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CPMT-PERT

CIVIL ENGINEERING

Date of Test : 03/08/2026

ANSWER KEY ➤

1.	(b)	7.	(c)	13.	(c)	19.	(d)	25.	(c)
2.	(a)	8.	(c)	14.	(d)	20.	(d)	26.	(b)
3.	(d)	9.	(b)	15.	(c)	21.	(b)	27.	(a)
4.	(a)	10.	(a)	16.	(c)	22.	(b)	28.	(c)
5.	(b)	11.	(a)	17.	(d)	23.	(b)	29.	(b)
6.	(d)	12.	(a)	18.	(a)	24.	(d)	30.	(c)

DETAILED EXPLANATIONS

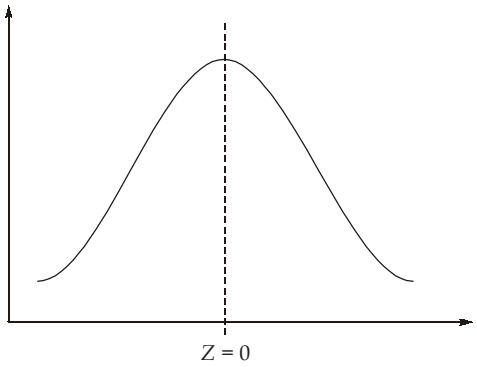
1. (b)

$$\text{Sinking fund factor} = \frac{i}{(1+i)^n - 1}$$

$i = 6\%$ $n = 6$ years,

$$\therefore \quad \text{SFF} = \frac{0.06}{(1+0.06)^6 - 1} = 0.1433 \simeq 0.14$$

2. (a)



For $Z > 0$ $p > 50\%$

$Z = 0$ $p = 50\%$

$Z < 0$ $p < 50\%$

3. (d)

Gantt chart indicates comparison of actual progress with the scheduled progress.

4. (a)

5. (b)

6. (d)

7. (c)

8. (c)

Crashing is a method of determining the optimum project duration corresponding to the minimum cost of the project. It only involves the crashing of critical activities which directly affects the overall project duration.

9. (b)

10. (a)

$$t_e = \frac{\left(t_0 + 4t_m + t_p\right)}{6}$$

$$= \frac{(6 + 4 \times 11 + 16)}{6} = 11 \text{ days}$$

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11. (a)

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

Z normal deviate	1.1	1.2	1.3
%Probability	86.43	88.49	90.32

Value of Z for 90% probability.

$$\frac{1.3 - 1.2}{90.32 - 88.49} = \frac{1.3 - Z_{90}}{90.32 - 90}$$

$\Rightarrow$ $Z_{90} = 1.2825$

Using, $T_E = 45$ weeks

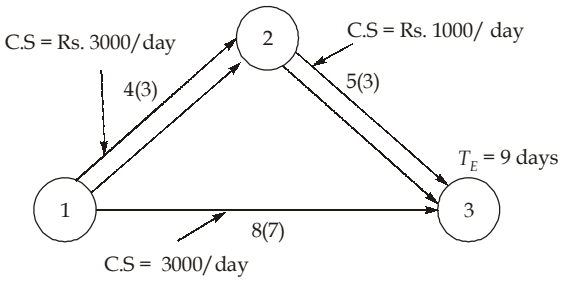
$\sigma = \sqrt{V}$

$\Rightarrow$ $\sigma = \sqrt{12.25} = 3.5$

$\therefore$ $Z_{90} = 1.2825 = \frac{T_S - 45}{3.5}$

$\simeq$ $T_S = 49.489$ weeks $\simeq 50$ weeks

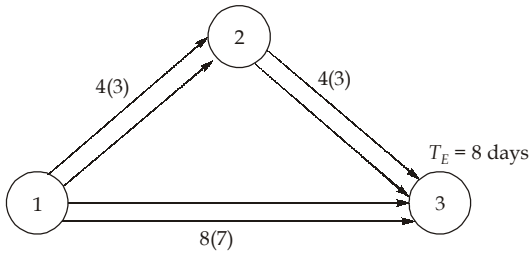
12. (a)



Total cost, T.C. = (4000 + 5000 + 8000) + 9 × 2000

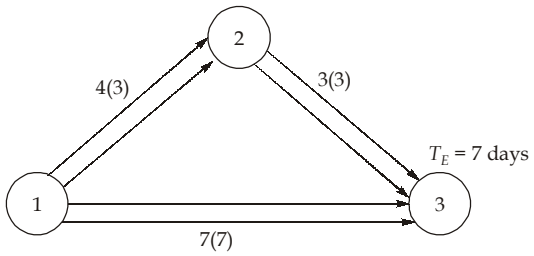
= 17000 + 18000 = Rs. 35000

Crashing activity 2–3 and 1–3 by 1 days:



T.C. = 35000 – 2000 + 1000 × 1 = Rs. 34000

Further crashing activity 2–3 and 1–3 by 1 day:

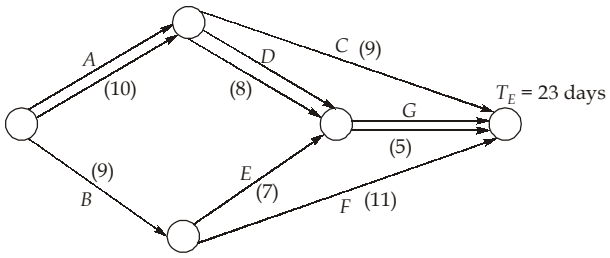


T.C = 34000 – 2000 + 4000 = Rs .36000

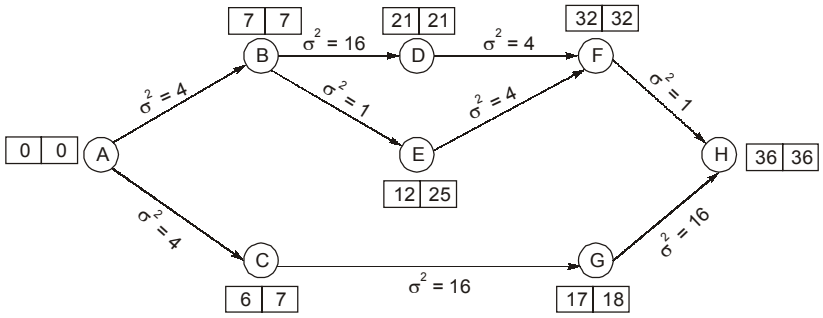
Hence minimum cost = Rs. 34000

Optimum duration = 8 days

13. (c)



14. (d)



Standard deviation of project,

$$\sigma = \sqrt{4+16+4+1} = 5 \text{ days}$$

$$Z = \frac{T_S - T_E}{\sigma} = \frac{31-36}{5} = -1$$

Thus, $P(t \le 31) = P(Z \le -1)$

$= 0.5 - \phi(1) = 0.5 - (0.8413 - 0.5)$

$= 0.1587 = 15.87\%$

15. (c)

Total volume of earth work in excavation,

$V = L \times B \times H$

$H = 800 + 300 + 300 + 60$

$= 1460$ mm

$B = 2000$ mm

$L = 1000$ mm ($\because$ Per meter length of footing is required)

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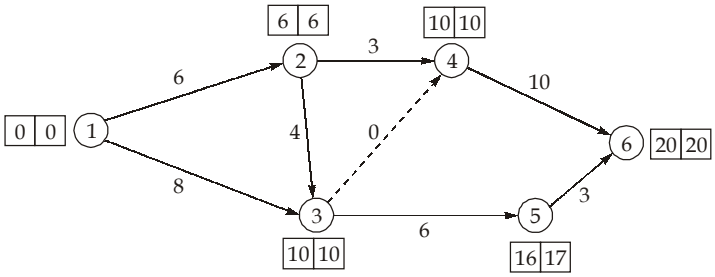
$$V = \frac{1460 \times 2000 \times 1000}{10^9}\ \text{m}^3$$

$$= 2.92\ \text{m}^3$$

16. (c)



Critical path is $1 \to 2 \to 3 \to 4 \to 6$

$\because$ Variance = 4

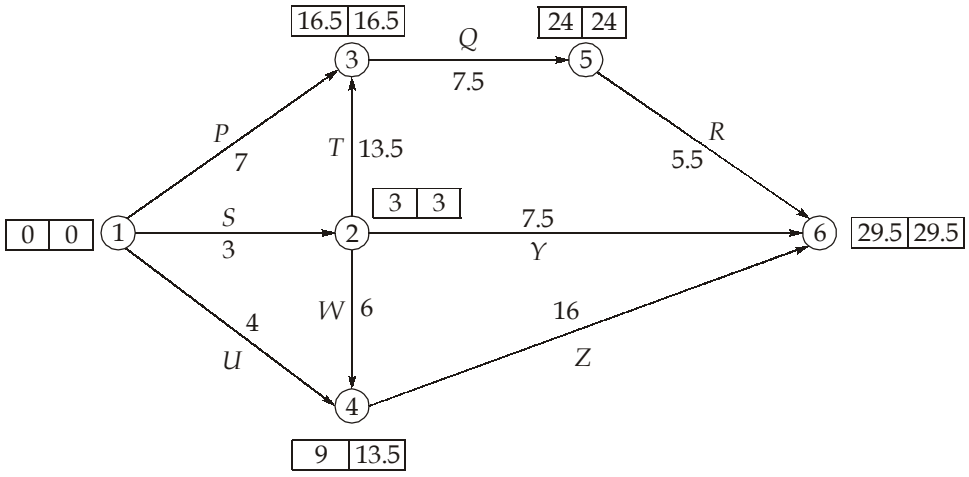
$\therefore$ Standard deviation = $\sqrt{\text{Variance}} = 2$

$$Z = \frac{X - \overline{X}}{2} = \frac{24 - 20}{2} = 2$$

$\therefore$ From given table,

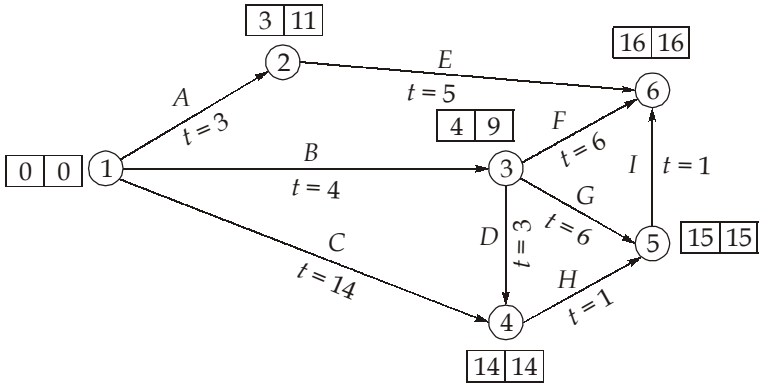
Probability ($Z = 2$) = 97.92%

17. (d)



50% probability corresponds to time required for all activities to be completed along critical path i.e., 29.5 days.

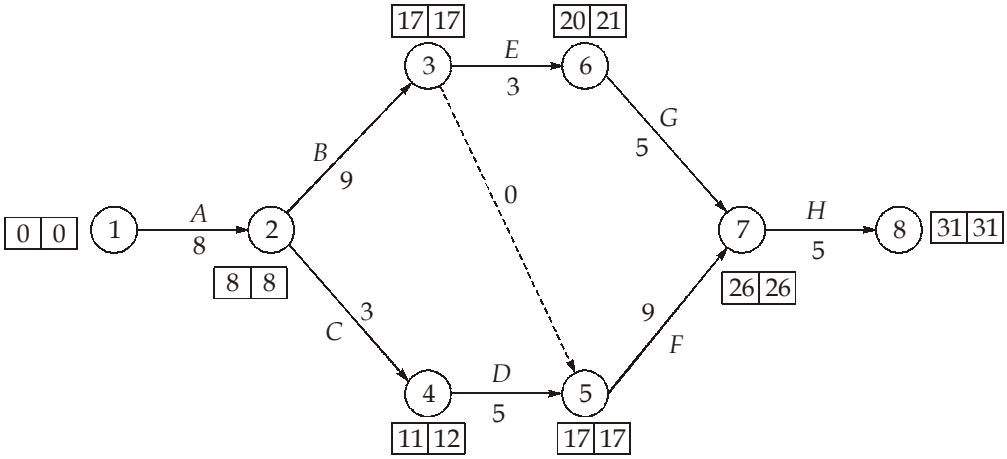
18. (a)



$$F_T = T_L^{\,j} - T_E^{\,i} - t_{ij}$$

$$\therefore \quad (F_T)_D = 14 - 4 - 3$$
$$= 7 \text{ days}$$

19. (d)



20. (d)

Limitation of bar chart:

(i) Lack of degree of details

(ii) Review of project progress

(iii) It does not show interdependencies and relationship between various activities of the project.

(iv) Time uncertainties

(v) It does not indicate the critical activities of the project.

21. (b)

Duration range is given by

$$T_E \pm 3\sigma = (9T \pm 3\sigma)$$

Standard deviation, $\sigma = \sqrt{\mu^2 + \mu^2 + \mu^2 + \mu^2 + \mu^2 + \mu^2 + \mu^2 + \mu^2 + \mu^2}$

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$$\Rightarrow \quad \sigma = 3\mu$$
$$\text{Duration range} = 9T \pm 3(3\mu)$$
$$= 9T \pm 9\mu$$

22. (b)

$\because$ FDDB (fixed factor for double decline balance method $= \frac{2}{n}$

Where, n is useful line of equipment in year.

Hence, $\text{FDDB} = \frac{2}{4} = \frac{1}{2}$

So, book value at the end of second year (B_2),

$$= C_i(1 - FDDB)^2$$
$$= 200{,}000\left(1 - \frac{1}{2}\right)^2$$
$$= \frac{200{,}000}{4} = \text{Rs. } 50{,}000$$

Hence option (b) is correct.

23. (b)

From table for $P = 95\%$

$$z = 1.6 + \frac{1.7 - 1.6}{99 - 91}(95 - 91) = 1.65$$

$$z = \frac{T_S - T_E}{\sigma}$$

Standard deviation, $\sigma = \sqrt{\text{Variance}} = \sqrt{16} = 4$ weeks

$$\therefore \quad 1.65 = \frac{T_S - 50}{4}$$
$$\Rightarrow \quad T_S = 56.6 \text{ weeks}$$

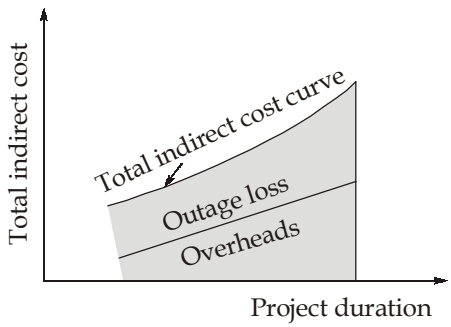
24. (d)

In resource levelling, project duration may get changed.

25. (c)

Indirect cost: Indirect cost of a project are those expenses which can not be assigned or associated to any individual activity of the project.

- Indirect cost is associated with a group of activities or project as a whole.



- Indirect cost always increases with time.
- Overheads increases linearly with time at constant rate but outage loss increase non-linearly with time.

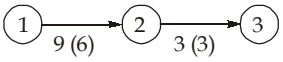
26. (b)

$$\text{Cost slope} = \frac{\Delta c}{\Delta t}$$

$$\text{For activity 1–2, cost slope} = \frac{9500 - 8000}{9 - 6} = \text{Rs. } 500$$

$$\text{For activity 2–3, cost slope} = \frac{5500 - 5000}{2} = \text{Rs. } 250$$

Since cost slope of activity 2–3 is less and hence crashing it by 2 days.



Total project duration = 12 days

$\therefore$ Total cost = 8000 + 5000 + 12 × 300 + 2 × 250 = Rs. 17100

27. (a)

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

$$t_{e_{AB}} = \frac{4 + 4 \times 6 + 8}{6} = 6 \text{ days}$$

$$t_{e_{BC}} = \frac{7 + 4 \times 7 + 9}{6} = 7.33 \text{ days}$$

$$t_{e_{CD}} = \frac{3 + 4 \times 4 + 9}{6} = 4.67 \text{ days}$$

$\therefore$Expected project duration= 18 days.

28. (c)

29. (b)

Effective cycle time = Forward time + Return time + Fixed time

$$= \left(\frac{100}{250 \times 0.8} + \frac{100}{300 \times 0.8}\right)60 + 25$$

= 80 seconds

Hence option (b) is correct.

30. (c)

$$P_{\text{avg}} = \frac{P(n+1) + S(n-1)}{2n} = \frac{30 \times (5+1) + 5(5-1)}{2 \times 5} = 20 \text{ lakhs}$$

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