CIVIL ENGINEERING

GATE | PSUs

CONSTRUCTION MATERIALS & MANAGEMENT

Volume - I & II : Study Material with Classroom & Self Practice Questions (Workbook)

Construction Materials and Management

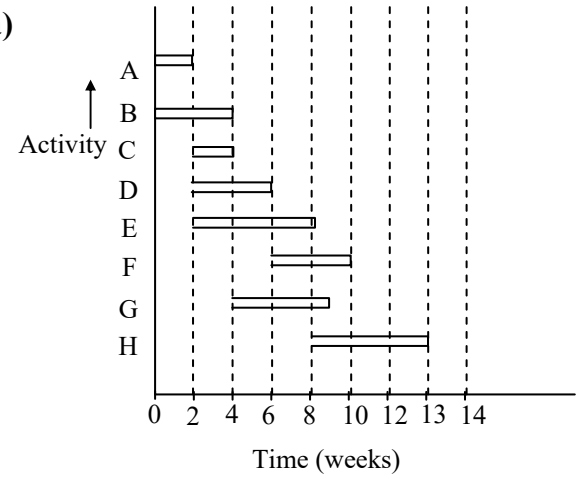
Solutions for Volume : I Classroom Practice Questions

Chapter- 3
Introduction to Project Management

07. Ans: 13 weeks

Sol:

a)

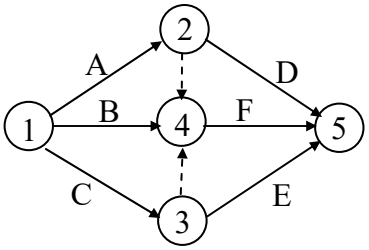


Total completion time of period = 13 weeks

Chapter- 4
Elements of Networks

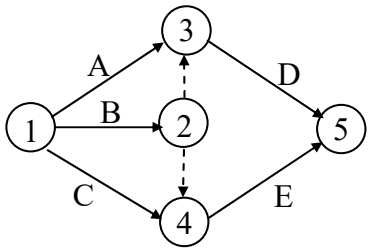
12.

Sol:



13.

Sol:



Chapter- 5
PERT

13. Ans: (a)

Sol: $t_E = \dfrac{t_o + 4t_L + t_P}{6}$

$= \dfrac{8 + 4 \times 9 + 13}{6} = 9.5$

Variance, $\sigma^2 = \left(\dfrac{t_p - t_o}{6}\right)^2 = \left(\dfrac{13 - 82}{6}\right)^2$

$\sigma^2 = \dfrac{25}{36}$

29. Ans: 50% & 95.2%

Sol:

(a) $T_E = 24$ month

$\sigma = 3.6$

$Z = \dfrac{T_S - T_E}{\sigma}$

$Z = \dfrac{24 - 24}{3.6} = 0$

From table probability = 50%

(b) $Z = \dfrac{30 - 24}{3.6}$

$Z = 1.67$

From table probability = 95.2%

30. Ans: 65.76 & 58.25 weeks

Sol:

a) $T_E = 60$ weeks

$\sigma^2 = 20.25$

P (%) = 90 %

$\Rightarrow Z = 1.28$

Std deviation = $\sqrt{\text{variance}} = \sqrt{20.25}$

$\sigma = 4.5$

$1.28 = \dfrac{T_S - T_E}{4.5}$

$T_S = 65.76$ weeks

b)

P(%) = 35%

For P(%) = 35 %

From table,

$Z = -0.387$

$-0.387 = \dfrac{T_s - T_E}{4.5}$

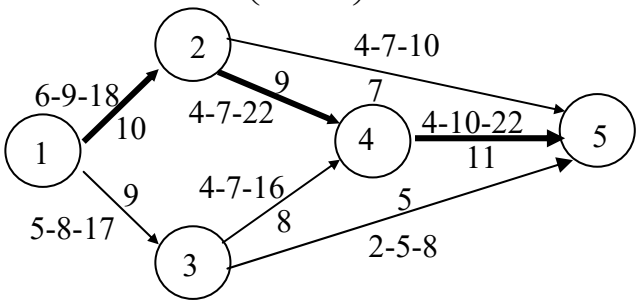
T_E = weeks

= 58.25 weeks

31. Ans: 90.32%

Sol: $t_E = \dfrac{t_o + 4t_L + t_P}{6}$

$\sigma^2 = \left(\dfrac{t_p - t_o}{6}\right)^2$



Activity	$t_o - t_L - t_P$	t_E	σ^2
1-2	6-9-18	10	4
1-3	5-8-17	9	4
2-4	4-7-22	9	9
3-4	4-7-16	8	4
2-5	4-7-10	7	1
4-5	4-10-22	11	9
3-5	2-5-8	5	1

Critical path:

1 – 2 – 5 = 10 + 7 = 17
1 – 2 – 4 – 5 = 10 + 9 + 11 = 30
1 – 3 – 4 – 5 = 9 + 8 + 11 = 28
1 – 3 – 5 = 9 + 5 = 14

Critical path = 1 – 2 – 4 – 5
T_E = 30 days; T_S = 36 days

$Z = \dfrac{T_S - T_E}{\sigma}$

To calculate σ :-

σ^2 of critical path

$\sigma^2 = 4 + 9 + 9 = 22$

$\sigma = \sqrt{22} = 4.69$

$Z = \dfrac{36 - 30}{4.69} = 1.27 \simeq 1.3$

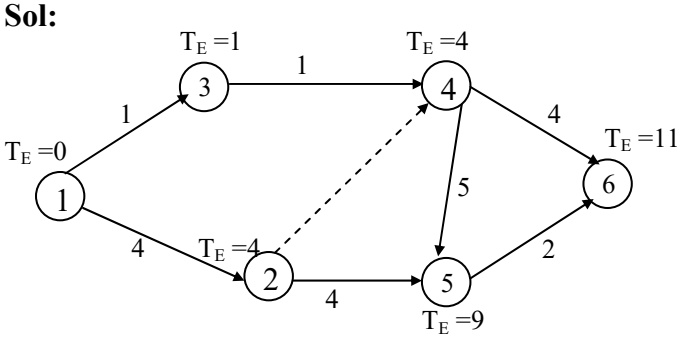
From the table

$Z = 1.3 \Rightarrow$ probability = 90.32 %

Chapter- 6 CPM

27. Ans: (c)

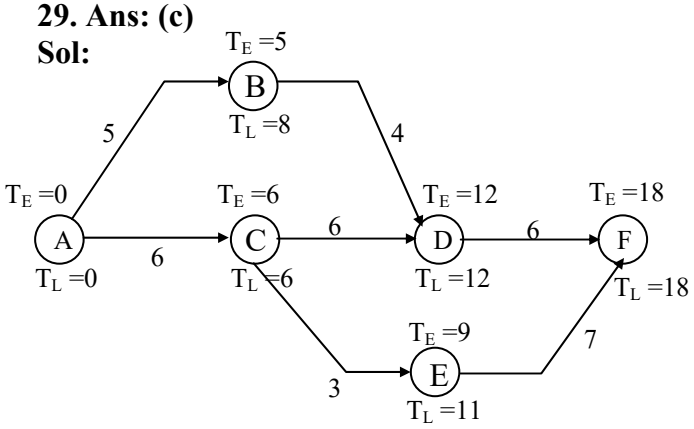
Sol:



$\therefore$ Earliest start time for activity 5 – 6 = 9 days

29. Ans: (c)

Sol:



$F_{T(AB)}$ = LST –EST

EST = 0

LST = 8 –5 = 3

$F_{T(AB)}$ = 3

$F_{T(CE)}$ = LST – EST

= (11 –3) – 6 = 2

$F_{F(EF)} = \left(T_E^j - T_E^i\right) - t^{ij}$

= 18 –9 –7

= 2

Chapter- 7
CPM Cost Analysis

11. Ans: (a)

Sol:

Week	Parallel Activities	Total Resource Load
9th	A	6
11th	A + B	6 + 4 = 10
13th	A + B+ D	6 + 4 + 7 = 17
15th	A + B + C + D	6 + 4 + 3 + 7 = 20

From the above, the maximum resource load per week is 20

12. Ans: (c)

Sol: From the data given, the maximum time for the project is 11 days and minimum time is 9 days.

For 11 days, the total direct cost is:

800 + 1200 + 500 = 2500 units.

For 10 days, the total direct cost is:

800 + 1350 + 500 = 2650 units.

For 9 days, the total direct cost is:

900 + 1500 + 500 = 2900 units.

∴ The feasible range of total direct cost varies from 2500 to 2900.

13. Ans: (a)

Sol: From the given diagram, on the 21st & 22nd day three concurrent activities are there with a total resources of 6 + 7 + 9 = 22.

Minimum resource occurs when only one activity exists. In the present case it is 6 per day.

∴ Maximum resources is 22 and minimum is 6