Branch: CIVIL ENGINEERING _MOCK-A SOLUTIONS

01. Ans: (B)

Sol: To avoid shrinkage cracks on the surface of rigid pavement reinforcement is provided near the top face of slab.

02. Ans: (A)

Sol: The given function is odd function since f(–x) = – f(x) .

For odd function $\int_{-1}^{1} f(x) = 0$

03. Ans: (2.82) **No Range**

Sol: Total volume = volume of bitumen + volume of aggregate

$$\frac{100}{G_t} = \frac{7}{G_b} + \frac{93}{G_a} \qquad \left[G = \frac{w}{V}\right]$$

$$\frac{100}{2.5} = \frac{7}{1.0} + \frac{93}{G_a}$$ (Assume total weight =100)

$G_a = 2.82$

04. Ans: (D)

Sol: P (x = 1) = 0.5 P (x = 2)

$$\frac{\lambda e^{-\lambda}}{1!} = \frac{1}{2}\frac{\lambda^2 e^{-\lambda}}{2!}$$

$\Rightarrow \lambda = 4$

$$P(x = 4) = \frac{\lambda^4 e^{-\lambda}}{4!}$$

$$= \frac{4^4 e^{-4}}{24} = \frac{32}{3} e^{-4}$$

05. Ans: (C)

Sol: Equivalency factor

$$= \left(\frac{\text{Actual wheel load}}{\text{Standard wheel load}}\right)^4 = \left(\frac{4100}{8200}\right)^4$$

$= 0.0625$

06. Ans : (C)

Sol: At critical condition, the upward pressure and downward pressures are equal at the junction of clay and sand.

upward pressure = downward pressure

$\gamma_w \times 5 = \gamma_{sat} \times (8 - h)$

$10 \times 5 = 20 \times [8 - h]$

$h = 5.50$ m

07. Ans: (B)

Sol: The given differential equation

$4y''' + 4y'' + y' = 0$

$\Rightarrow 4D^3 + 4D^2 + D = 0$

$\Rightarrow D(2D + 1)^2 = 0$

$D = 0, \frac{-1}{2}, \frac{-1}{2}$

$\therefore y_c = C_1 + (C_2 + C_3x)e^{-x/2}$

08. Ans: (B)

09. Ans : (C)

Sol: $C = \frac{100}{2} = 50\,\text{kPa}$

$q_{nu} = C\,N_C$

$N_C = 5\left[1 + 0.2\,\frac{D}{B}\right]\left[1 + 0.2\,\frac{B}{L}\right]$

$= 5\left[1 + 0.2 \times \frac{2}{1}\right]\left[1 + 0.2 \times \frac{1}{2}\right] = 7.7$

$\therefore q_{nu} = 50 \times 7.7 = 385$ kPa

10. Ans: (B)

Sol: $X = \frac{F_2 - F}{F - F_1}$

F_2 – Fineness modulus of coarse aggregate = 6.4

F_1 – Fineness modulus of fine aggregate = 2.8

F = Fineness modulus of combined aggregate fineness modulus=5.2

$X = \frac{6.4 - 5.2}{5.2 - 2.8} = 0.5$

Proportion of fine aggregate Y in percentage

$Y = \frac{X}{1 + X} \times 100$

$= \frac{0.5}{1 + 0.5} \times 100 = 33.33\%$

11 Ans: (0.35) No Range

Sol: Maximum intensity is the maximum of averages of two consecutive Rainfall intensities throughout the storm

Case -1: $\frac{1.5 \times 30 + 2.6 \times 30}{60} = 2.05$ cm/min

Case-2: $\frac{1.4 \times 30 + 2.8 \times 30}{60} = 2.1$ cm/min

$\therefore$ Maximum intensity = 2.1 cm/min

$= 2.1 \times \frac{10}{60}$ mm/sec

= 0.35 mm/sec

12 Ans: (A)

Sol: $P = \frac{1}{60}$ $q = \frac{59}{60}$

Probability of occurring atleast once means : Risk

$R = 1 - q^n$

$= 1 - \left(\frac{59}{60}\right)^{30} = 0.396$

13 Ans: (B)

Sol: In a short column subjected to pure axial loading , the strain variation is uniform with a value of 0.002.

14 Ans: (A)

Sol: Torsion reinforcement to be provided at restraint corners

$= \frac{3}{4}$(reinforcement required at midspan)

$= (3 \times 500)/4 = 375\ mm^2$

15 Ans: 125 Range: No range

Sol: Equivalent shear force = $V_u + \frac{1.6T_u}{b}$

$= 45 + \frac{1.6 \times 15 \times 1000}{300}$

$= 125\ kN$

16 Ans: (B)

Sol: Structure fails when the load exceeds design load or strength is less than characteristic strength or both. Since compressive load is equal characteristic strength, failure occurs only if strength of the structure is less than characteristic strength .

Probability = 0.05

17 Ans: (C)

Sol: When distance between outer most bolts in the direction of applied load is larger than 15 times the shank diameter of bolt (i.e long joint), the shear distribution is non uniform, the bolts at end of the joint are stressed more. the force shared by the end bolts so high may lead to progressive joint failure called unbuttoning.

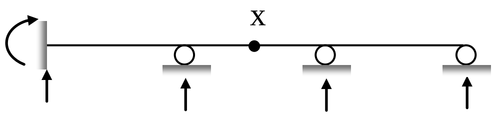
18 Ans: (A)

19. Ans: (D)

Sol: $\tau_{max} = \frac{9}{8} \times \tau_{avg} = \frac{9}{8} \times \frac{25000}{200 \times 200} = 0.703\ MPa$

20. Ans: (C)

Sol:



Unknown = 5

Equations $\Sigma F_y = 0, \Sigma M_o = 0$

$\Sigma M_x = 0$

$\therefore$ S.I = 5 − 3 = 2

21. Ans: (C)

Sol: $C = \sqrt{KRT} = \sqrt{1.4 \times 287 \times 288} = 340$ m/s

Here C = Velocity of light;

K = 1.4 for air;

R = Characteristic gas constant

$= 287 \frac{J}{kgK}$ for air;

T = Temperature in Kelvin scale = 273+15

= 288K

$\therefore$ Distance of lightning = 340 × 2 = 680 m

22. Ans: (D)

23. Ans: (D)

24 Ans: (C)

Sol: $\frac{dy}{dx} = 4x^3 e^{-y}$

Using variable separable method

$e^y = x^4 + c$

at x =1, y =0, $\Rightarrow$ c=0

$\Rightarrow e^y = x^4$

25. Ans: (D)

Sol: $z^2 + 9 = 0 \Rightarrow z = \pm 3i$

$z_0 = 3i$ lies inside the circle.

$$\therefore I = 2\pi i \lim_{z\to 3i} \frac{(z-3i)}{(z+3i)(z-3i)}$$

$$= 2\pi i . \frac{1}{6i} = \frac{\pi}{3}$$

26. Ans: 8.39 (Range: 8.2 to 8.6)

Sol: Given

S = 200 m

L = 1000 m

R = 500 m

L > S

$\therefore$ m = set back distance from the centre-line of the road.

m = R – (R–d) cos $\alpha/2$

d : distance between the centre line of the road and the centre line of the inside lane

$$d = 3.5\times 3 - \frac{3.5}{2} = 8.75 \text{ m}$$

$$\frac{\alpha}{2} = \frac{180S}{2\pi(R-d)}$$

$$\frac{\alpha}{2} = \frac{180\times 200}{2\pi(500-8.75)} = 11.66^o$$

m = 500 – (500 – 8.75) cos (11.66)

m = 18.89 m

$\therefore$ Distance form inner edge to obstruction

= 18.89 – 3.5 × 3

= 8.39 m

27. Ans: (D)

Sol: The Characteristic equation is

$$|A - \lambda I| = 0$$

$$\Rightarrow \begin{vmatrix} 4-\lambda & 1 \\ -1 & 2-\lambda \end{vmatrix} = 0$$

$\Rightarrow \lambda^2 - 6\lambda + 9 = 0$

$\Rightarrow \lambda = 3, 3$

The eigen vectors for $\lambda = 3$ are given by the equation [A – 3I]X = 0 where $X = \begin{bmatrix} x \\ y \end{bmatrix}$

$\Rightarrow x + y = 0$

$\therefore$ (x, y) = (2, –2) is an eigen vector

28. Ans: 0.7 Range (0.68 to 0.73)

Sol: $R_{ruling} = \frac{V^2}{127(e+f)}$

$$= \frac{120^2}{127(0.07+0.15)}$$

$\because$ Plain terrain, e = 0.07

$\simeq$ 516 m

$W_e = (W_m + Wps)$

$$= \left(\frac{n\ell^2}{2R} + \frac{v}{9.5\sqrt{R}}\right)$$

$$= \left(\frac{4\times 6^2}{2\times 516} + \frac{120}{9.5\sqrt{516}}\right)$$

$\simeq 0.7$ m

29. Ans: (C)

Sol: Coefficient of permeability, $k = C_v.\, m_v.\gamma_w$

Time factor, $T_v = \frac{\pi}{4}U^2$

Since both samples reach 50% consolidation.

$T_{VA} = T_{VB}$

$$\frac{C_{VA}.t_A}{d^2} = \frac{C_{VB}.t_B}{d^2}$$

$C_{VA}.t_A = C_{VB}.\, t_B$

$$\frac{C_{VA}}{C_{VB}} = \frac{t_B}{t_A} = 2$$

Coefficient of volume compressibility,

$$m_v = \frac{a_v}{1+e_0}$$

$$m_v = \frac{\Delta e}{\Delta\sigma(1+e_0)}$$

$$\frac{m_{VA}}{m_{VB}} = \frac{\left[\frac{0.52-0.48}{1.5\times(1+0.52)}\right]}{\left[\frac{0.63-0.6}{1.5(1+0.63)}\right]} = 1.43$$

$$\therefore \frac{k_A}{k_B} = \frac{C_{VA}}{C_{VB}} \times \frac{m_{VA}}{m_{VB}} = 2 \times 1.43 = 2.86$$

30. Ans: (B)

Sol: $g(x) = \frac{f(x)}{x+1}$

g(x) in continuous and differentiable in [0, 5].

By Lagrange's theorem, there exists a value $c \in (0, 5)$, such that

$$g^1(c) = \frac{g(5)-g(0)}{5-0} = \frac{\left(-\frac{1}{6}\right)-4}{5} = \frac{-5}{6}$$

31. Ans: 36.67 (Range: 36 to 38)

Sol: Relative density, $I_D = \frac{e_{max} - e}{e_{max} - e_{min}}$

Unit weight, $\gamma = 1.9 \times 9.81 = 18.639$ kN/m^3

$\gamma = \gamma_d(1 + w)$

$18.639 = \gamma_d(1 + 0.2)$

$\gamma_d = 15.53 = \frac{G\gamma_w}{1+e}$

$e = 0.69$

$$\therefore I_D = \frac{0.8-0.69}{0.8-0.5}\times 100 = 36.67\%$$

32. Ans: (D)

Sol:

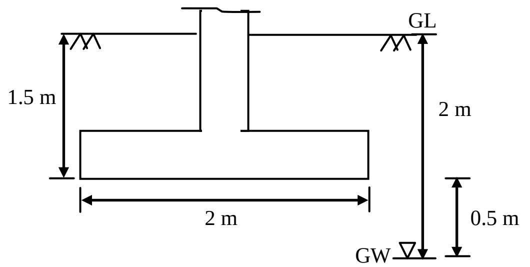
$$[A/B] = \begin{bmatrix} 1 & 2 & 3 & 14 \\ 1 & 4 & 7 & 30 \\ 1 & 1 & 1 & \lambda \end{bmatrix} \sim \begin{bmatrix} 1 & 2 & 3 & 14 \\ 0 & 2 & 4 & 16 \\ 0 & 0 & 0 & 2\lambda-12 \end{bmatrix}$$

To be consistent Rank of augmented matrix (ρ(A/B)) and Rank of A matrix should be equal.

$\rho(A/B) = \rho(A) = 2\lambda - 12 = 0 \Rightarrow \lambda = 6$

33. Ans: (A)

Sol:



Since the soil is loose deposit of silty sand and ϕ = 20° (<28°), local shear failure occurs.

$\therefore$ Effective cohesion, $C' = \frac{2}{3}C$

$$C' = \frac{2}{3}\times 1 = 0.67 \text{ t/m}^2$$

Ultimate bearing capacity,

$q_u = 1.3C' N_c^1 + \gamma D\ N_q^1 + 0.4\ B\ \gamma_a\ N'_\gamma$

For the depth of 2 m below the base of footing average unit weight.

$$\gamma_a = \frac{\gamma\times 0.5+\gamma'\times 1.5}{0.5+1.5}$$

$$= \frac{1.5\times 0.5+(2-1)\times 1.5}{2}$$

$\gamma_a = 1.125$ t/m^3

$\therefore q_u = 1.3\ 0.67\ \times 11.8 + 1.5\times 1.5\times 3.8 + 0.4$

$\times\ 2\ \times\ 1.125\ \times\ 1.3$

$q_u = 19.99$ t/m^2

34. Ans: (C)

Sol: Load carrying capacity of under reamed pile

$$\therefore Q = \frac{\pi}{4}\times d_s^{\ 2}\times C.N_c + \frac{\pi}{4}(d_u^{\ 2} - d_s^{\ 2}).C'.N_c$$
$$+\pi\times d_s(L-x).\alpha.C$$

Given

S for soft clay α =1, d_s = 0.2 , x = 0.5 m

$\therefore d_u = 2.5\ d_s$

$= 2.5 \times 0.2 = 0.5$ m

$$Q = \frac{\pi}{4}\times 0.2^2\times 50\times 9 + \frac{\pi}{4}(0.5^2 - 0.2)^2\times 50\times 9$$
$$+\pi\times 0.2\times(5-0.5)\times 1\times 50$$

$= 229.728$ kN $\simeq 230$ kN

35. Ans: (C)

Sol: We know that volumetric shrinkage (V_s)

$$V_s = \frac{V_\ell - V_d}{V_d}\times 100$$

$$\therefore (V_s)_{\text{at liquid limit}} = \frac{V_\ell - V_d}{V_d}$$

V_ℓ = volume at liquid limit

$$\Rightarrow 0.44 = \frac{V_\ell}{V_d} - 1$$

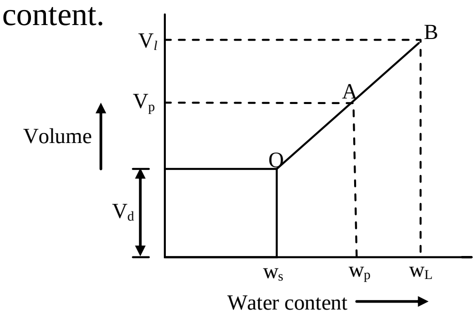
$\Rightarrow V_\ell = 1.44\ V_d$

$$(V_s)_{\text{at plastic limit}} = \frac{V_p - V_d}{V_d}$$

$$\Rightarrow 0.29 = \frac{V_p}{V_d} - 1$$

$\Rightarrow V_p = 1.29\ V_d$

Now using the graph between volume and water content.



As the slope of line OAB is constant slope of OA = slope of AB.

$$\frac{V_p - V_d}{w_p - w_s} = \frac{V_\ell - V_p}{w_L - w_p}$$

$$\Rightarrow \frac{1.29\,V_d - V_d}{0.33 - w_s} = \frac{1.44V_d - 1.29V_d}{0.47 - 0.33}$$

$$\Rightarrow \frac{0.29}{0.33 - w_s} = \frac{0.15}{0.14}$$

$w_s = 0.0593$

$w_s \approx 6\%$

36. Ans: 36 Range: No range

Sol:

Time (hr) (1)	4hr UH(m^3/s) (2)	S-curve addition (3)	S-curve (4)	Offset S-curve (5)	S-curve difference (6)	(S-curve difference) × $\frac{4hr}{6hr}$
0	0		0		0	0
2	9		9		9	6
4	20	0	20		20	13.33
6	35	9	44	0	44	29.33
8	43	20	63	9	54	**36**
10	22	44	66	20	46	30.67
		63		44		
		66		63		
				66		

∴ Max peak ordinate of 6hr UH = 36 m^3/s

37. Ans: (C)

Sol: Total load = 45kN/m

Moment of inertia = $400 \times \frac{600^3}{12}$

$= 72 \times 10^8\ mm^4$

Slope at supports due to pre stress = θ_1

$$= \frac{Pe\ell}{2E_cI} = \frac{1200 \times 1000 \times 150 \times 8000}{2 \times 30000 \times 72 \times 10^8}$$

$= 0.00333$ (upwards)

Slope at supports due to load

$$= \frac{w\ell^3}{24E_CI} = \frac{45 \times 8000^3}{24 \times 30000 \times 72 \times 10^8}$$

$= 0.004444$ (downwards)

Net slope (θ) = 0.00444-0.00333 = 0.00111 (downwards)

Increase in stress

$$= \frac{2e\theta}{\ell}E_s = \frac{2\times150\times0.00111}{8000}\times2\times10^5$$

= 8.325MPa

38. Ans: (C)

Sol: Number of ways we can distribute 5 red balls into 3 numbered boxes

= C(3–1+5, 5)

= 21

Similarly we can distribute 5 white balls in 21 ways and 5 blue balls in 21 ways.

By product rule, required number of ways = (21) (21) (21) = 9261

39. Ans:14.14 Range: (14 - 15)

Sol: b = 200mm ; d = 500mm

Case I:

Beam is designed as balanced section

Depth of neutral axis = 0.48d for Fe415 steel

= 0.48×500= 240mm

$0.36f_{ck}bx_u = 0.87f_yA_{st}$

$0.36 \times 25 \times 200 \times 240 = 0.87 \times 415A_{st,1}$

$A_{st,1} = 1196.5\ mm^2$

Limiting moment of resistance

$= 0.138f_{ck}bd^2 = 0.138 \times 25 \times 200\times 500^2$

= 172.5kNm

Case II:

Moment to be resisted by compressive steel = 200-172.5 = 27.5kNm

Corresponding area of tensile steel required $= A_{st,2}$

$0.87f_yA_{st,2}(d - d') = 27.5 \times 10^6$

$0.87 \times 415 \times A_{st,2}(500 - 50) = 27.5 \times 10^6$

$A_{st2} = 169.26mm^2$

Total area of steel = 1196.5+169.26

$= 1365.76mm^2$

Percentage increase in tensile steel

= 169.26/1196.5 ×100 = 14.14%

40. Ans: (D)

Sol: Effective length of fillet weld $L_w = 2 \times 120 + 100 = 340$ mm

Effective throat thickness $t_t = K \times S$

$= 0.7 \times 5$

= 3.5 mm

Design force P = Smaller of design axial strength of plate (P_{dp}) and design shear strength of fillet weld (P_{dw})

Design shear strength of fillet weld

$P_{dw} = L_w\times t_t \times f_u/\sqrt{3}\times\gamma_{mw}$

$= 340\times3.5\times410/\sqrt{3}\times1.25$

$= 225.35\times10^3$ N = 225.35 kN

Design axial strength of plate

$P_{dp} = A_g\times f_y/\gamma_{mo}$

=100×10×250/1.10

$= 227.27\times10^3$ N = 227.27 kN

Design force P = Smaller of P_{dp} and P_{dw}

= 225.35 kN

41. Ans: (B)

Sol: ρ = 950 kg/m^3; μ = 0.2 N.s/m^2; D = 0.1 m

$$\frac{P_1 - P_2}{L} = \frac{32\mu v_{avg}}{D^2}$$

$$V_{avg} = \frac{(P_1 - P_2)D^2}{32\mu L} = \frac{10\times10^3\times0.1^2}{32\times0.20\times10}$$

= 1.5625 m/s

Wall shear stress $\tau_w = \frac{1}{2}\frac{dp}{dx}\times R = \frac{4\mu V_{avg}}{R}$

$$\tau_w = \frac{4\times0.2\times1.5625}{0.05} = 25\ \text{N/m}^2$$

42. Ans: (A)

Sol: $F_{V_p} = F_{V_m}$

$$\frac{V_P^2}{\ell_p g_p} = \frac{V_m^2}{\ell_m g_m}$$

$$\therefore\ V_m = V_p\times\sqrt{\frac{\ell_n}{\ell_p}\times\frac{g_m}{g_p}}$$

$$= 15\times\sqrt{\frac{1}{30}}\times1 = 2.74\ \text{m/s}$$

$$F_P = F_m\times\frac{P_P}{P_m}\times\left(\frac{R_P}{\ell_m}\right)^2\times\left(\frac{V_P}{V_m}\right)^2$$

= 25 × 1 × 30^2 m = 2.74^2

$\therefore$ F_P = 168921 N =169kN

43. Ans: (D)

Sol: For hydraulic jump in rectangular channel

$$\frac{2q^2}{g} = y_1y_2(y_1+y_2)$$

$$q^2 = \frac{0.2\times1(1+0.2)}{2}\times9.81$$

q^2 = 1.1772

q = 1.085 m^3/s/m

$$\therefore\ \frac{Q}{B} = q$$

Q = 1.085 ×4

Q = 4.34 m^3/sec

44. Ans: (C)

Sol: $T_1 = \frac{t_i}{\sum t_i}$

$$T_1 = \frac{25}{25+23+40} = 0.284$$

$$T_2 = \frac{23}{25+23+40} = 0.261$$

$$T_3 = \frac{40}{25+23+40} = 0.455$$

Equivalent noise level

$$L = 10\log_{10}\sum\left(10^{\frac{Li}{10}}\times T_i\right)$$

$$= 10\log_{10}\Sigma\left(10^{\frac{95}{10}}\times0.284 + 10^{\frac{120}{10}}\times0.261 + 10^{\frac{70}{10}}\times0.455\right)$$

= 114.18 dB

45. Ans: (B)

Sol: Total marbles = 10 + 30 + 20 + 15 = 75

P[both are white] = P[first is white and second is white]

$$= \frac{35}{75}\times\frac{35}{75} = \frac{4}{25}$$

46. Ans: (C)

Sol: Sulphur containing in coal = $\frac{2.5}{100}\times 8000$

= 200 kg/hr

$$= \frac{200\times 10^3\,\text{gm}}{1\times 60\times 60\,\text{sec}}$$

= 55.56 gm/sec

$$\underset{32}{S} + \underset{2\times16}{O_2} \rightarrow \underset{64}{SO_2}$$

32 gm of S produce = 64 gm of SO_2

1 gm of S produce = 2 gm of SO_2

55.56 gm/sec of S produce

= 2× 55.56 of SO_2

SO_2 emission = 111.12 gm/sec

47. Ans: (C)

Sol: $K_{D,T} = K_{D,20°}(1.047)^{T-20°}$

$K_{D,30°} = 0.1\times(1.047)^{30-20}$

= 0.158

To find ultimate BOD,

$y_t = L\,(1 - (10)^{-K_D t})$

$110 = L(1-(10)^{-0.158\times 5})$

L = 131.3 mg/*l*it

To find 5-days, 20°C BOD

$y_t = L(1-(10)^{-K_D t})$

$y_5 = 131.3(1-(10)^{-0.1\times 5})$

y_5 = 89.8 mg/*l*it

48. Ans: (D)

Sol: Supply of water to be treated per day

= 2.7 × 10^6 litres/day

Supply of water to be treated during the detention period of 4 hours. The capacity of the tank

$$= \frac{2.7\times 10^6}{24}\times 4 = 0.45\times 10^6 \text{ litres}$$

= 450 m^3

Length of tank = Flow velocity × detention time

= 12 × 4 × 60

= 2,880 cm

= 28.80 m

Cross sectional area of the tank

$$= \frac{\text{Capacity of the tank}}{\text{Length of the tank}}$$

$$= \frac{450}{28.8} = 15.625 \text{ m}^2$$

49. Ans: (B)

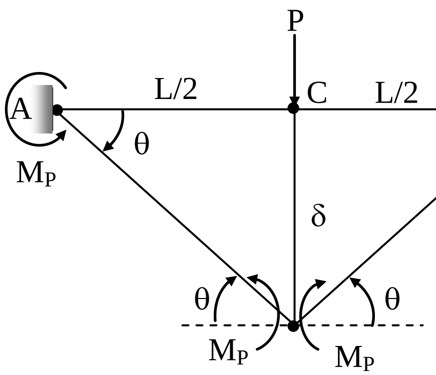
Sol: Static indeterminacy D_s = r – s

= 4 – 2

= 2

No. of plastic hinges required to form a mechanism 'n' = $D_s + 1 = 3$

1st possibility : Plastic hinges at A,C & B

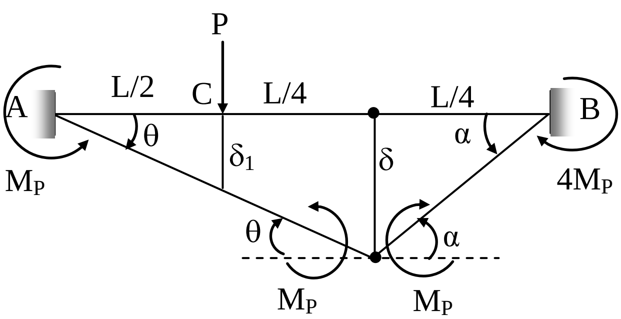


Using virtual work method

$$P_u \times \frac{L}{2}\theta = 7M_P\theta$$

$$P_u = \frac{14M_P}{L}$$

2nd possibility : Plastic hinges at A. D and B



$$P_u \times \frac{L}{2}\theta = 2M_P\theta + 5M_P\alpha$$

$\delta = \delta$

$$\frac{3L}{4}\theta = \frac{L}{4}\alpha$$

$\alpha = 3\theta$

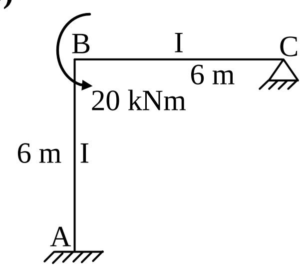
$$P_u \frac{L}{2}\theta = 2M_P\theta + 5M_P(3\theta)$$

$$P_u = \frac{34M_P}{L}$$

Lower load will be the collapse load is $\frac{14M_P}{L}$

50. Ans: (B)

Sol:



Equivalent stiffness at joint B

$$= K_B = \frac{4EI}{L} + \frac{3EI}{L}$$

$$= \frac{7EI}{L}$$

$$K_B = \frac{M}{\theta_B}$$

$$\theta_B = \frac{M}{K_B} = \frac{20}{\frac{7EI}{6}} = \frac{120}{7EI}$$

51. Ans: (B)

Sol: $\Sigma M_B = 0$

$V_A \times 20 - P(20-X) = 0$

$$V_A = \frac{P(20-X)}{20}$$

& $\Sigma M_C = 0$ (from left)

$-H_A \times 5 + V_A \times 10 - P \times (10-X) = 0$

$$-5H_A + \frac{P(20-x)}{20} \times 10 - P(10-X) = 0$$

$\rightarrow H_A = \frac{PX}{10}$

Given that left hinge reaction is inclined with a slope of two vertical on one horizontal

$\therefore \frac{V_A}{H_A} = \frac{2}{1} \Rightarrow V_A = 2H_A$

$\frac{P(20-X)}{20} = 2\frac{PX}{10}$

P(20 – X) = 4PX

$\therefore$ X = 4 m from left support

52. Ans: 8000 **Range: No range**

Sol: D = KS + C

for anallatic lens

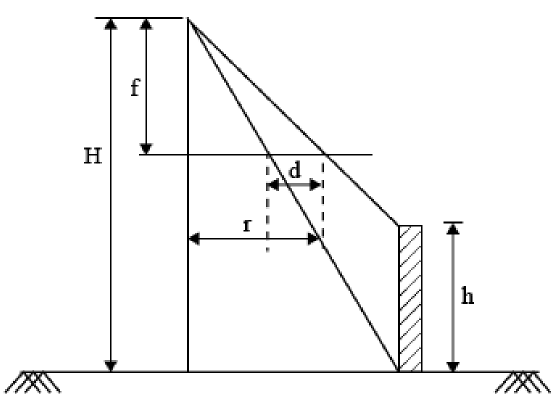
K = 100, C = 0, given S = 0.8 m

D = 0.8 × 100 + 0

= 80 m = 8000 cm

53. Ans: (B)

Sol: Given



H → Flying height of a camera

H = 1000 m

r → Distance of top of a minar from nadir point

$r = 10 \text{ cm} = \frac{10}{100} \text{m} = 0.1\text{m}$

d → relief displacement

$d = 7.2 \text{ mm} = \frac{7.2}{1000} \text{m} = 0.0072\text{m}$

h → height of the tower ?

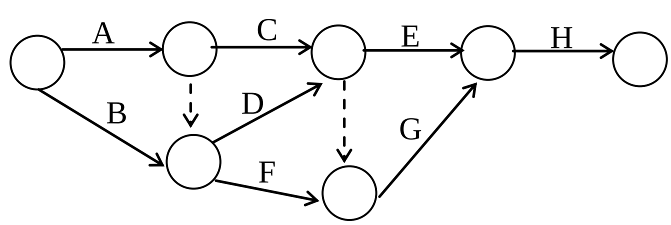
To calculate the height of tower, when relief displacement is given use the formula,

$h - \frac{dH}{r}$

$\therefore h = \frac{0.0072 \times 1000}{0.1} = 72 \text{ m}$

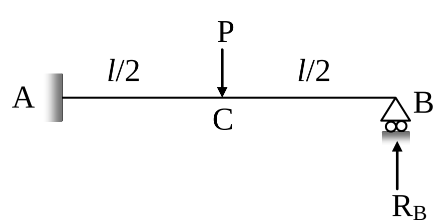
54. Ans: (C)

Sol:



55. Ans: (C)

Sol:

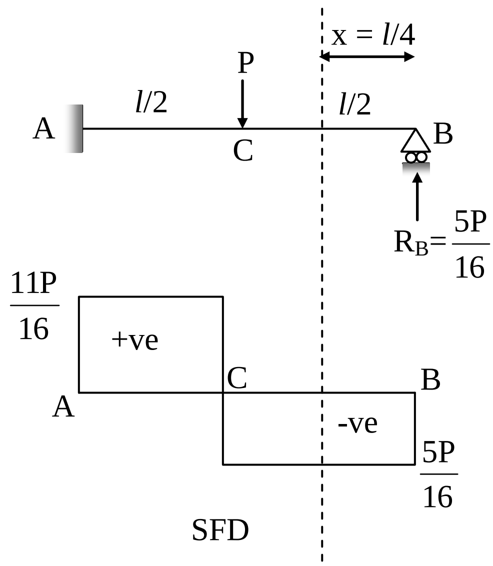


$\downarrow (y_p)_B = \uparrow (y_{R_B})_B \rightarrow$ Compatibil ity condition

$$\frac{P\left(\frac{\ell}{2}\right)^3}{3EI} + \frac{P\left(\frac{\ell}{2}\right)^2}{2EI}\left(\frac{\ell}{2}\right) = \frac{R_B \ell^3}{3EI}$$

$$\frac{5P\ell^3}{48EI} = \frac{R_B \ell^3}{3EI}$$

$$\therefore R_B = \frac{5P}{16}$$



$\therefore$ S.F. @ $\frac{L}{4}$ from prop = $\frac{5P}{16}$

56. Ans: (A)

Sol: Vulgarity (n.) means offensive speech or conduct.

57. Ans: (A) **58. Ans: (B)**

59. Ans: (A)

Sol: Cylinder volume = $\pi r^2 h = \frac{22}{7} \times 10 \times 10 \times 14 = 4400\ m^3$

60. Ans: (D)

Sol: Speed = 10 kmph = $10 \times \frac{5}{18} m/\sec$

$$= \frac{50}{18} m/\sec$$

Man walks 50 m in 18 sec.

61. Ans: (D)

Sol: Rate downstream = (24/2) kmph = 12 kmph.

Rate upstream = (24/4) kmph = 6 kmph.

Therefore, speed in still water

= 1/2 × (12 + 6) = 9 kmph.

62. Ans: (B)

Sol: Let principle be 4. Then amount = $4 \times \frac{7}{4} = 7$

Interest = 7 - 4 = 3

Rate of interest $= \frac{3 \times 100}{4 \times 4} = 18\frac{3}{4}\%$

63. Ans: (C)

Sol: Net part filled in 1 hour

$$= \frac{1}{10} + \frac{1}{12} - \frac{1}{20} = \frac{6+5-3}{60}$$

$$= \frac{11-3}{60} = \frac{8}{60} = \frac{2}{15}$$

The tank will be full in $\frac{15}{2}$ hrs

= 7 hrs.30 min.

64. Ans: (A)

Sol: Share of wealth that C gets (in Rs lakhs)

= 20

Tax = 40%

$\Rightarrow$ Wealth tax (in Rs lakhs) that C has to pay

$= \frac{40}{100} \times 20 = 8$

65. Ans: (A)

Sol: Note that an assumption is like a premise in that if it is wrong the argument is invalid, and if it is right it supports the conclusion. If the statement in (A) is correct, it supports the idea that point and shoot is not art, but if it is wrong, and choosing what to point the camera at involves art, then the argument is invalid. Hence, (A) is an assumption.