* What are the characteristics of the critical path of a network? [DNCC'22]

→ The longest path in the network
→ Specifies the minimum project duration
→ Indicates amount of scheduling flexibility
→ A project can have more than one critical path.
→ Total float of activities on critical path is zero
→ Critical path changes as the project progresses

→ any delay in any of activities in critical path results in a delay in the overall project duration.

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* PERT = Programme Evaluation & Review Technique

*

Activity	Estimated duration (weeks)		
	optimistic time (t_o)	most likely time (t_m)	Pessimistic (t_p)
1-2	1	7	13
1-6	2	5	14
2-3	2	14	26
2-4	2	5	8
3-5	7	10	19
4-5	5	5	17
6-7	5	8	29
5-8	3	3	9
7-8	8	17	32

You are required to –

(1) Draw the project network

(2) Find the expected duration & variance of each activity

(3) Calculate the earliest & latest occurance for each activity

(4) calculate expected project length

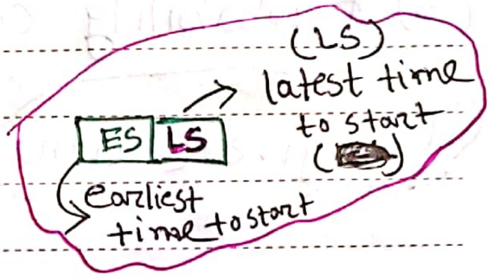
(5) calculate the variance and standard deviations of project length

(6) Find the probability of the project completing in 40days

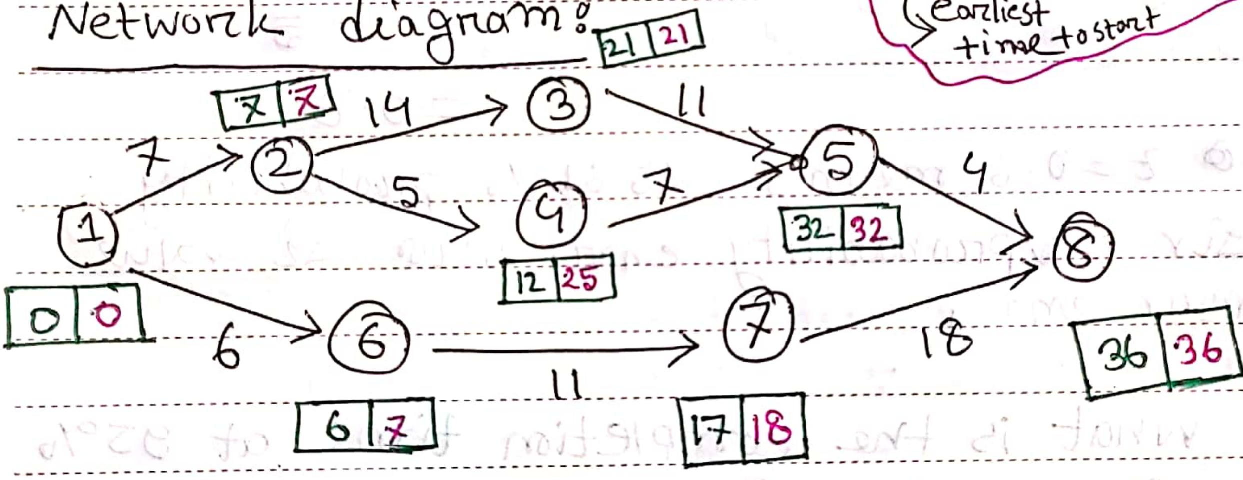
Sol^n:

~~Activity 1-2 1-6 2-3 2-4 3-5 4-5 6-7~~

Activity	1-2	1-6	2-3	2-4	3-5	4-5	6-7	5-8	7-8
expected time $\left(t_e = \frac{t_o + 4t_m + t_p}{6}\right)$	7	6	14	5	11	7	11	4	18
variance $\sigma^2 = \left(\frac{t_p - t_o}{6}\right)^2$	4	4	16	1	4	4	16	1	16



Network diagram:



* Earliest এর ক্ষেত্রে বাম থেকে ডান হবে।
* latest এর ক্ষেত্রে ডান থেকে বামে। (ডানে) দিক থেকে শুরু
* ES এর ক্ষেত্রে যেই সময় যোগফল সর্বোচ্চ হবে সেই সময় value বসাবে। Look 5 & 8
* LS এর ক্ষেত্রে যেই সময় বিয়োগফল সর্বনিম্ন হবে তার value বসাবে। Look 2 & 1
* Float or slack = LS − ES

Critical path এর slack/float always zero হবে

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∴ critical path 1-2-3-5→8

∴ Expected project duration = 7+14+11+4 = 36 weeks

∴ project length variance, σ^2 = 4+16+4+1 = 25

∴ project length standard deviation, σ = 5

(6) probability coefficient, $z = \frac{T_s - T_e}{\sigma}$

T_s = given time

$= \frac{40-36}{5}$

$= 0.8$

z = 0.8 means 78.81% probability.

এর probability chart থেকে এই value আসবে।

* what is the completion time at 95% confidence level?

for 95% confidence level, z = 1.96

$\therefore z = \frac{T_s - 36}{5}$

$\Rightarrow T_s = 5z + 36 = 5 \times 1.96 + 36$

$= 45.8$ weeks

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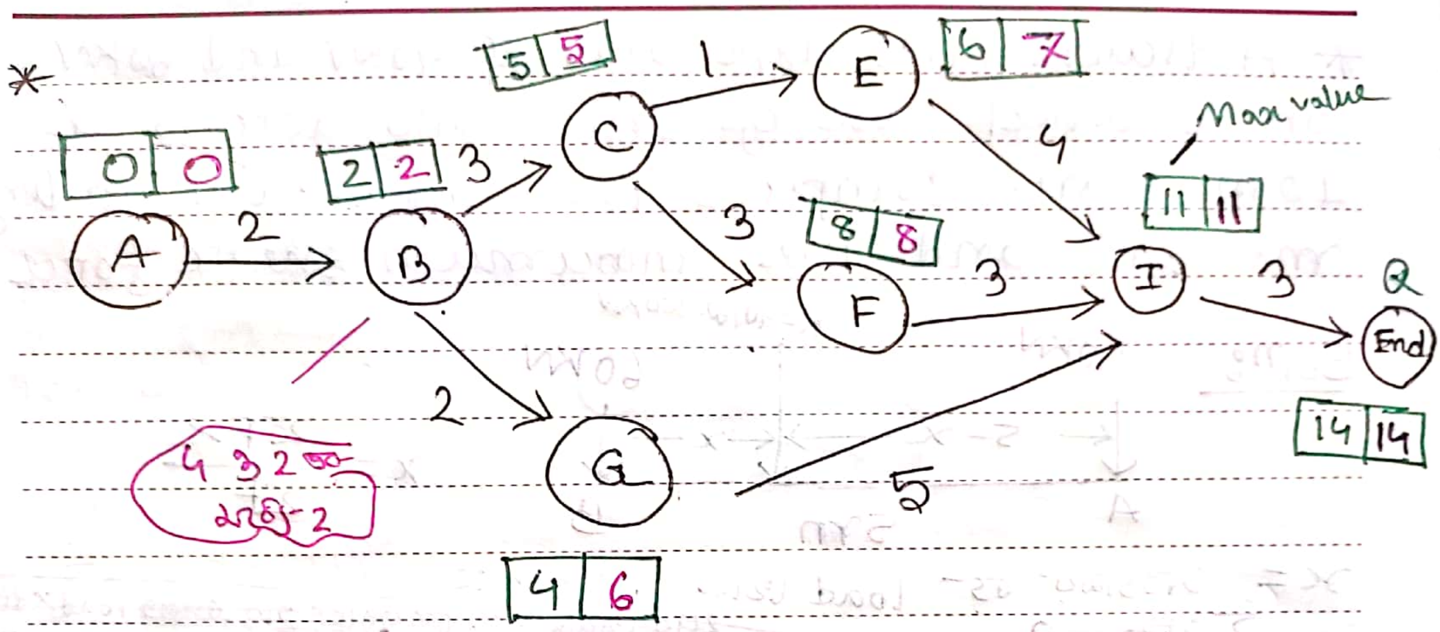

LS ⟵ ⟶ ES

(14 days)

∴ critical path A→B→C→F→I→Q

বলা হয়েছে C তে একদিন Delay হয়েছে এবং G তে একটি delay হয়েছে।
তাহলে project duration এ একদিন ডিলে হবে কেননা হবে C তে হয়েছে, আর C critical path এর অংশ। G এর delay এ project duration এ কোনো প্রভাব ফেলবে না। তখন project duration হবে 14+1=15 days

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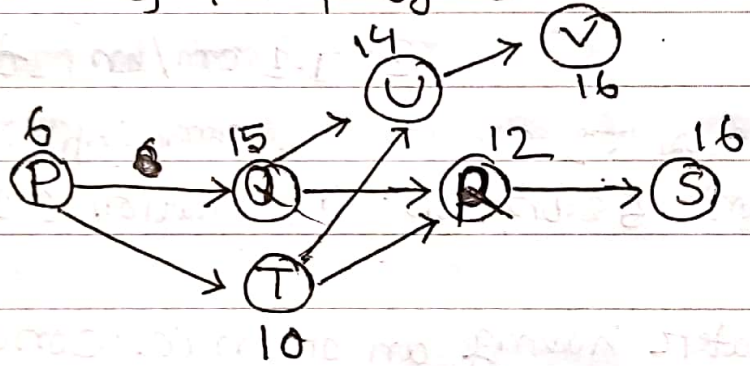
(4) The activity details of a project are given below:

Activity	Depends on	Duration (in days)
P	--	6
Q	P	15
R	Q, T	12
S	R	16
T	P	10
U	Q, T	14
V	U	16

The estimated minimum time (in days) for the completion of the project will be what?

Ans:



∴ Critical path = 6+15+14+16 = 51 days

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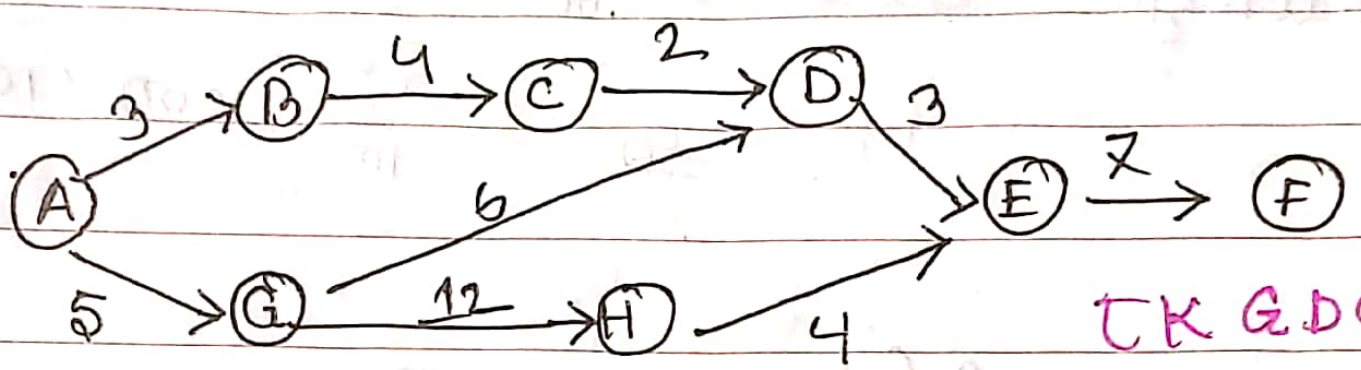

[TK GDCL '21]

Critical path → A → G → H → E → F

Time = 5 + 12 + 4 + 7 = 28 days