19-12-2022

CPM & PERT

CPM (Critical Path Method)

Path connecting the first initial node to the very last terminal node of longest duration in any project network is called critical path.

Formula's

1. Earliest start Time : ES

2. Earliest Finish Time: $EF = ES + t_{ij}$ ($t_{ij} \to$ duration)

3. Latest Finish Time : LF

4. Latest start time : $LS = LF - t_{ij}$

5. Total float $= LF - EF$ (or) $LS - ES$

6. Free Float $=$ Total float $-$ slack of head event (j)

7. Slack $= L - E$

8. Independent float $=$

Ⓠ Calculate the total float, free float and the independent float for the project whose activities are given below:

Activity	1-2	1-3	1-5	2-3	2-4	3-4	3-5	3-6	4-6	5-6
Dur	8	7	12	4	10	3	5	10	7	4

Sol⁷;
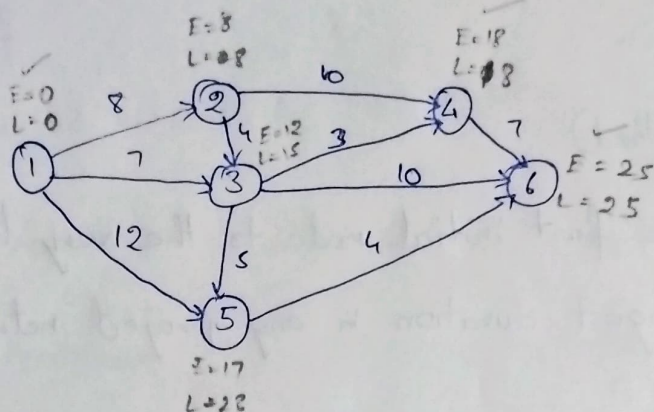
Critical path : 1- 2 -4- 6

Duration : 8 +10 +7 = 25

A	Dur	Earliest		Latest		TF	FF	IF
		Es	Ef	LS	LF			
1-2	8	0	8	0	8	0	0	0
1-3	7	10	7	8	15	8	5	5
1-5	12	0	12	9	21	9	5	5
2-3	4	8	12	11	15	3	0	0
2-4	10	8	18	8	18	0	0	0
3-4	3	12	15	15	18	3	3	0
3-5	5	12	17	16	21	4	0	-3
3-6	10	12	22	15	25	3	3	0
4-6	7	18	25	18	25	0	0	0
5-6	4	17	21	21	25	4	4	0

PERT (Program Evaluation Review Technique)

t_o — Optimistic Time Estimate

t_p — pesimistic Time Estimate

t_m — Most likely Time Estimate

$$\text{Expected duration} = t_c = \frac{t_o + 4t_m + t_r}{6}$$

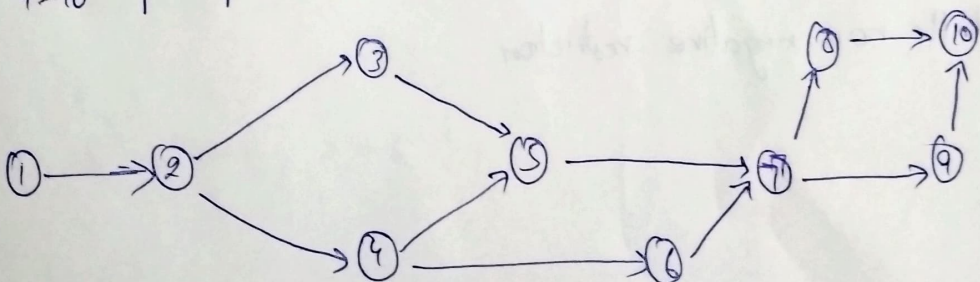$$\text{Expected variance}^{(\sigma^2)} = \left(\frac{t_p - t_o}{6}\right)^2$$

② Construct the network for the project whose activities and the 3 estimates of their activities are given below:

Compute i, Expected duration of each activity

ii, Expected variance of each activity

iii, Expected variance of the project length

A	t_o	t_m	t_{pn}	$t_e = \frac{(t_o + 4t_m + t_p)}{6}$	$(\sigma^2) = \left(\frac{t_p - t_o}{6}\right)^2$
1-2	3	4	5	4	1/9
2-3	1	2	3	2	1/9
2-4	2	3	4	3	1/9
3-5	3	4	5	4	1/9
4-5	1	3	5	3	4/9
4-6	3	5	7	5	4/9
5-7	4	5	6	5	1/9
6-7	6	7	8	7	1/9
7-8	2	4	6	4	4/9
7-9	1	2	3	2	1/9
8-10	4	6	8	6	4/9
9-10	3	5	7	5	4/9

CP : 1-2-3-5-7-8-10

Dur : 4+2+4+7+4+6 = 27

Var : $\frac{1}{9} + \frac{1}{9} + \frac{1}{9} + \frac{1}{9} + \frac{4}{9} + \frac{4}{9} = \frac{12}{9} = \frac{4}{3}$

Unit I

LPP Linear programming Formation & Graphical method

Graphical method