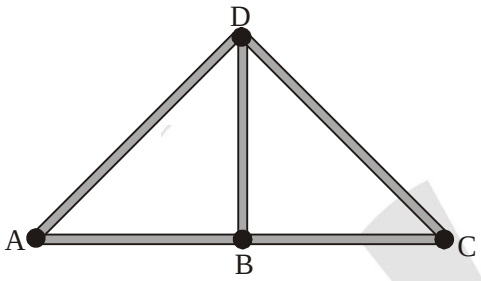
ANSWERS AND EXPLANATIONS

1. *Ans. (c)*

The frame is symmetrical in shape and size about a central vertical line. Therefore symmetrical loading about the centre line will not cause any side away.

2. *Ans. (b)*



King-Post Truss

The king post (BD) of the king post truss is a compression member. So the stress carried by the King-Post of King-Post roof truss is compressive in nature.

3. *Ans. (d)*

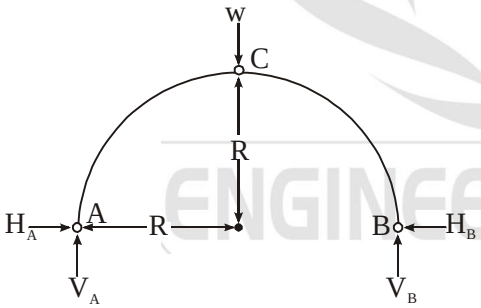
BM at fixed support

$$= \frac{wL^2}{12} \text{ (hogging)}$$

BM at mid span

$$= \frac{wL^2}{24} \text{ (sagging)}$$

4. *Ans. (a)*



Due to symmetry vertical reactions

$$V_A = V_B = \frac{w}{2}$$

Now from left

$$M_c = 0$$

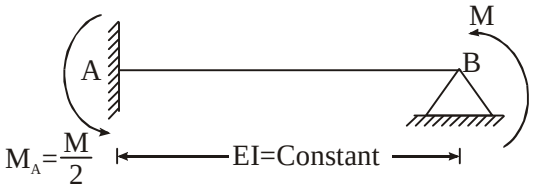
$$V_A \times R - H_A \times R = 0$$

$$H_A = V_A = \frac{w}{2}$$

$$H_A = H_B = \frac{w}{2}$$

5. *Ans. (c)*

6. *Ans. (c)*



Carry over factor

$$= \frac{\text{Carry over moment at farther end (A)}}{\text{Applied moment at near end (B)}}$$

$$\text{COF} = \frac{M_A}{M}$$

7. *Ans. (d)*

8. *Ans. (b)*

9. *Ans. (c)*

10. *Ans. (a)*

11. *Ans. (c)*

12. *Ans. (b)*

- Mild Steel $\rightarrow$ Fe250 0.53d
- HYSD $\rightarrow$ Fe415 0.48d
- HTS $\rightarrow$ Fe500 0.46d

13. *Ans. (c)*

14. *Ans. (b)*

Design bond strength for M30 concrete for HYSD-Steel in tension

$$= 1.5 \times 1.60 = 2.40$$

15. *Ans. (d)*

They are provided to resist shear cracks.

16. *Ans. (a)*

17. *Ans. (a)*

Shear stress diagram for rectangular RC-Beam is parabolic having zero at upper fibre and maximum at neutral-axis.

18. *Ans. (c)*

In a two way restrained slab torsional steel is provided at top and bottom.

19. *Ans. (b)*

20. *Ans. (a)*

21. ***Ans. (c)***

22. ***Ans. (c)***

As per codal recommendation, wind-load and earthquake loads are not considered simultaneously.

23. ***Ans. (c)***

24. ***Ans. (d)***

25. ***Ans. (d)***

26. ***Ans. (d)***

27. ***Ans. (a)***

28. ***Ans. (c)***

29. ***Ans. (c)***

Throat is the weakest section.

30. ***Ans. (b)***

31. ***Ans. (a)***

32. ***Ans. (a)***

33. ***Ans. (b)***

The major mode of failure in weld is 'Shear.'

34. ***Ans. (c)***

$$\text{Shape factor} = \frac{Z_p}{Z_e}$$

$$Z_p = \frac{A}{z}\left(\bar{y}_1 + \bar{y}_2\right)$$

$$= \frac{\pi D^2}{8}\left(\frac{2D}{3\pi} + \frac{2D}{3\pi}\right)$$

$$= \frac{\pi D^3}{6\pi} = \frac{D^3}{6}$$

$$Z_e = \frac{I}{y} = \frac{\pi D^4/64}{D/2} = \frac{\pi D^3}{32}$$

$$\text{Shape factor} = \frac{D^3/6}{\pi D^3/32} = \frac{16}{3\pi}$$

35. ***Ans. (c)***

36. ***Ans. (d)***

Aluminosilicates are the major component of kaolin and other clay minerals.

37. ***Ans. (b)***

$$\text{Activity} = \frac{\text{PI}}{\%\text{Weight finer than } 2\mu}$$

38. ***Ans. (a)***

0 – 25% humid soil.

25 – 50% damp soil.

39. ***Ans. (a)***

Time factor

$$T_v = \frac{C_v t}{d^2}$$

$$t \propto d^2$$

Where, d = Length of drainage path

$$d_1 = \frac{H}{2}$$

$$d_2 = H$$

So, 'd' is doubled then time taken will be four times.

So, the rate of compression will be four times slower.

40. ***Ans. (c)***

41. ***Ans. (c)***

For boiling condition

$$i = i_c$$

$$i = i_c = \frac{G-1}{1+e}$$

$$i \approx 1$$

For fine sand

$$G = 2.65,\ e = 0.65$$

42. ***Ans. (c)***

Porosity n = 0.375

$\therefore$ Void Ratio

$$e = \frac{n}{1-n}$$

$$e = \frac{0.375}{1-0.375} = 0.6$$

Specific gravity

$$G = 2.6$$

Critical hydraulic gradient

$$i_C = \frac{G-1}{1+e}$$

$$i_C = \frac{2.6-1}{1+0.6} = 1$$

43. ***Ans. (c)***

Coefficient of compressibility

$$a_v = \frac{\Delta e}{\Delta \bar{\sigma}} = \frac{0.7-0.6}{17.5-17.0}$$

$$= \frac{0.1}{0.5} = 0.2 \text{ m}^2/\text{t}$$

44. ***Ans. (c)***

For cohesive soils change in water content, changes it's state.

So, consistency as applied to cohesive soils is an indicator of its shear strength.

45. ***Ans. (c)***

Given, $I_P = 25$

$\%C = 15$

Activity ratio,

$$A_C = \frac{\%I_P}{\%C} = \frac{25}{15} = 1.67$$

46. ***Ans. (b)***

47. ***Ans. (b)***

For pure cohesive soils

$N_c = 5.7$

$N_q = 1$

$N_r = 0$

48. ***Ans. (c)***

49. ***Ans. (b)***

50. ***Ans. (b)***

$e_o = 1$

$e_f = 0.5$

$H_o = 2.4$ cm

$$\frac{\Delta H}{H_o} = \frac{\Delta e}{1+e_0}$$

$$\Delta H = \frac{0.5 \times 2.4}{1+1}$$

$\Delta H = 0.6$ cm

So, final thickness = 2.4 – 0.6 = 1.8 cm.

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