Lecture-17
SL

Date 06/03/18
Page

PERT

Q.

Activity	Preceding activity	Optimistic time	Most likely time	Pessimistic time	Cost	te
A	–	2	4	12	600	5
B	–	10	12	26	6000	14
C	A	8	9	10	500	9
D	A	10	15	20	4500	15
E	A	7	7.5	11	8000	8
F	B, C	9	9	9	800	9
G	D	3	3.5	7	400	4
H	E, F, G	5	5	5	450	5

Indirect cost per day = ₹ 100/-

Program evaluation and review technique (PERT)

P.

The traditional single estimate of duration of any activity is replaced by three time estimate in PERT system.

i) Optimistic time (t_o or a)

ii) Pessimistic time (t_p or b)

iii) Most likely time (t_a or m)

Optimistic time (t_o or a)

It is the shortest possible time to complete the activity.

Pessimistic time (t_p or b)

It is the longest time that an activity could take if everything goes wrong.

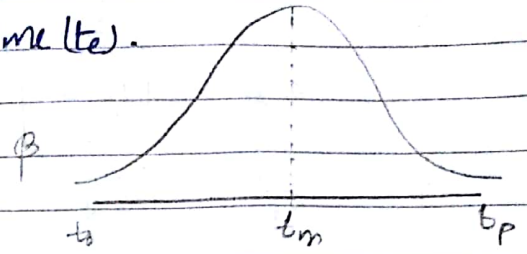
If only one time is given, it will be t_a (to in red)

Most likely time (t_a or m)

It is the estimate of normal time an activity would take.

The duration of each activity follow the β distribution.

We have to calculate expected time (t_e).



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

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

$$\text{Standard deviation } (\sigma) = \frac{t_p - t_o}{6}$$

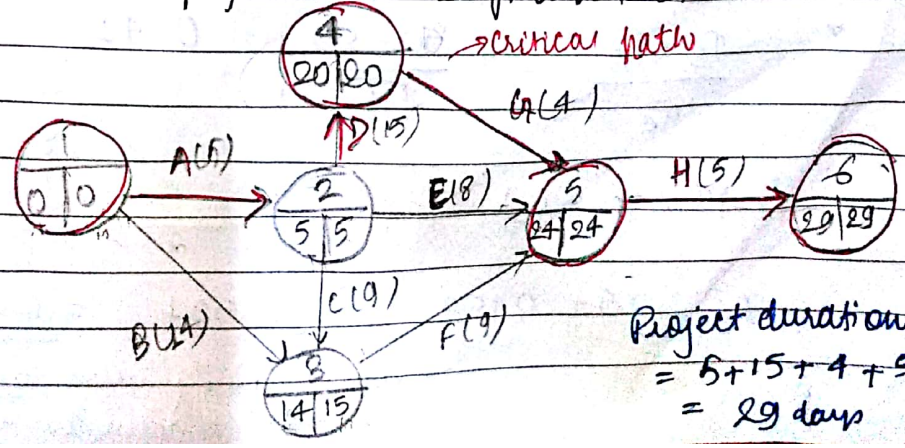
Probability of meeting the scheduled time

~~= Probability of completing the project by~~

Probability of completing the project by scheduled time t_s is calculated by std. normal variate Z.

$$Z = \frac{T_s - T_e}{\sigma_e}$$

Q. i) Draw the network diagram.
ii) Find the critical path, and project completion time, project variance, project cost, project duration.
iii) If a 30 days deadline is imposed, what is the probability that the project will be finished in time.



Don't do directly in exam

Critical path
= A → D → G → H

Project duration
= 5 + 15 + 4 + 5
= 29 days

Variance of project length is obtained by summing variance of each critical activity.

$$\sigma_A^2 = \left[\frac{12-2}{6}\right]^2 = 25/9$$

$$\sigma_D^2 = 25/9$$

$$\sigma_G^2 = 4/9$$

$$\sigma_H^2 = 0$$

∴ Variance of the project (σ^2)

$$= \sigma_A^2 + \sigma_D^2 + \sigma_G^2 + \sigma_H^2$$

$$= 25/9 + 25/9 + 4/9 = 6 \text{ days}$$

Total cost of the project

= Σcost of each activity + indirect cost/day × duration

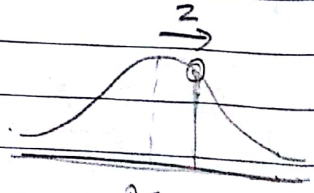
$$= 600 + 600 + 500 + 450 + 900 + 800 + 400 + 450 + 29 \times 100$$

$$= ₹ 7600$$

ii) Project duration is estimated to be 29 days with a variance of 6 days

So, with 30 days restriction, probability is not 100%.

$$Z = \frac{T_s - T_e}{\sigma_e} = \frac{30-29}{\sqrt{6}} = 0.41$$



∴ P(X ≤ 30)

$$= 0.5 + 0.1591 = 0.6591 = 65.91\%$$

0.1591 → corresponding value to 0.41 in the std. norm. variate table