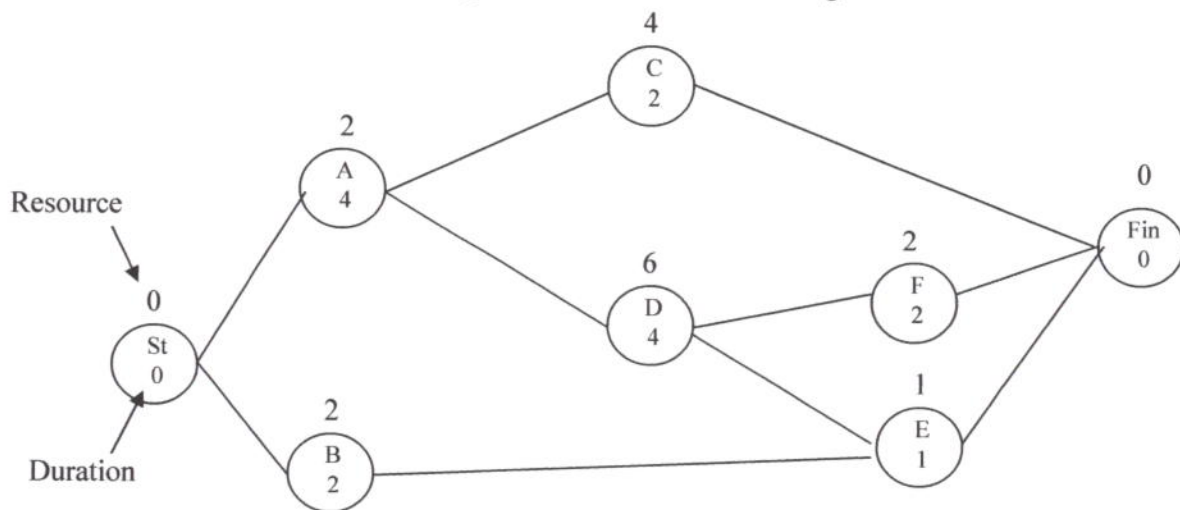
Q3) A time-cost relationship must be done for the following project, the following table and precedence network represents the project data, if 20 million dinars was estimated as an indirect cost per month. Determine the followings:

- 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	96	102	32	120	80	80	24	42



Q4) 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.



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

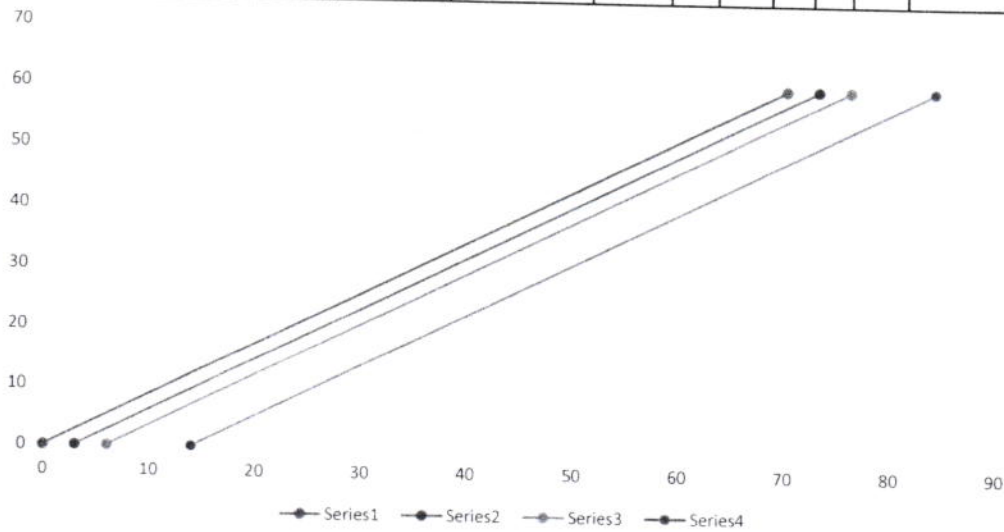
activity	Duration (month)	Description and relationship
A	2	Begins the work
B	3	Should start after 4 months from start date of (A)
C	2	Can be finished after 6 months from the finish date of (A)
D	4	Can start after 2 months from the finish date of (A)
E	4	Can starts as soon as activities (B & D) finished, 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)

Ans 1- (1)

No. of units per project = 60
 handover rate = 5
 No. of days per week = 6
 No. of hours per day = 8

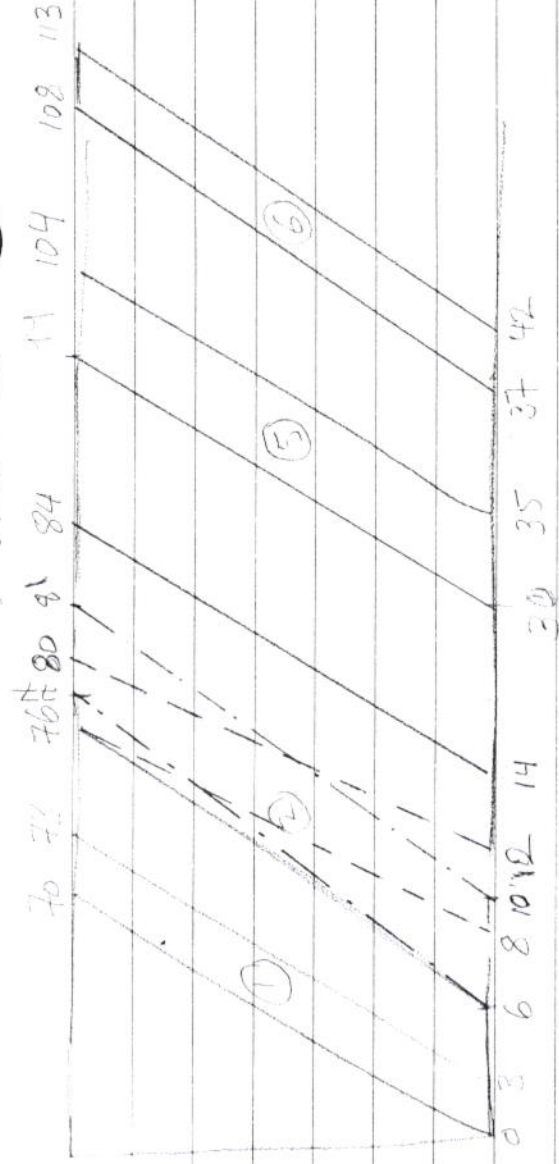
0 150

activity No.	description	man-hours (M)	men / team (Q)	G	g	U	T		S	min. buffer
1	excavation and casting foundation	95	5	9.90	10	5.05	2.4	3	70	3
2	wall building and slabs casting	400	7	41.67	42	5.04	7.1	8	70	15
3	interior finishings	110	4	11.46	12	5.24	3.4	4	68	2
4	exterior finishings	115	4	11.98	12	5.01	3.6	4	71	2
5	roofing and floorings	150	4	15.63	16	5.12	4.7	5	69	2
6	paintings and servcies	175	6	18.23	18	4.94	3.6	4	72	



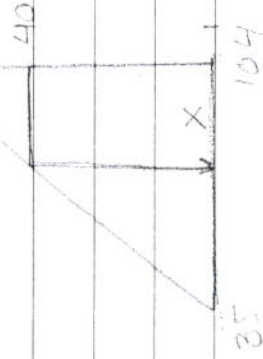
x	y
0	0
3	0
70	60
73	60
6	0
14	0
76	60
84	60

Ans - Q. 1 ②



② $\frac{104}{113} = \frac{23}{x}$ $\frac{104}{113} = \frac{23}{x}$ $\frac{104}{113} = \frac{23}{x}$

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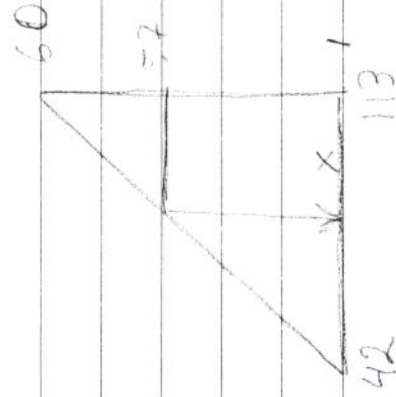


$x = 23$

$104 - 23 = 81$ min.

③ $\frac{60}{4} = 15$

First team will leave at 15 min.
he will finish home at 7

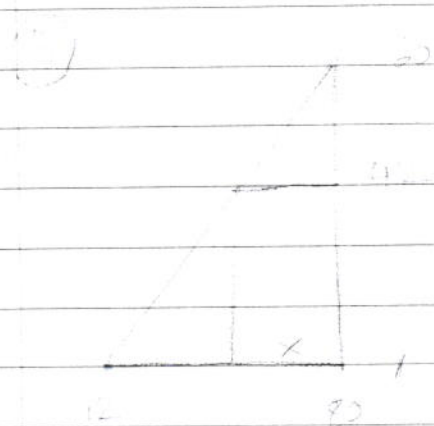


$\frac{113}{42} = \frac{23}{x}$ $\frac{113}{42} = \frac{23}{x}$ $\frac{113}{42} = \frac{23}{x}$

$x = 3.55$

Time = 113 - 3.55 = 110

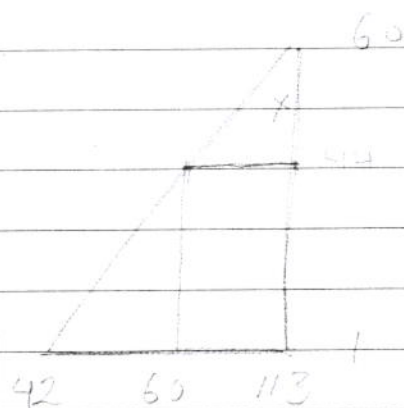
(4) Team No. 1 will Leave first



$$\frac{x}{80-12} = \frac{18}{60}$$

$$x = 20.4$$

$$\text{Time} = 80 - 20.4 \approx 60$$



$$\frac{x}{60} = \frac{113-42}{113-60}$$

$$x = 44.78$$

$$113 - 44 = 69$$

$$69 = \frac{113-42}{60} = \frac{71}{60} = \frac{1}{5}$$

~~Set~~ Ans. 2 - 1

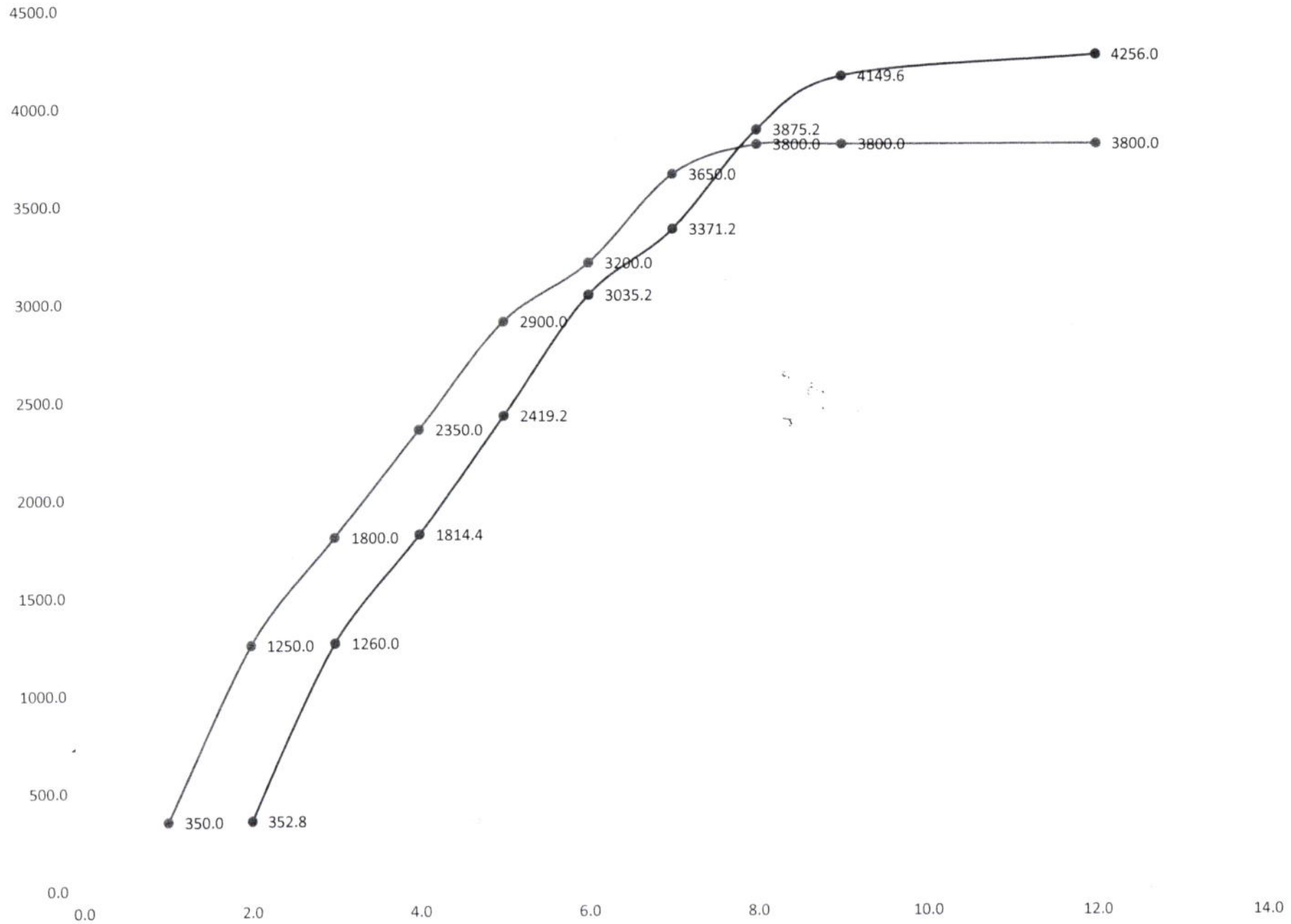
activity	duration	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	12.0	price
A	2.0	392.0	392.0									784.0
B	2.0		336.0	336.0								672.0
C	4.0		280.0	280.0	280.0	280.0						1120.0
D	4.0				336.0	336.0	336.0	336.0				1344.0
E	2.0							168.0	168.0			336.0
price	summ=	392.0	1008.0	616.0	616.0	616.0	336.0	504.0	168.0			4256.0
comul price		392.0	1400.0	2016.0	2632.0	3248.0	3584.0	4088.0	4256.0			
comul discount			39.2	140.0	201.6	212.8	212.8	212.8	212.8	212.8		
comulative payment			352.8	1260.0	1814.4	2419.2	3035.2	3371.2	3875.2	4149.6	4256.0	
cost		350.0	900.0	550.0	550.0	550.0	300.0	450.0	150.0	0.0	0.0	
comulative cost		350.0	1250.0	1800.0	2350.0	2900.0	3200.0	3650.0	3800.0	3800.0	3800.0	
deficit		-350.0	-897.2	-540.0	-535.6	-480.8	-164.8	-278.8	75.2	349.6	456.0	

212.8 106.4

4

2-2

(5)



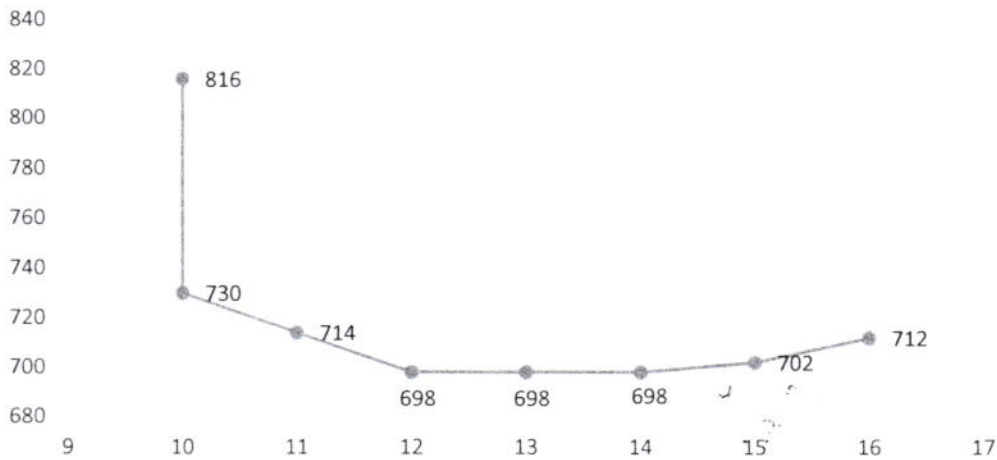
Ans. 3 - 1

(6)

A	B	C	D	E	F	G	I	L	20
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	392
40	96	102	32	120	80	80	24	42	
	20	15		36	56	16		10	

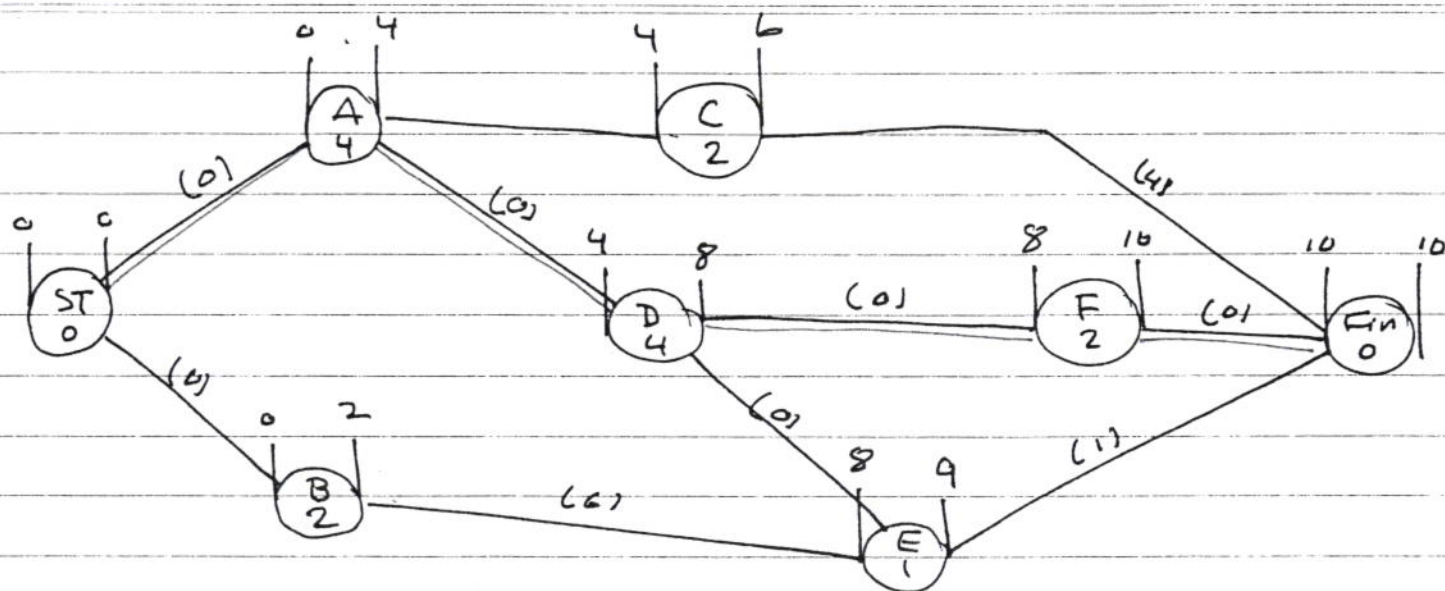
		dc	idc	tc
normal st	16	392	320	712
L	15	402	300	702
G	14	418	280	698
B	13	438	260	698
B	12	458	240	698
E	11	494	220	714
E	10	530	200	730
C&F	10	616	200	816

Chart Title

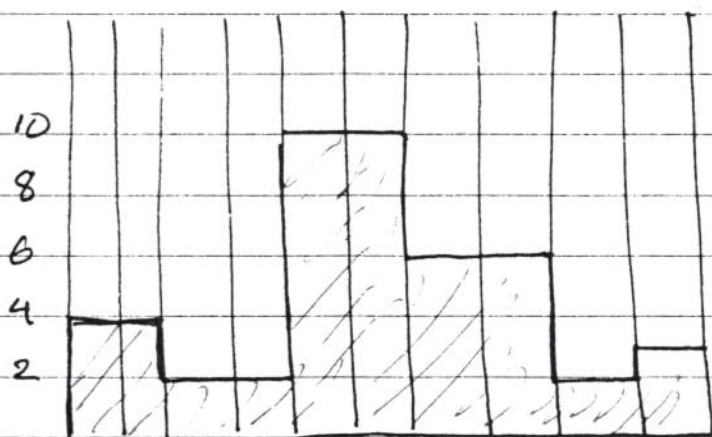


Q4

Ans. 4 - 1 (7)



	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
IR	4	4	2	2	10	10	6	6	2	3



4-2 (8)

$$IF = r \left(\sum_1^m x_i - \sum_1^m w_i - m \cdot r \right)$$

Forward :

$$IFE_1 = 1(3-2-1 \times 1) = 0$$

\therefore Shift E \rightarrow 1

$$IFC_1 = 4(10-6-4 \times 1) = 0$$

$$C_2 = 4(20-12-4 \times 2) = 0$$

$$C_3 = 4(20-8-4 \times 2) = 16$$

$$C_4 = 4(20-5-4 \times 2) = 28$$

\therefore Shift C \rightarrow 4

Final

$$IFB_1 = 2(4-2-2 \times 1) = 0$$

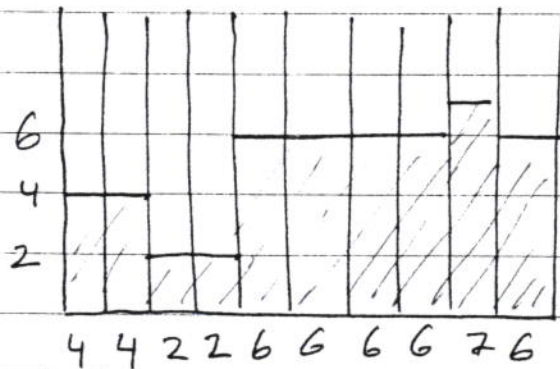
$$B_2 = 2(8-4-2 \times 2) = 0$$

$$B_3 = 2(8-8-2 \times 2) = -$$

\vdots

$$B_7 = -$$

\therefore Shift B \rightarrow 2



Backward

$$IFB \leftarrow 1 = 2(4-2-2 \times 1) = 0$$

$$\leftarrow 2 = 2(8-4-2 \times 2) = 0$$

\therefore Shift B \leftarrow 2

$$IFC \leftarrow 1 = 4(7-6-4 \times 1) = -$$

$$\leftarrow 2 = 4(13-12-4 \times 2) = -$$

$$\leftarrow 3 = 4(13-12-4 \times 2) = -$$

$$\leftarrow 4 = 4(13-12-4 \times 2) = -$$

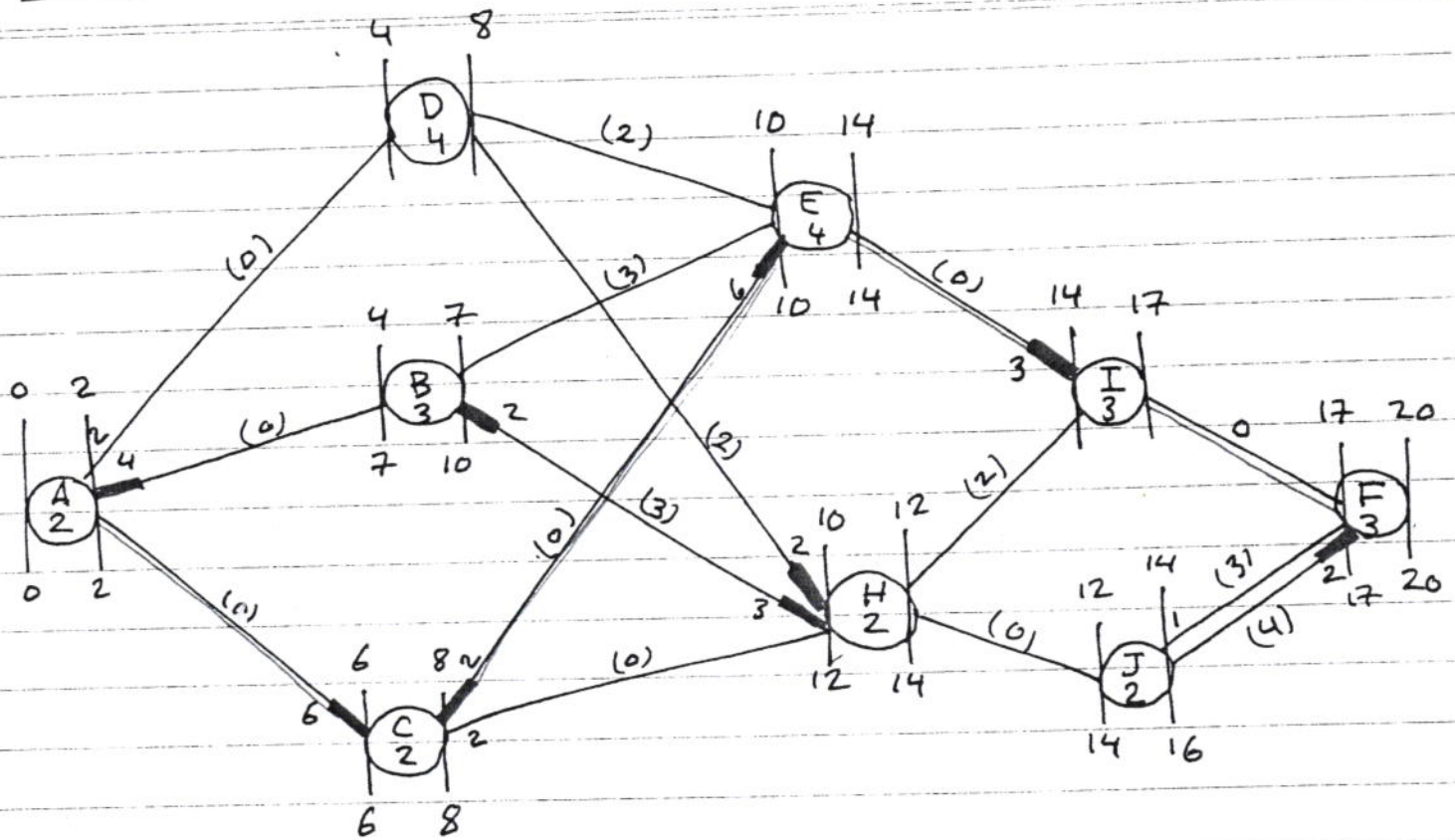
\therefore don't Shift C

$$IFE \leftarrow 1 = 1(7-6-1 \times 1) = 0$$

\therefore Shift \leftarrow 1

Ans. 5 - 1 (9)

Q.5



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