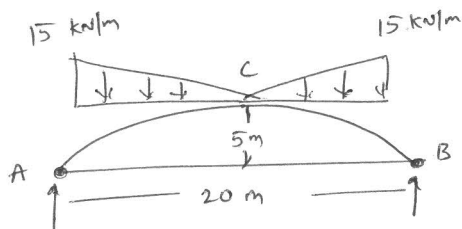


Analysis determinate structures

IAT-2. [Solution]

①

1)
b)



$$\rightarrow V_a = V_b = \frac{1}{2} \times 10 \times 15 = 75 \text{ kN}$$

→ Taking moment about C, of the forces on the left forces of C

$$H \times 5 + 75 \times \frac{2}{3} \times 10 = 75 \times 10$$

$$\therefore H = \underline{50 \text{ kN}}$$

(4)

→ The eqn to the parabola with the crown C as origin

$$y = \frac{4h}{l^2} x^2 = \frac{4 \times 5}{20 \times 20} x^2$$

$$\underline{y = \frac{x^2}{20}}$$

(4)

→ consider the equilibrium of the part C,

$$M_x = 50 \cdot \frac{x^2}{20} - \frac{1}{2} x \cdot \frac{3x}{2} \cdot \frac{x}{3}$$

$$M_x = \frac{5}{2} x^2 - \frac{x^3}{4}$$

(4)

→ For B.M to be Max, $\frac{dM_x}{dx} = 0$

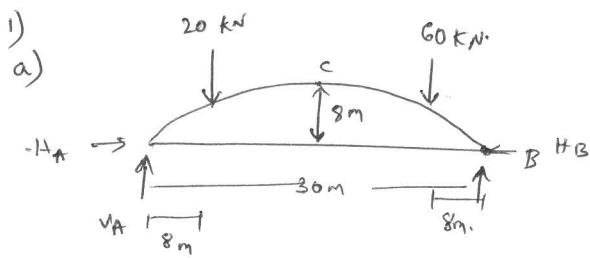
$$= 5x - \frac{3}{4} x^2 = 0$$

$$\therefore x = \underline{\frac{20}{3} \text{ m}}$$

$$\text{Max} = \frac{5}{2} \left(\frac{20}{3}\right)^2 - \frac{1}{4} \left(\frac{20}{3}\right)^3$$

(4)

$$= \underline{37.03 \text{ kN/m}}$$



$$V_A + V_B = 20 + 60$$

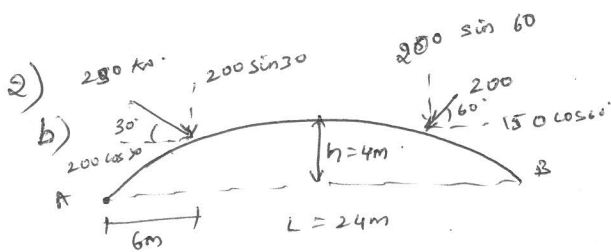
$$\sum M_A = 0, \quad V_B \times 30 = (60 \times 22) + 20(8)$$

$$V_B = \frac{1360}{30} = \underline{45.33 \text{ kN}} \quad (2)$$

$$\sum M_c = 0,$$

$$+ V_B \times 15 + H_B \times 8 = 60 \times 7 = 420 \quad (2)$$

$$\underline{H_B \times 8 = 46.8 \text{ kN}}$$



$$y = \frac{4hx}{L^2} (L-x)$$

$$= \frac{4 \times 4 \times 6}{(24)^2} (24-6)$$

$$\textcircled{a} \text{ D} = \underline{3 \text{ m}}$$

$$\textcircled{a} \text{ E} = \underline{3.55 \text{ m}}$$

$$\sum M_A = 0$$

$$V_B \times 24 + 200 \cos 60^\circ \times 3.55 - 200 \sin 60^\circ \times 16 - 200 \sin 30^\circ \times 6 - 250 \cos 30^\circ \times 3 = 0$$

$$V_B = \frac{355}{24} \text{ kN} - 2771.2 - 750 - 649$$

$$\boxed{V_B = 158.9 \text{ kN}} \quad (4)$$

$$\boxed{V_A = 139.2 \text{ kN}} \quad (4)$$

$$\sum H = 0$$

$$= V_B(12) - H \times 4 - 200 \sin 60 (4) - 200 \cos 60 (0.44)$$

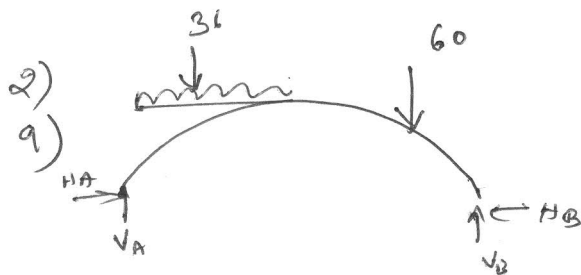
$$\boxed{H = 292.54 \text{ kN}} \quad (4)$$

$$\text{B.M } M_D = -176.15 \times 3 + 139.2 \times 6$$

$$= \underline{307.05 \text{ kN-m}}$$

$$M_E = -292.6 \times 3.56 + 158.95 \times 8$$

$$= \underline{229.766 \text{ kN-m}} \quad (4)$$



$$V_A + V_B = 60 + (36 \times 18)$$

$$= 708$$

$$\sum M_B = 0$$

$$V_A \times 36 - 60 \times 9 - 36 \times 18 \times 18.7 = 0$$

$$V_A = 501 \text{ kN}$$

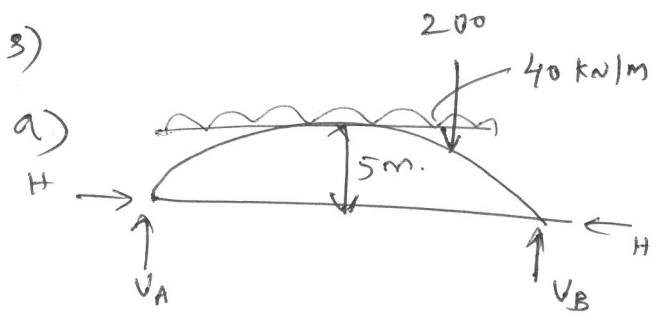
$$V_B = 207 \text{ kN}$$

(2)

Taking moment about C

$$\boxed{H = 531 \text{ kN}}$$

(2)



→ $\Sigma M_A = 0$

$$20V_B = (40 \times 20 \times 10) + (200 \times 15)$$

$$= 550 \text{ kN}$$

(4)

→ $\Sigma V = 0$

$$V_A + V_B = 200 + (40 \times 20)$$

$$= 450 \text{ kN}$$

→ $\Sigma M_C = 0$

$$5H = 5500 - 1000 - 2000$$

$$\therefore H = 500 \text{ kN}$$

(7)

→ $\tan \theta = 0.5$

$$\therefore \theta = 26.56$$

(4)

→ B.M @ D

$$\Sigma M_D = -V_A \times 5 + H (3.75) + 40 \times 5 \times 5/2$$

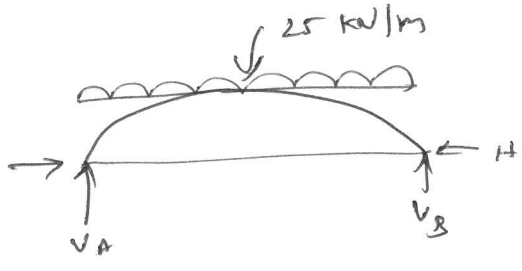
$$= 125 \text{ kN/m}^2$$

$$N = 178.5 \text{ kN}$$

$$F = 469.5 \text{ kN}$$

(4)

3b)



$$\rightarrow \Sigma M_A = 0 = -V_B(25) + 25 \times \frac{25^2}{2}$$

$$\therefore V_B = \frac{25 \times 25}{2} = \underline{312.5 \text{ kN}}$$

$$\rightarrow \Sigma V = 0$$

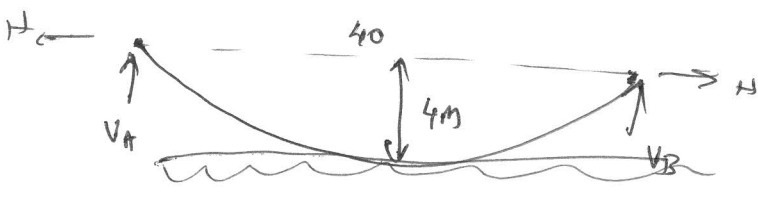
$$V_A + V_B = 25 \times 25 \quad (2)$$

$$= \underline{312.5 \text{ kN}}$$

$$\rightarrow \Sigma M_C = V_B(12.5) - H(5) - 25 \times \frac{25}{2} \times \frac{25}{4}$$

$$\therefore H = \underline{390.6 \text{ kN}} \quad (2)$$

4)



$$\Sigma M_A = 0,$$

$$V_B \times 40 - 10 \times 40 \times \frac{40}{2} = 0$$

$$\therefore V_B = \underline{200 \text{ kN}}$$

$$\therefore V_A = 200 \text{ kN} \quad \left| \therefore V_A = V_B = \frac{wl}{2} \quad (4)$$

$$\Sigma M_B = 0,$$

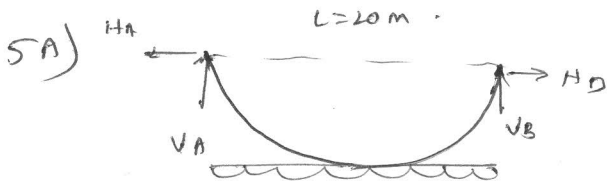
$$V_B \times 20 - H_B \times 4 - 10 \times 20 \times \frac{20}{2} = 0$$

$$\therefore H = \frac{wl^2}{8h} = \underline{500 \text{ kN}} \quad (2)$$

$$\rightarrow \text{Max tension, } T_{\max} = \sqrt{V^2 + H^2} = \sqrt{200^2 + 500^2} \quad (2)$$

$$= 538.1 \text{ kN}$$

$$\rightarrow \text{Length of cable, } L_c = L + \frac{8h^2}{31} = \underline{41.06 \text{ m}} \quad (2)$$



$$\sum M_A = 0,$$

$$V_B \times 20 - 20 \times 20 \times \frac{20}{2} = 0$$

$$\underline{V_B = 200 \text{ kN}} \quad (2)$$

$$V_A + V_B = 20 \times 20$$

$$\therefore \underline{V_A = V_B = 200 \text{ kN}} \quad (2)$$

(b) horizontal reaction

$$\sum M_C = 0$$

$$V_B \times 10 - H_B \times 4 - 20 \times 10 \times \frac{10}{2} = 0$$

$$H = \frac{wL^2}{8h} = \underline{250 \text{ kN}} \quad (2)$$

(c)

$$T_{\max} = \sqrt{V^2 + H^2} = \sqrt{200^2 + 250^2} = 320.15 \text{ kN}$$

$$T_{\text{act}} = \sqrt{H^2} = \underline{250 \text{ kN}} \quad (2)$$

$$L_c = \frac{L + 8h^2}{31} = \underline{22.13 \text{ m}} \quad (2)$$