PERT [Programme Evaluation Review Technique]

Q1) A project consists of the following activities and duration.

Activity	Least Time t_o (days)	Greatest Time t_p (days)	Most Likely Time t_m (days)
1 - 2	3	15	6
1 - 3	2	14	5
1 - 4	6	30	12
2 - 5	2	8	5
2 - 6	5	17	11
3 - 6	3	15	6
4 - 7	3	27	9
5 - 7	1	7	4
6 - 7	2	8	5

$$te = \frac{t_o + 4t_m + t_p}{6}$$

$$\sigma^2 = \left[\frac{t_p - t_o}{6}\right]^2$$

$$\sigma = \frac{t_p - t_o}{6}$$

i) Draw the network diagram

ii) Compute the expected duration of each activity (te)

iii) Compute the expected variance of each activity σ^2

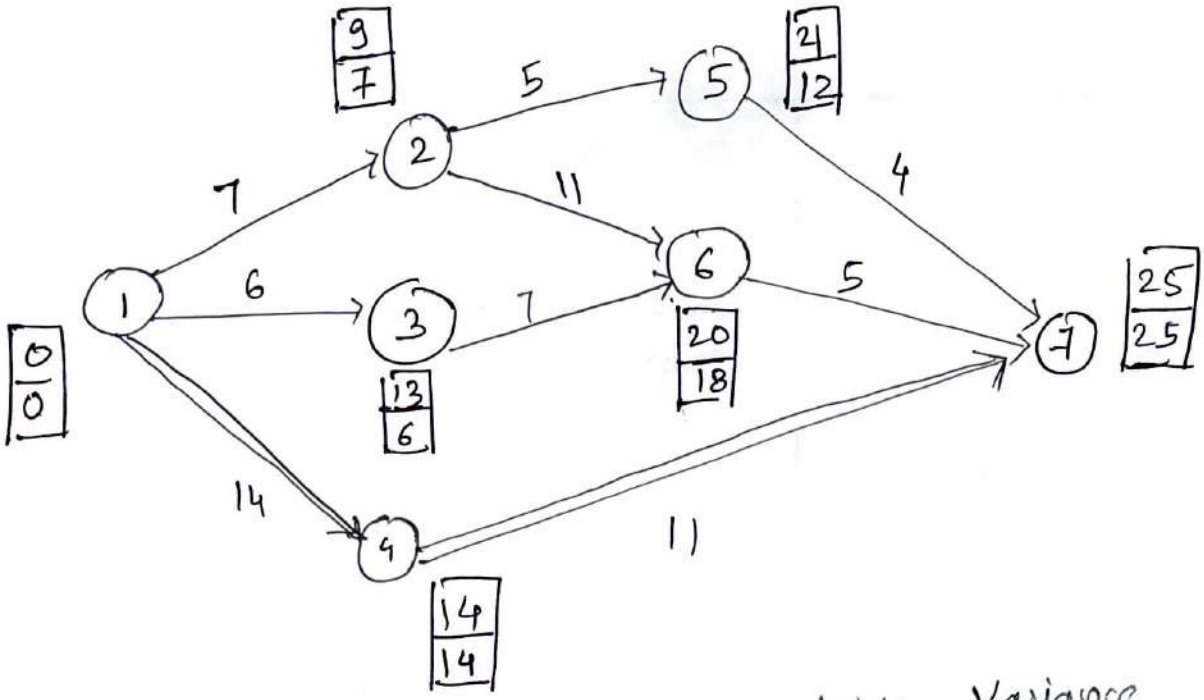
iv) Compute the standard deviation of each activity σ

v) Determine the critical path

vi) Compute the expected variance of the critical path

vii) Compute the expected standard deviation of critical path

viii) What is the probability that the project will be completed in 27 days?



Activity	to	tp	tm	4tm	te	deviation σ	Variance σ2
1 - 2	3	15	6	24	7	2	4
1 - 3	2	14	5	20	6	2	4
1 - 4	6	30	12	48	14	4	16
2 - 5	2	8	5	20	5	1	1
2 - 6	5	17	11	44	11	2	4
3 - 6	3	15	6	24	7	2	4
4 - 7	3	27	9	36	11	4	16
5 - 7	1	7	4	16	4	1	1
6 - 7	2	8	5	20	5	1	1

* Critical path = 1 - 4 - 7
* Expected project duration along critical path = 14 + 11 = 25
* Expected variance of the critical path = 16 + 16 = 32
* Expected Std. deviation of the critical path = ~~4 + 4 = 16~~ $\sqrt{32}$
$= \sqrt{16 \times 2} = 4\sqrt{2}$

* To calculate probability we need,

Z : Standard Normal Variate

$$z = \frac{T_S - T_E}{\sigma_c} = \frac{27-25}{4\sqrt{2}} = \frac{2}{4\sqrt{2}} = 0.35$$

Probability $= P(z \leq 0.35)$

$= 0.6368$

$= 0.6368 \times 100$

$= 63.68\% \simeq 63.7\%$.

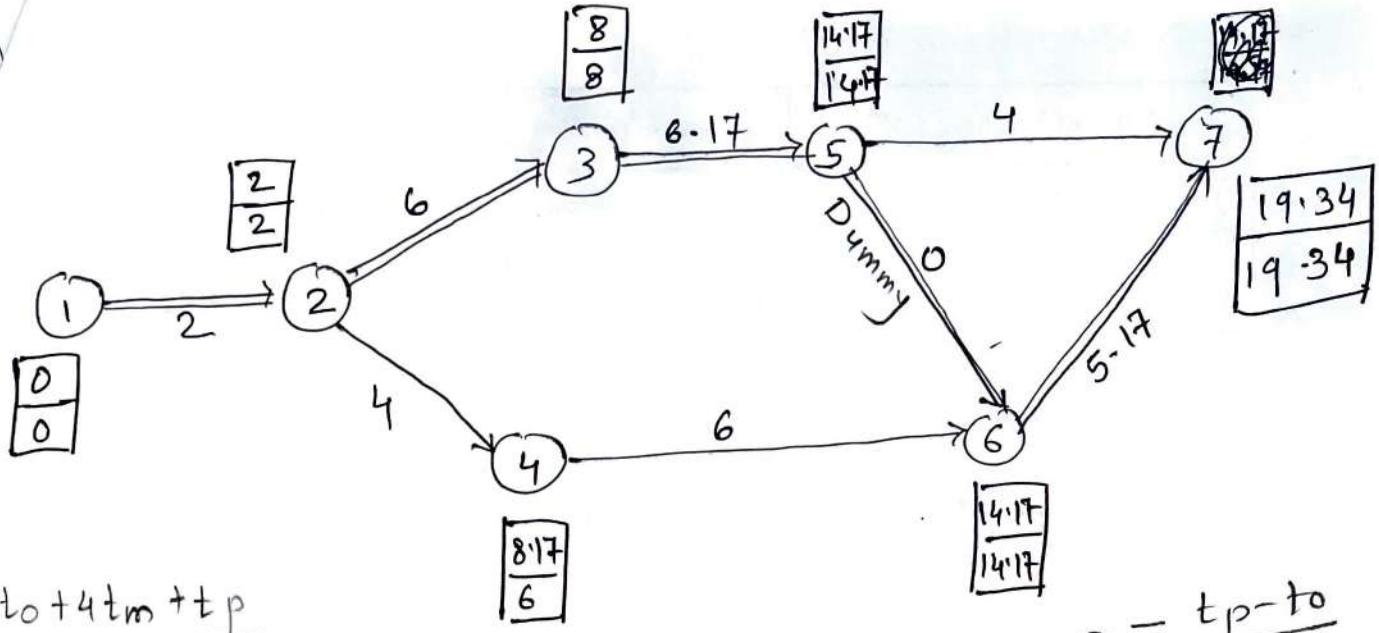
Q.2 For the given project, following are the activities as below:

Activity i-j	Duration in weeks. to	tm	tp
1 - 2	1	2	3
2 - 3	3	6	9
2 - 4	2	4	6
3 - 5	4	6	9
4 - 6	4	6	8
5 - 6	0	0	0
5 - 7	3	4	5
6 - 7	2	5	9

a) Draw the project network and find the project duration

b) Calculate the variance along the critical path

c) What is the probility that the project will be completed in the estimated time.



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

$\sigma = \frac{tp - to}{6}$

Activity	to	tp	tm	4tm	te	σ	σ^2
1-2	1	3	2	8	2	0.33	0.11
2-3	3	9	6	24	6	1	1
2-4	2	6	4	16	4	0.66	0.44
3-5	4	9	6	24	6.17	0.83	0.69
4-6	4	8	6	24	6	0.66	0.44
5-6	0	0	0	0	0	0	0
5-7	3	5	4	16	4	0.33	0.11
6-7	2	9	5	20	5.17	1.16	1.35

Critical path = 1 - 2 - 3 - 5 - 6 - 7

Total project duration = 2 + 6 + 6.17 + 0 + 5.17 = 19.34 weeks

Variance along critical path = 0.11 + 1 + 0.69 + 0 + 1.35

= 3.15

Probability : $z = \frac{T_S - T_E}{\sigma_c} = \frac{19.34 - 19.34}{\sqrt{3.15}} = 0$

∴ Probability = $(z \leq 0)$

= 0.50 = 50%