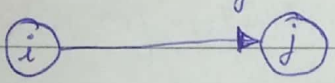
CH-3 PROJECT SCHEDULING

→ Project scheduling involves the sequencing of project tasks which are necessary to complete the project.
→ It also include the identification of task which are critical and limited

→ Network
A network is a symbolic representation of essential characteristics of a project.
→ Important terminologies in a network

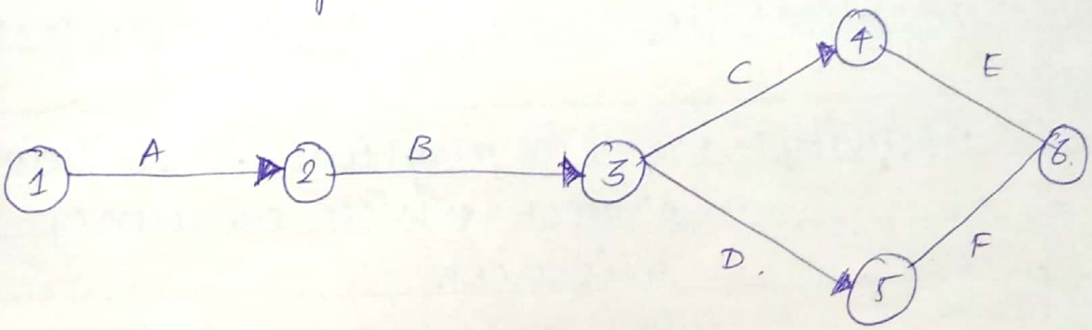
1) Activity :- • It is a physical, identifiable part of project which consumes time and resources.
• Ex:- making a foundation in a civil-engineering project, software testing in an IT project.
• It is represented by an arrow (⟶)
• The tail of arrow represents starting of activity and head represents finishing. (description ⟶ time.)

2) Event :- • It represents beginninging and ending of activity.
• It does not consume any time.
• It is represented by a circle (○) aka node.
• The starting point of the event is i^{th} event and j^{th} event.



3) Path :- An unbroken chain of activity of arrows connecting initial event to some other events is called path.

4) Network Diagram :-



- It is a graphical representation of logically and sequentially connected arrows and nodes.
- The following are the paths in above network diagram.

  ABCE

  & ABDF

5) Predecessor Activity :
- In a network diagram, the activity which to be completed before starting another activity.
- In above diagram, B is predecessor activity for C.

6) Successor Activity :-

- The activity which follows another the another activity in network diagram is called....
- In above diagram, B is the successor activity of A.

7) Dummy activity :-

- A dummy activity neither requires time nor resources. It is an imaginary activity shown in a network to identify the dependance among operation.
- Dummy activities are meant for control purpose, maintaining the network logic
- An activity followed by a dummy activity can be completed once the activity preceeding the dummy activity is completed.
- Dummy activities are represented by dotted lines (- - - - - →)
- Consider two set of activities:

Set 1

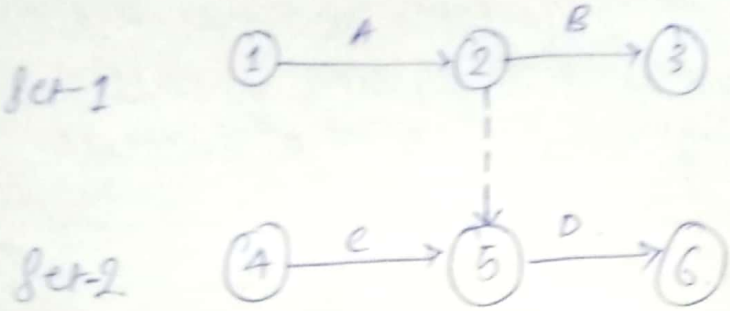
A: Delivery of new machines

B: Installing new machines

Set 2

C: Remove existing machines

D: Dispose existing machines



03-AUG-2022.

FULKERSON's RULES:-

1) The initial event which has no incoming arrow should be numbered 1

2) No two events should have same number.

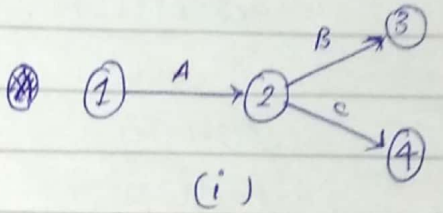
3) Head event must have higher number.

4) Final node must have all incoming arrows and no outgoing arrow.

5) final event must have highest number.

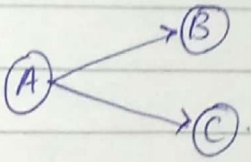
→ NETWORK TYPES:-

1) Activity on arrow
2) Activity on node.



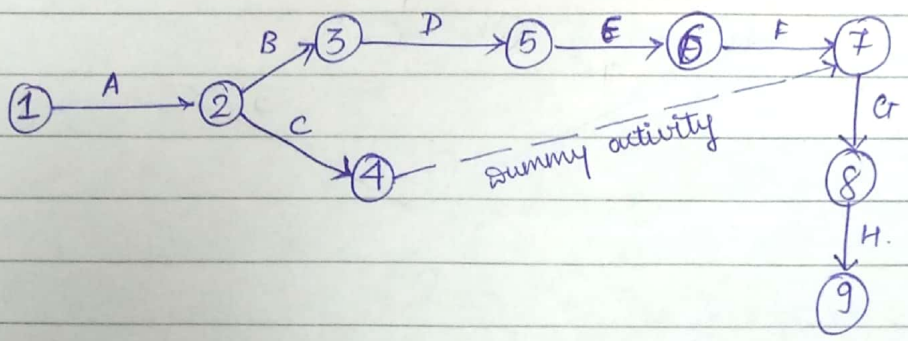
(i)

↳ we will be following activity on arrow



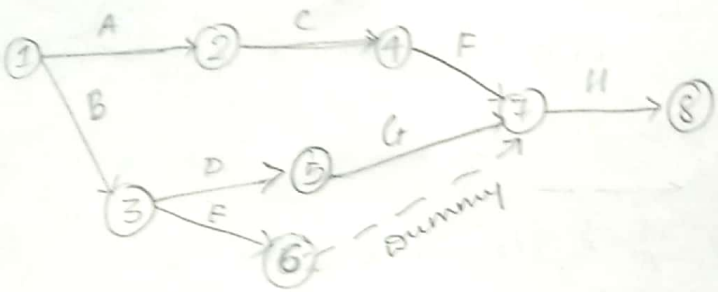
Q. An assembly of electrical bus-bar is as follows- Construct a network diagram for the assembly.

Activity	Description	Predecessor.
A	open job order	—
B	Get copper material	A.
C	Get hardware & consumable	A
D	Cut the copper material	B.
E	Bend copper pieces	D.
F	Deburr copper piece	E.
G	Polish copper piece	F, C
H	Test bus-bar	G.



8. Draw the network diagram for given relationship of activities.

Activity	A	B	C	D	E	F	G	H
Predecessor	–	–	A	B	B	C	D	E,F,G



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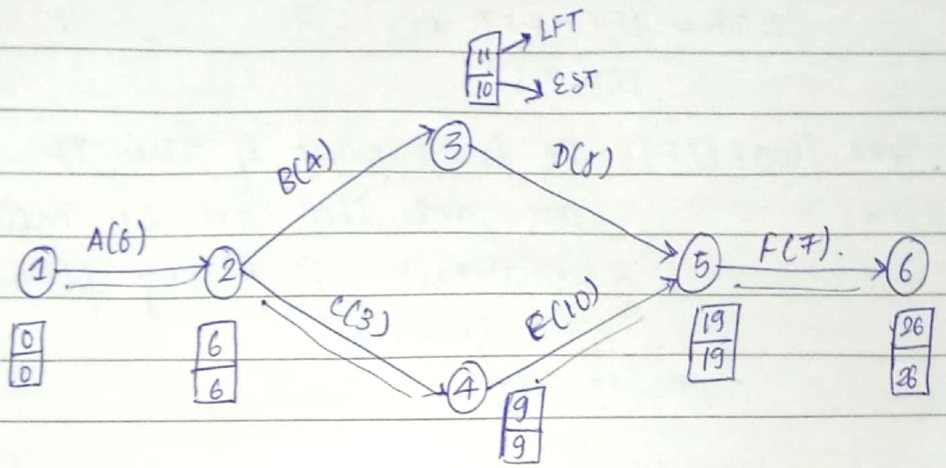


Activity	Duration	EST	EST+ Dur. EFT	LFT- Dur. LST	LFT	LST-EST TF	TF-HS FF	LFT-EST head HS	LFT-EST tail TS	TF-TS IndF	TF-FF IndF
A	6	0	6	0	6	0	0	0	0	0	0
B	4	6	10	7	11	1	0	1	0	1	1
C	3	6	9	6	9	0	0	0	0	0	0
D	8	10	18	11	19	1	1	0	1	0	0
E	10	9	19	9	19	0	0	0	0	0	0
F	7	19	26	19	26.	0	0	0	0	0	0

* EST = Earliest starting time. [*] ⇒ before activity
* LFT = Latest finishing time [*] ⇒ after activity.
* EFT = Earliest finishing time
  = EST + Activity Duration
* LST = Latest starting time
  = LFT - Activity Duration
* Slack = Slack is the time by which the occurence of an even can be delayed. = LFT - EST
* Head Slack (HS) = LFT-EST of head node of activity
* tail Slack (TS) = LFT-EST of tail node of activity.
* TF (Total Float) = Maximum time upto which an activity can be delayed without affecting the project completion time.

$\therefore TF = LFT - EFT$ or

$LST - EST$

* free float (FF) = It is a part of the TF within which an activity can be manipulated without affecting float of subsequent activities.

$\therefore FF = TF - HS$

* Ind F (Independent float) = It is a part of TF within which an activity can be delayed without affecting float of preceeding activities.

$\therefore IndF = TF - TS$

If there occurs a -ve value of IndF, write 0.

* Int F (Interfering float) = It is the part of TF ~~within~~ which cause a reduction in the float of subsequent activities.

$\therefore IntF = TF - FF$

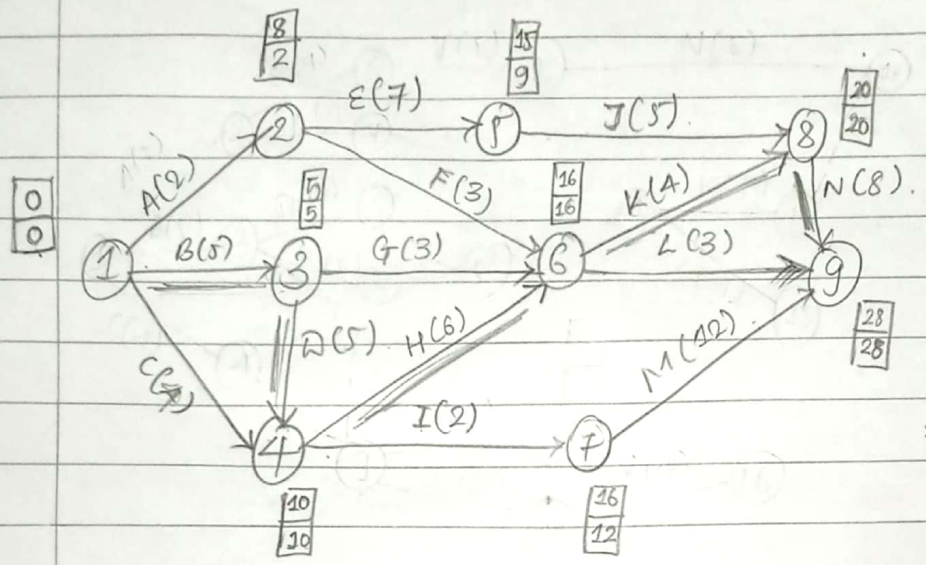
10/8/22. PM ①.

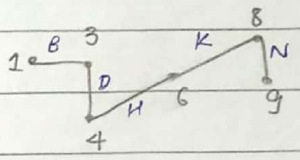
Activity	Predecessor	Duration
A	–	2
B	–	5
C	–	4
D	B	5
E	A	7
F	A	3
G	B	3
H	C, D	6
I	C, D	2
J	E	5
K	F, G, H	4
L	F, G, H	3
M	I	12
N	J, K	8

The above table shows different activities in a project.

1. Construct a CPM network.
2. Identify critical path & estimate the project completion time.
3. Calculate the total float (TF) & (FF) free float

10/8/22 PM



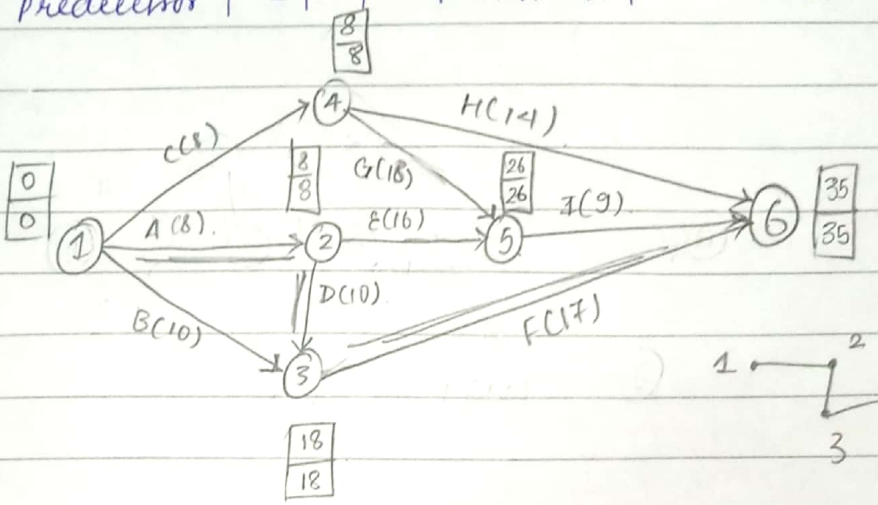


Activity	Duration	EST	EFT	LST	LFT	HS	TF	FF
A	2	0	2	6	8	6	6	0
B	5	0	5	0	5	0	0	0
C	4	0	4	6	10	0	6	6
D	5	5	10	5	10	0	0	0
E	7	2	9	8	15	6	6	0
F	3	2	5	13	16	0	11	11
G	3	5	8	13	16	0	8	8
H	6	10	16	10	16	0	0	0
I	2	10	12	14	16	4	4	0
J	5	9	14	15	20	0	6	6
K	4	16	20	16	20	0	0	0
L	3	16	19	25	28	0	9	9
M	12	12	24	16	28	0	4	4
N	8	20	28	20	28	0	0	0

PM

22-08-22.

Task.	A	B	C	D	E	F	G	H	I
Time	8	10	8	10	16	17	18	14	9
predecessor	-	-	-	A	A	B,D	C	C	E,G

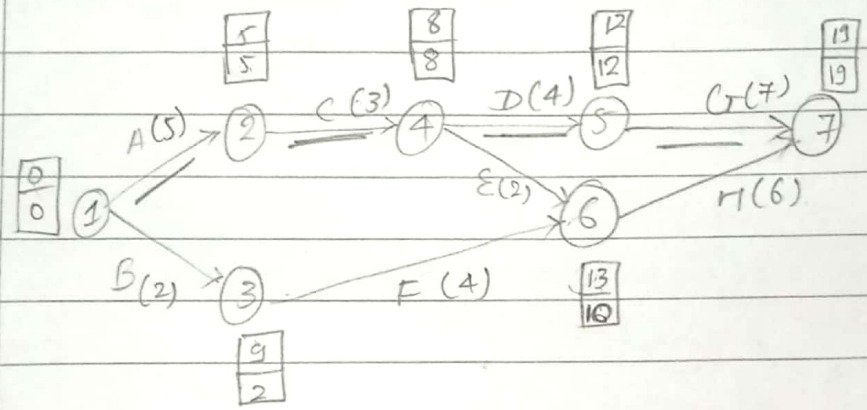


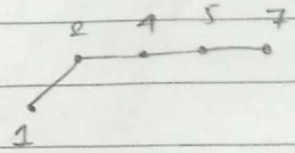
Task	Time	Pre.	EST	EFT	LST	LFT	HS	TF	FF
A	8	-	0	8	0	8	0	0	0
B	10	-	0	10	8	18	0	8	8
C	8	-	0	8	0	8	0	0	0
D	10	A	8	18	8	18	0	0	0
E	16	A	8	24	10	26	0	2	2
F	17	B,D	18	35	18	35	0	17	17
G	18	C	8	26	8	26.	0	18	18
H	14	C	8	22	21	35	0	13	13
I	9	E,G	26	35.	26.	35.	0	9	9

PM

24-08-22.

Activity	A	B	C	D	E	F	G	H
Predecessor	–	–	A	C	C	B	D	E,F
Duration	5	2	3	4	2	4	7	6



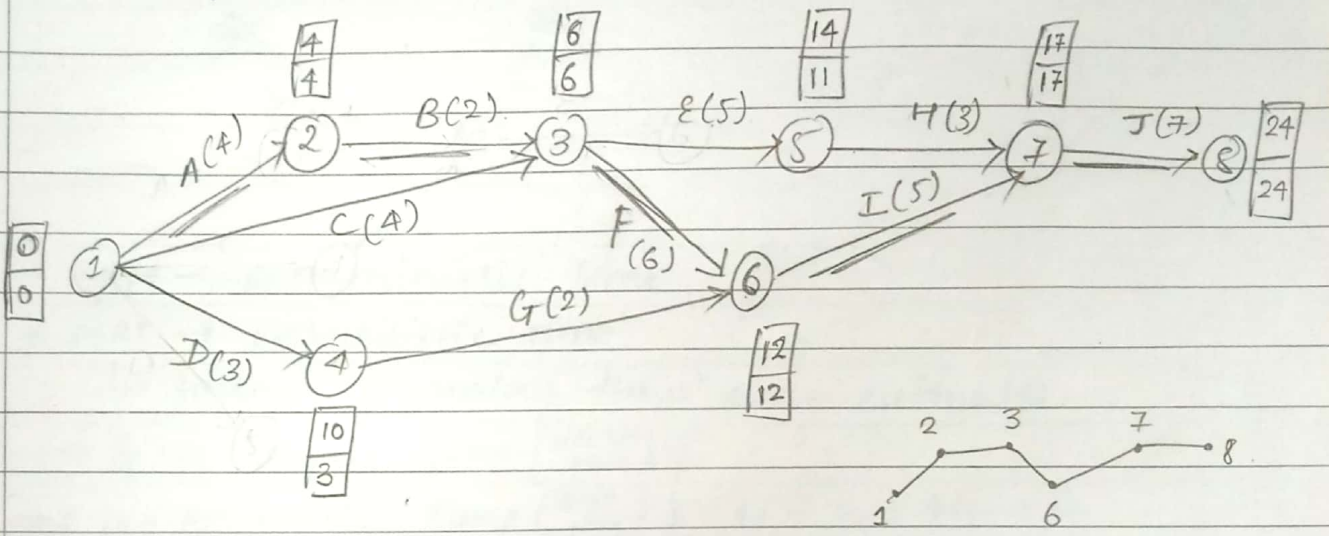


Act.	Dur.	EST	EFT	LST	LFT	HS	TS	TF	FF	IndF	IntF
A	5	0	5	0	5	0	0	5	5	5	0
B	2	0	2	7	9	7	0	7	0	7	7
C	3	5	8	5	8	0	0	0	0	0	0
D	4	8	12	8	12	0	0	0	0	0	0
E	2	8	10	11	13	3	0	3	0	3	3
F	4	2	6	9	13	3	7	7	4	0	3
G	7	12	19	12	19	0	0	0	0	0	0
H	6	10	16	13	19	0	3	3	3	0	0

PM

24-8-22.

Activity	A	B	C	D	E	F	G	H	I	J
Predecessor	-	A	-	-	B,C	B,C	D	E	F,G	H,I
Duration	4	2	4	3	5	6	2	3	5	7

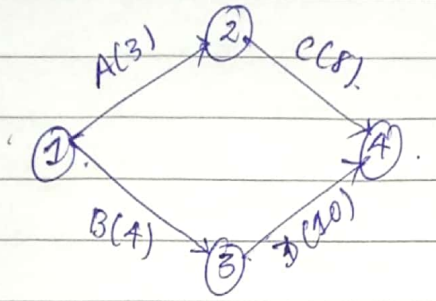


Activity	Duration	EST	EFT	LST	LFT	HS	TS	TF	FF	IndF	IntF
A	4	0	4	0	4	0	0	0	0	0	0
B	2	4	6	4	6	0	0	0	0	0	0
C	4	0	4	2	6	0	0	2	2	2	0
D	3	0	3	7	10	7	0	7	0	7	7
E	5	6	11	9	14	3	0	3	0	3	3
F	6	6.	12	6	12	0	0	0	0	0	0
G	2	3~~0~~	5	10	12	0	7	7	7	0	0
H	3	11	14	14	17	0	3	3	3	0	0
I	5	12	17	12	17	0	0	0	0	0	0
J.	7	17	24	17	24	0	0	0	0	0	0

PM

29-08-22 ①.

PERT [Project(Program) Evaluation Review Technique]



* CPM → Deterministic Time
* PERT → Probabilistic Time.
  - ↳ follow following three time estimates.
  - → tp = pessimistic time (worst case)
  - → to = optimistic time (best case)
  - ↳ tm = most likely time

$$te = \frac{to + 4tm + tp}{6}$$

⇓

(texpected / tavg.)

* Since the time distributions follow Beta-probability distributions, the expected time or average time is →

2) variance of time, $V = \left(\frac{tp - to}{6}\right)^2$.

3) Standard Deviation, $\sigma = \sqrt{V}$