PERT Example:-

* A project is composed of 8 activities, the time estimate for which are given below:-

Activity	Predecessor	Duration		
		to	tm	tp
A	–	2	4	12
B	–	10	12	26
C	A	8	9	10
D	A	10	15	20
E	A	7	7.5	11
F	B, C	9	9	9
G	D	3	3.5	7
H	E, F, G	5	5	5

Z	Probability(P)
0	0.5
0.5	0.6950
1	0.843

$0.5 = 0.6950$

$0.4 = ?$

$= \frac{0.6950 \times 0.4}{0.5}$

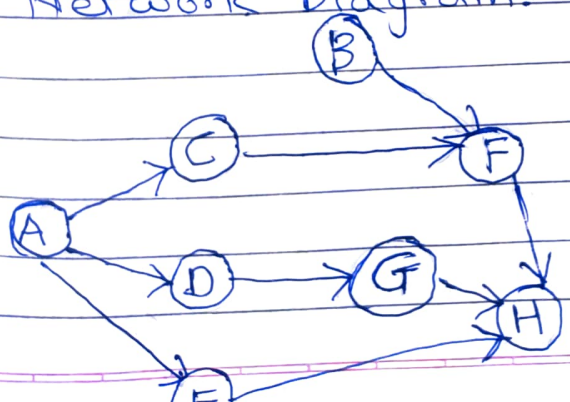
i) Draw the n/w diagram.

ii) Find the critical path & expected projected duration

iii) Calculate the std. deviation & variance of the project

iv) What is the probability of completing the project on 30-week deadline?

Ans:⇒ i) Network Diagram:-



ii) Critical Path:-

Expected Project Duration:-

- To find out Expected Time TE, we will use PERT formula:-

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

where,

to: optimistic time i.e. shortest possible time to complete the task.

tm: Most Likely time i.e. most probable duration of the task.

tp: pessimistic time i.e. longest possible time to complete the task.

Compute TE for each activity:-

Activity	to	tm	tp.	TE
A	2	4	12	$\frac{2+4(4)+12}{6} = 5$
B	10	12	26	$\frac{10+4(12)+26}{6} = 14$
C	8	9	10	$\frac{8+4(9)+10}{6} = 9$
D	10	15	20	$\frac{10+4(15)+20}{6} = 15$
E	7	7.5	11	$\frac{7+4(7.5)+11}{6} = 8$
F	9	9	9	$\frac{9+4(9)+9}{6} = 9$
G	3	3.5	7	$\frac{3+4(3.5)+7}{6} = 4$
H	5	5	5	$\frac{5+4(5)+5}{6} = 5$

Identify Critical Path:-

- We will find critical path by identifying the longest sequence of dependent tasks based on their expected duration.

From the expected duration TE:-

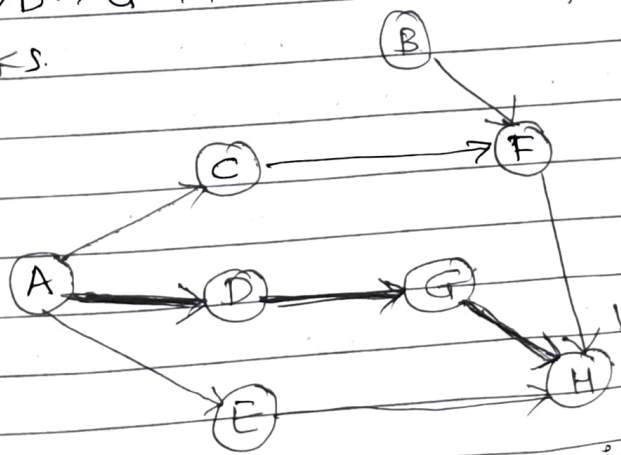
- Path 1:-
  $A \rightarrow C \rightarrow F \rightarrow H$
  Total duration:- $5+9+9+5 = 28$

- Path 2:-
  $A \rightarrow D \rightarrow G \rightarrow H$
  Total duration:- $5+15+4+5 = 29$

- Path 3:-
  $B \rightarrow F \rightarrow H$:- $14+9+5 = 28$

- Path 4:-
  $A \rightarrow E \rightarrow H$:- $5+8+5 = 18$

In above 4 paths longest path is $A \rightarrow D \rightarrow G \rightarrow H$ with an expected duration 29 weeks.



(Critical path shown in Bold Lines)

(iii) Standard Deviation & Variance:-

std. deviat^{n} for each activity:-

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

variance,

$$\sigma^2 = \left(\frac{tp - to}{6}\right)^2$$

Activity	to	tp	σ	σ^2
A	2	12	1.67	2.78
B	10	26	2.67	7.12
C	8	10	0.33	0.11
D	10	20	1.67	2.78
E	7	11	0.67	0.44
F	9	9	0	0
G	8	7	0.67	0.44
H	5	5	0	0

* Total project variance & std. deviation is calculated by summing variance along the critical path.

Critical Path is A → D → G → H.

Total project variance:

$$= 2.78 + 2.78 + 0.44 + 0$$
$$= 6.00$$

Thus, Total Project Variance = 6.00

The Standard deviation of Project is:-

$$\sigma_{project} = \sqrt{6.00}$$

$$\boxed{\sigma_{project} = 2.45}$$

ii) Probability of completing the project within 30 weeks is calculated by using Z-score Formula:-

A) Compute Z-score:

$$Z = \frac{T - TE}{\sigma_{project}}$$

where

T = 30 (target completn time.

TE = 29 (expected project duratn.

$\sigma_{project}$ = 2.45 (std. deviatn of project)

$$Z = \frac{30 - 29}{2.45}$$

$$Z = 0.40$$

B) Find Probability from Z-table (Z-table here, given in the problem)

- using table, probability corresponding to Z = 0.40 is approximately 0.556 or 0.60

So, probability of completing the project within 30 weeks is 0.556 or 0.6