METHODIST COLLEGE OF ENGINEERING & TECHNOLOGY

HYDERABAD

DEPARTMENT OF MECHANICAL ENGINEERING

LECTURE NOTES

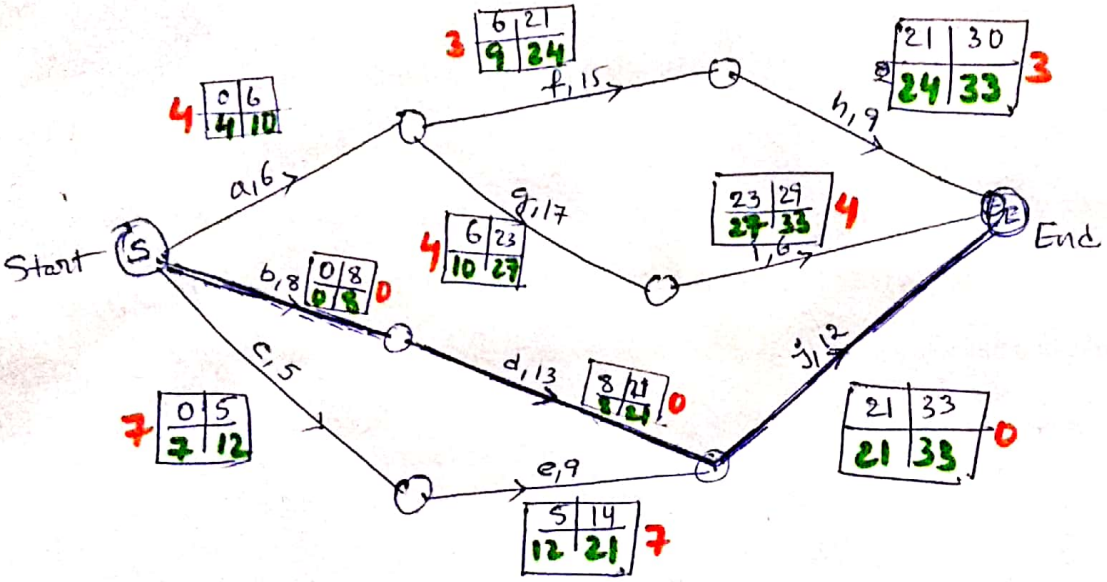
FOR

Industrial Administration and Financial Management

Example for CPM (Critical Path Method)

Activity	a	b	c	d	e	f	g	h	i	j
Preceding Activity	-	-	-	b	c	a	a	f	g	d,e
Duration	6	8	5	13	9	15	17	9	6	12

Draw the Network diagram, Find the Critical path, Calculate ES, EF, LS, LF & the total Float.



Path — Duration — Duration

a - f - h = 30

a - g - i = 29

b - d - j = 33 = longest path ⇒ Critical path ← This should be shown in dark line.

c - e - j = 26

Note: for Critical path, float will be zero.

ES	EF
LS	LF

Float

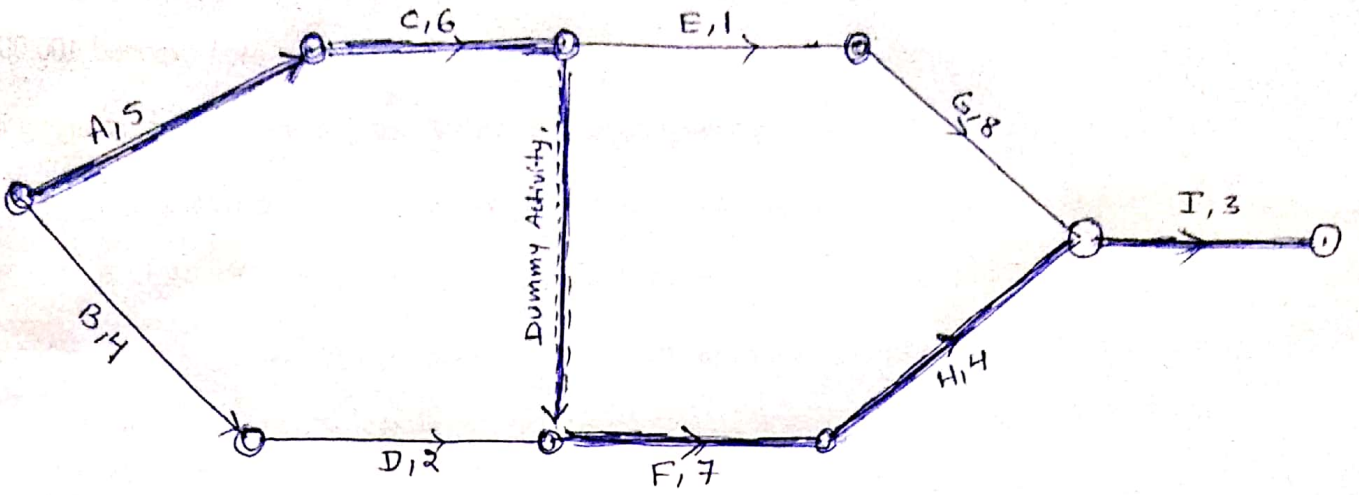
These value are shown in the Network Dia.

For ES & EF ⇐ ~~start~~ Start to END calculation.

For LS & LF ⇒ End to Start Calculation

2. A) Draw the network diagram and find the critical path find total slack activities.

Activity	A	B	C	D	E	F	G	H	I
Duration	5	4	6	2	1	7	8	4	3
Predecessor	-	-	A	B	C	C,D	E	F	G,H



Paths. Time

ACEGI = 5+6+1+8+3 = 23

BDFHI = 4+2+7+4+3 = 20

ACFHI = 5+6+7+4+3 = 25 → Maximum,

So in the critical path indicated in dark line.

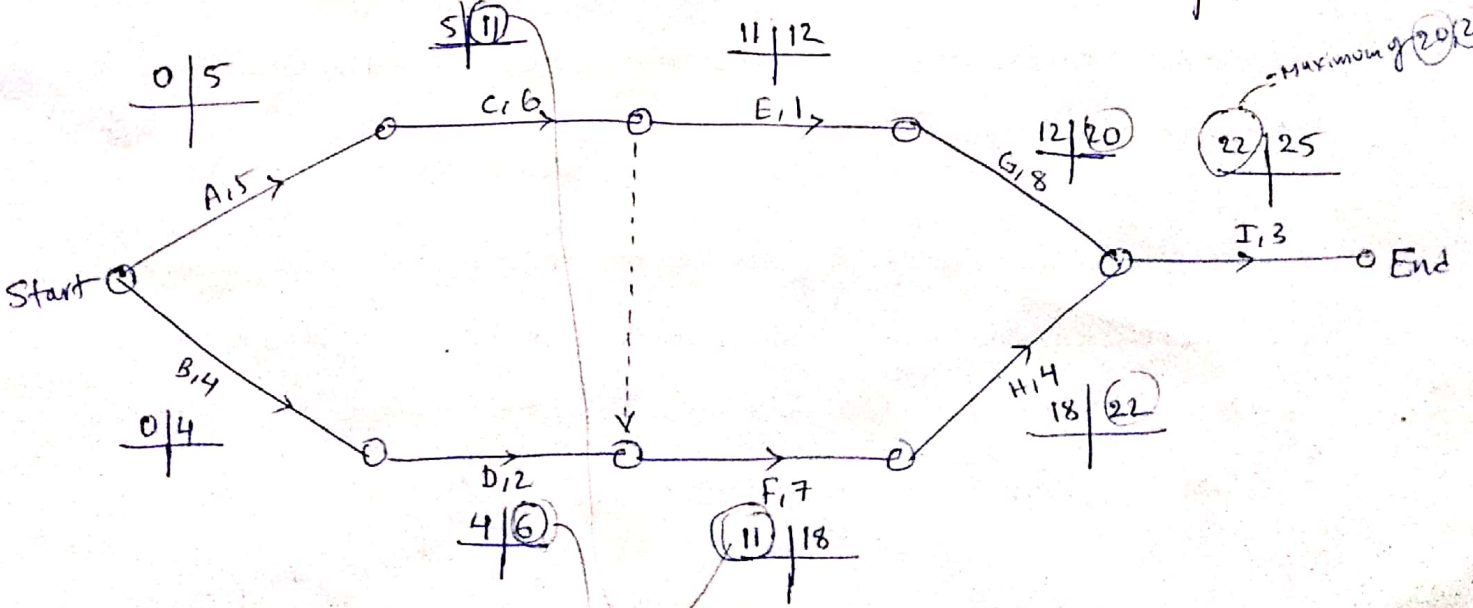
Critical path is A – C – F – H – I = 25.

Note: Critical path activities are having zero floats.

Note: Dummy activity is just a representation, no duration, & no activity.

Now. calculate ES, EF, ~~LS, LF~~ from Start to End

ES	EF
LS	LF



ES = Early Start Time

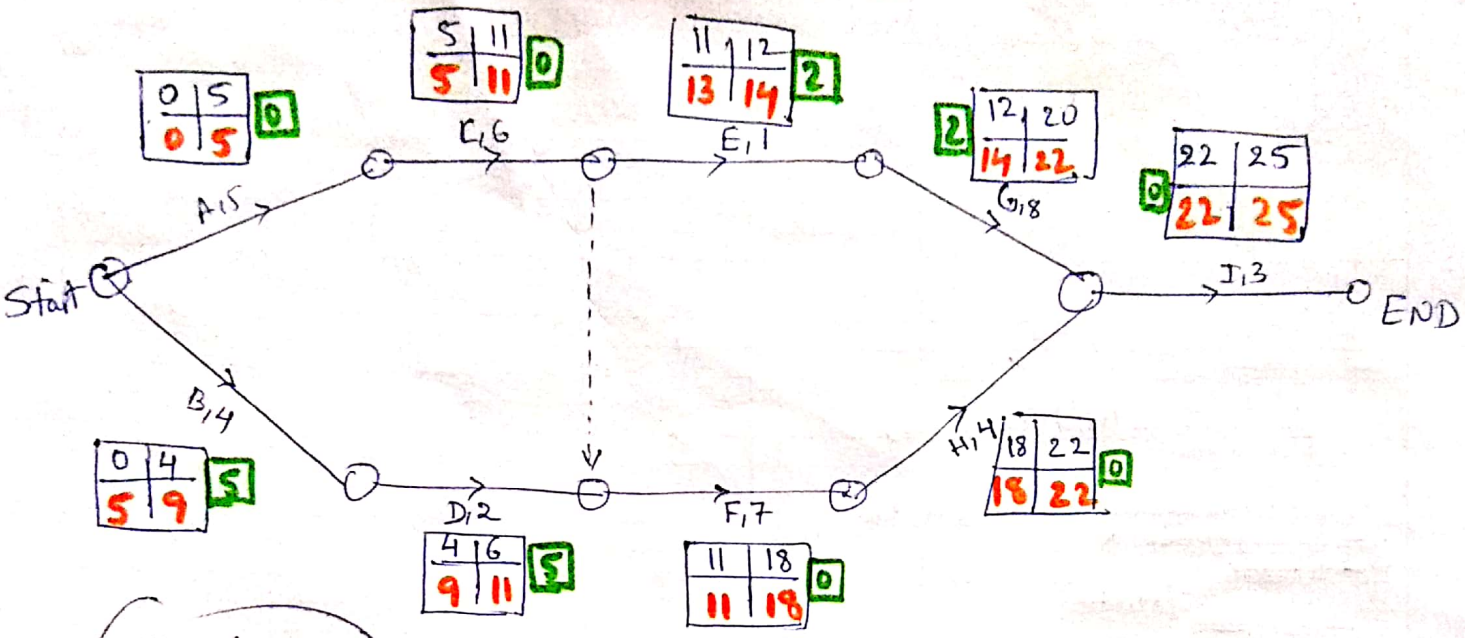
EF = Early Finish

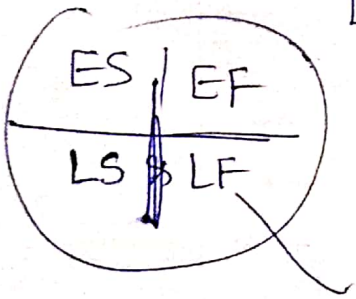
~~LS~~ LS = Latest Start

LF = Latest Finish.

Take this as maximum value of 6 & 11 ie 11

Now LS & LF from the End to start, back calculation

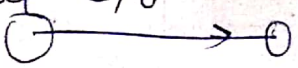




LS & LF are to be calculated from End to Start, taking maximum value of End ie. 25 as LF.

& then deduct the duration to get LS.

Note at C, 6



The LF ~~[illegible]~~ value to be taken minimum values of LS of E & F ie, 11 & 13 ie 11.

Floats can be calculated by ES-LS & EF-LF

Note; Critical Path can be observed with zero floats.

PERT Problem

⇒ Draw the Network Diagram
⇒ Find out critical Path.

In PERT Problems, activity duration won't be given.
They will give 3 time durations, like Optimistic Time ~~duration~~ duration, Pessimistic time duration & Most likely time duration.
We need to find Expected Time [Te] & Variance [σ^2]

Example

Activity	Immediate Preceding Activity	Optimistic Time (Hours) t_o	Most likly Time t_m	Pessimistic Time t_p	Expected Time. Te	Va (σ
A	—	4	6	8	6	4
B	—	1	4.5	5	4	4/
C	A	3	3	3	3	0
D	A	4	5	6	5	1/
E	A	0.5	1	1.5	1	1/
F	B, C	3	4	5	4	1/
G	~~B~~ B, C	1	1.5	5	2	4/
H	E, F	5	6	7	6	1/
I	~~D~~, E, F	2	5	8	5	1
J	D, H	2.5	2.75	4.5	3	1/
K	G, I	3	5	7.	5	4/

Draw the Network Diagram & find the critical Path.

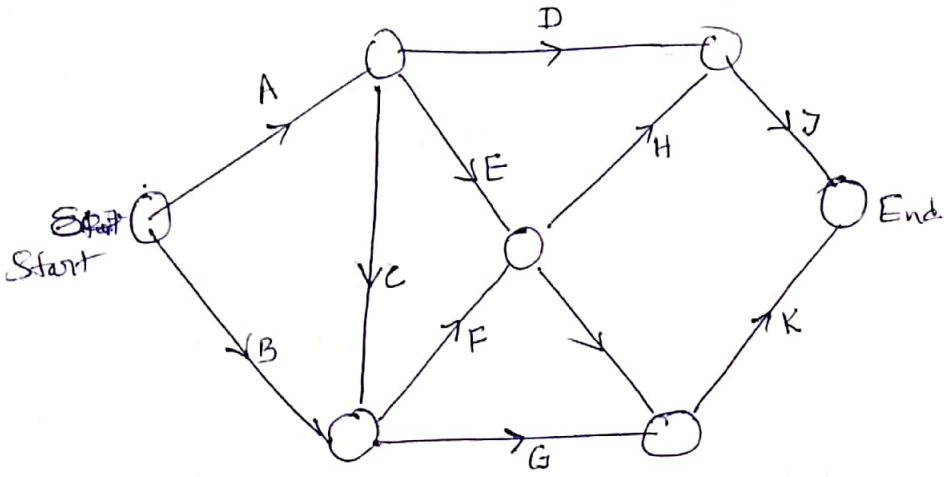
Sol:
① Find out Expected Time [Te]

$$Te = \frac{To + (4 \times Tm) + Tp}{6}$$

Step-(1): Calculate Expected Time (Te)

$$Te = \frac{(to + 4Tm + Tp)}{6}$$

Step-(2) Draw the Network Diagram



Step-(3) –

Path Activities	Total Path Duration (te)
A-D-J	6+5+3 = 14
A-E-H-J	6+1+6+3 = 16
A-C-F-H-J	6+3+4+6+3 = 22
A-E-I-K	6+1+5+5 = 17
A-C-G-K	6+3+2+5 = 16
A-C-F-I-K	6+3+4+5+5 = 23 → is the longest path ⇒ Critical path
B-G-K	4+2+5 = 11
B-F-H-J	4+4+6+3 = 17
B-F-I-K	4+4+5+5 = 18

So, A-C-F-I-K is the Critical Path