HW 9

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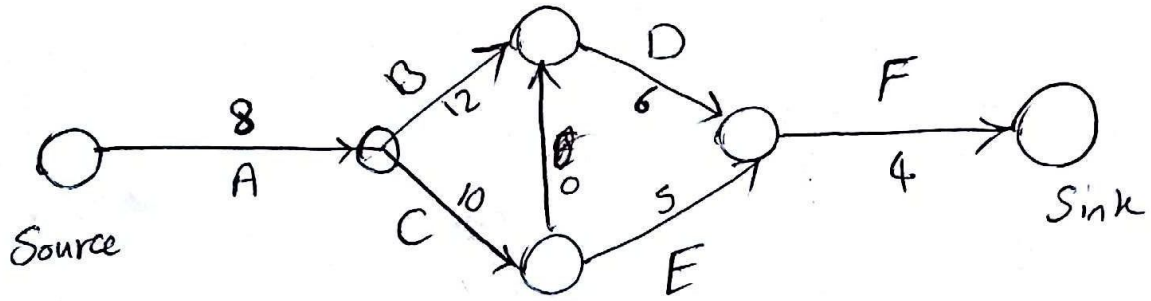
Problem 1)



a) Critical Path :

all pathes:

① A-B-D-F → Length → 8 + 12 + 6 + 4 = 30

② A-C-D-F → Length → 8 + 10 + 6 + 4 = 28

③ A-C-E-F → Length → 8 + 10 + 5 + 4 = 27

→ Critical Path = A-B-D-F

Path length = 30

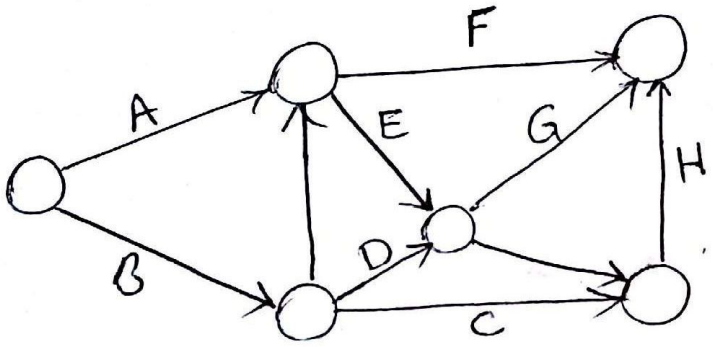
b) new critical path: B : 3

all Paths
① A-B-D-F $\xrightarrow{\text{Length}}$ 8+3+6+4 = 21
② A-C-D-F $\xrightarrow{\text{Length}}$ 8+10+6+4 = (28)
③ A-C-E-F $\xrightarrow{\text{length}}$ 8+10+5+4 = 27

Critical Path = A-C-D-F
with Length = 28

Problem 2

(a)



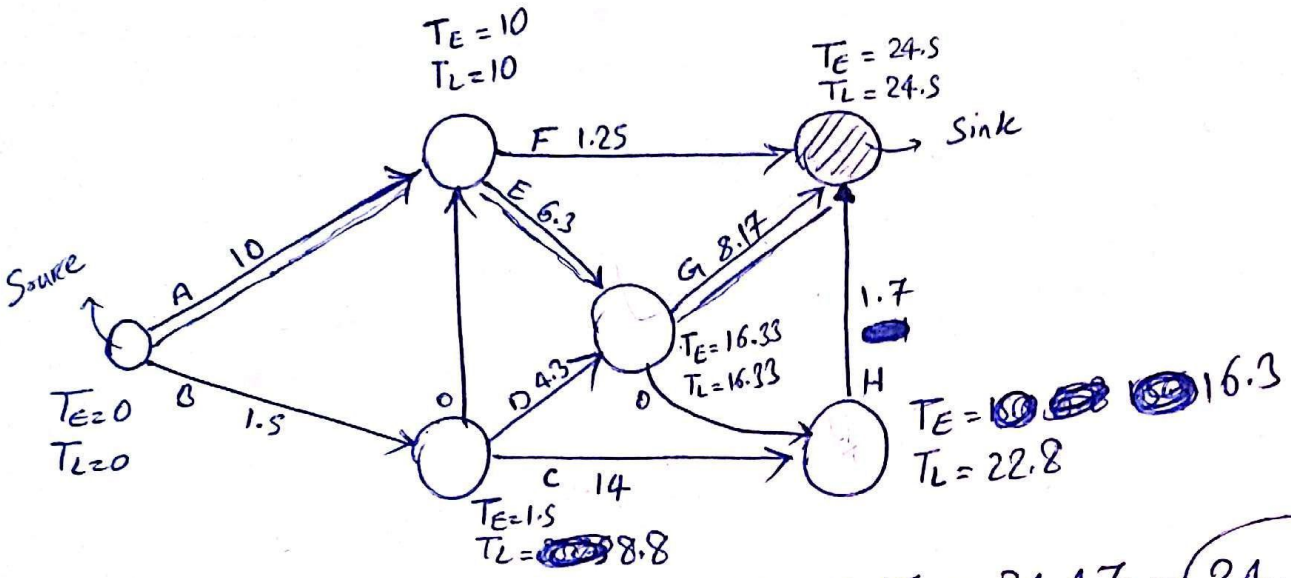
Activity	Duration Optim	Most likely	Pessimistic
A	8	10	12
B	1	1.5	2
C	12	14	16
D	2	4	8
E	5	6	9
F	0.5	1	3
G	6	8	11
H	1	1.5	3

$\sigma^2 = \left(\frac{b-a}{6}\right)^2$

Final durations: by $\left(\frac{a+4m+b}{6}\right)$

=>

	duration	σ^2		duration	σ^2
A	10	0.44	E	6.3	0.44
B	1.5	0.06	F	1.25	0.17
C	14	0.44	G	8.17	0.69
D	4.3	1	H	1.7	0.11



Longest path = A-E-G = 10 + 6.3 + 8.17 = 24.47 = 24.5

Critical path

So in summary :

Activity	Duration	ES	EF	LS	LF
A	10	0	10	0	10
B	1.5	0	1.5	0	23.25
C	14	1.5	15.5	23.25	22.8
D	4.3				
E	6.3				
F	1.25				
G	8.17				
H	1.7				

So critical path = A-E-G

with length 24.5

c) Standard deviation of critical path:

$$= \sqrt{0.44 + 0.44 + 0.69} = \underline{1.25}$$

$$Z = \frac{-2}{1.25} = -1.6$$

⇒ from normal distribution:

⇒ P(Z<1.6) = 0.94520

⇒ P(Z<-1.6) = 1 - 0.94520

$$\boxed{P(Z<-1.6) = 0.0548}$$

d)

all paths are listed

	Length
① A-F	10+1.25 = 11.25
② A-E-G	10+6.3+8.17 = 24.47
③ A-E-H	10+6.3+1.7 = 18 ← 2nd largest
④ B-F	1.5+1.25 = 2.75
⑤ B-E-G	1.5+6.3+8.17 = 15.97
⑥ B-E-H	1.5+6.3+1.7 = 9.5
⑦ B-D-G	1.5+4.3+8.17 = 13.97
⑧ B-D-H	1.5+4.3+1.7 = 7.5
⑨ B-C-H	1.5+14+1.7 = 17.2 ← 3rd largest

⇒ 2nd Critical path = A-E-H ⇒ length = 18 days

⇒ 3rd " " = B-C-H ⇒ Length = 17.2 days

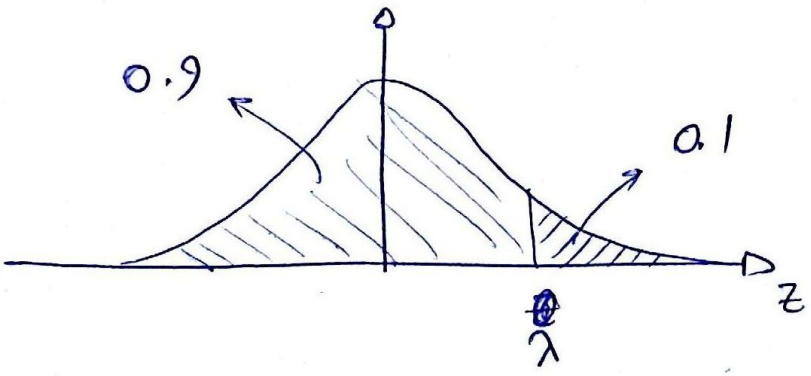
e)

1st: A-E-G
2nd: A-E-H
3rd: B-C-H

most important: A, E, G, H

reason: These are included in 1st and 2nd most important paths.

f)



from table ⇒ P(

$$P(z<\lambda) = 1-0.1 = 0.9$$

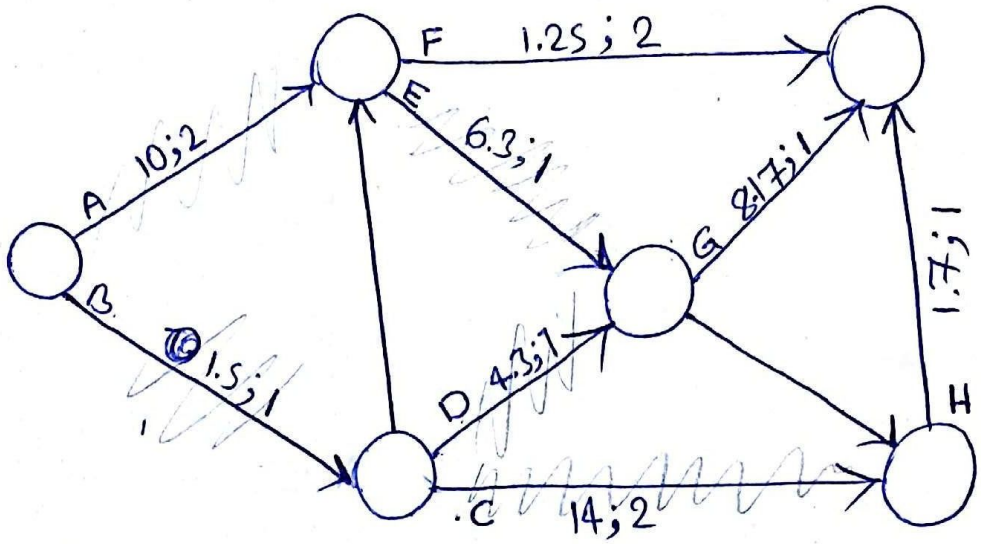
Table ⇒ $\lambda = 1.28$

$$1.28 = \frac{x-\mu}{\sigma} = \frac{x-24.47}{1.25}$$

$$\Rightarrow \boxed{x = 26.07 \text{ days}}$$

9)

3 units available



ACTIM approach

	A	B	C	D	E	F	G	H
ACTIM	24.47	17.2	15.7	12.4.7	14.47	1.25	8.17	1.7
Duration								
Res								
Tearl								
Tstart								
Tfin								

However, we should construct the table in the order of ACTIM :

A, B, C, E, D, G, H, F

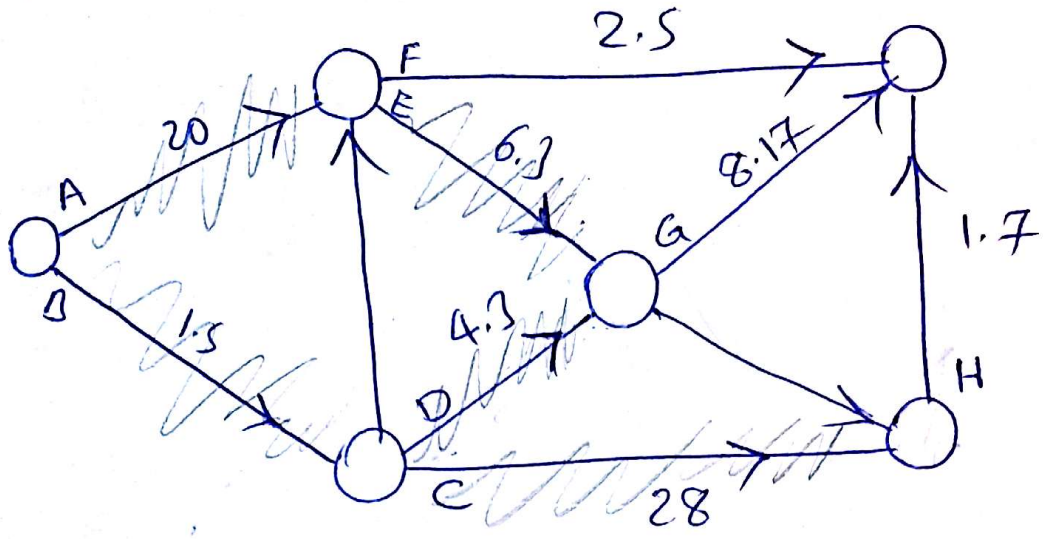
	A	B	C	E	D	G	H	F
ACTIM	24.47	17.2	15.7	14.47	12.47	8.17	1.7	1.28
Duration	10	1.5	14	6.3	4.3	8.17	1.7	1.28
Res	2	1	2	1	1	1	1	2
Tearl	0	0	1.5	10	1.5	16.3	16.3	10
Tstart	0	0	10	10	1.5	16.3	24	24.47
TFin	10	1.5	24	16.3	5.8	24.47	25.7	25.72

TNOW	0	1.5	10	16.3	24	24.47	
Res Availble	~~2~~ 1	1 0	~~2~~ 1 0	1	2 1	~~2~~	
Act allowed	~~A~~, ~~B~~	C, ~~D~~	~~C~~, ~~E~~, F	G, H, F	~~H~~, F	~~F~~	
Iteration #	1	2	3	4	5	6	

⇒ Duration = 25.72

ACTRESS approach :

Modified Network



A = 20 + 6.3 + 8.17 = 34.47

B = 1.5 + 28 + 1.7 = 31.2

C = 28 + 1.7 = 29.7

D = 4.3 + 8.17 = 12.47

E = 6.3 + 8.17 = 14.47

F = 2.5

G = 8.17

H = 1.7

→ order: A, B, C, E, D, G, F, H

ACTRESS

	A	B	C	E	D	G	F	H
ACTRESS	34.47	31.2	29.7	14.47	12.47	8.17	2.5	1.7
Duration	10	1.5	14	6.3	4.3	8.17	1.25	1.7
Res	2	1	2	1	1	1	2	1
Tearl	0	0	1.5	10	1.5	16.3	10	24
Tstart	0	0	10	10	1.5	16.3	24	24.47
Tfin	10	1.5	24	16.3	5.8	24.47	25.25	26.17

TNow	0	1.5	10	16.3	24	24.47		
Res Availble	3 ~~1~~	~~1~~	3 ~~1~~	~~1~~	~~2~~	~~1~~		
Act allowed	~~A, B~~	C, ~~D~~	~~C~~, E, F	G, F	~~F~~, H	H		
Identi #	1	2	3	4	5	6		

Duration = 26.17