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Section :- A

Subject :- Structure - I

Assignment :- 04

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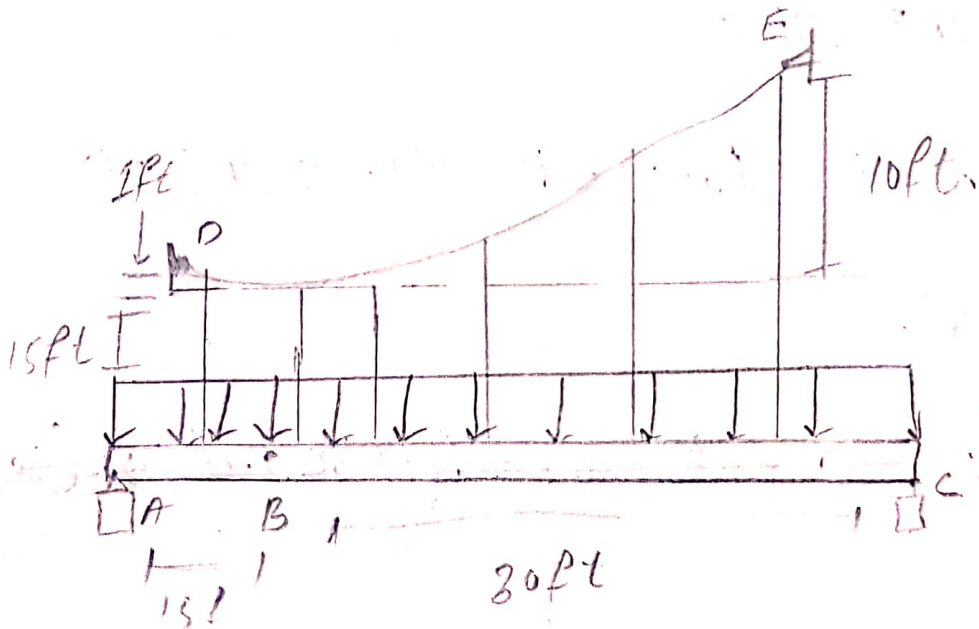
Date :- 13 July 2020

Assignment 10#04

Cables and Arches

Question #01

Determine the maximum and minimum tension in the parabolic cable and the force in each of the hangers. The girder is subjected to the uniform load and is pin connected at B.



Solution:-

②

Member BC

$$\sum F_x = 0$$

$$B_x = 0$$

Member AB

$$\sum F_x = 0$$

$$A_x = 0$$

moment at A

$$\left(\sum M_A = 0 \quad F_H(1) - B_y(15) - 45(7.5) = 0 \quad \text{--- (1)} \right)$$

FBD

$$\left(M_C = 0 - F_H(16) - B_y(30) + (45)(30) = 0 \right)$$

$$\boxed{F_H = 153.4} \quad B_y = 0$$

$$\omega_0 = \frac{2F_4 h}{L^2} = \frac{2(153.4)(10)}{30^2}$$

$$= \frac{3068}{900} = 3.40$$

$$\boxed{\omega_0 = 3.40 \text{ k/ft}}$$

$$F_{\max} = \omega_0 L \sqrt{1 + \left(\frac{L}{24}\right)^2}$$

$$= 3.4(30) \sqrt{1 + \left(\frac{30}{2(10)}\right)^2}$$

$$\boxed{F_{\max} = 183.6 \text{ k}}$$

Each hinges carries sfd of ω_0

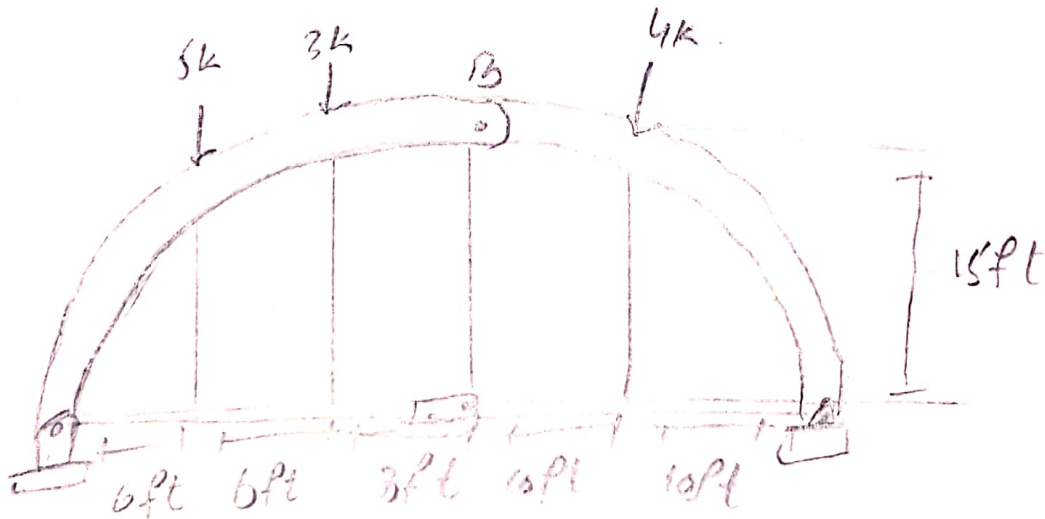
$$T = (5 \text{ ft})(3.4 \text{ k/ft})$$

$$\boxed{T = 17 \text{ k}}$$

(14)

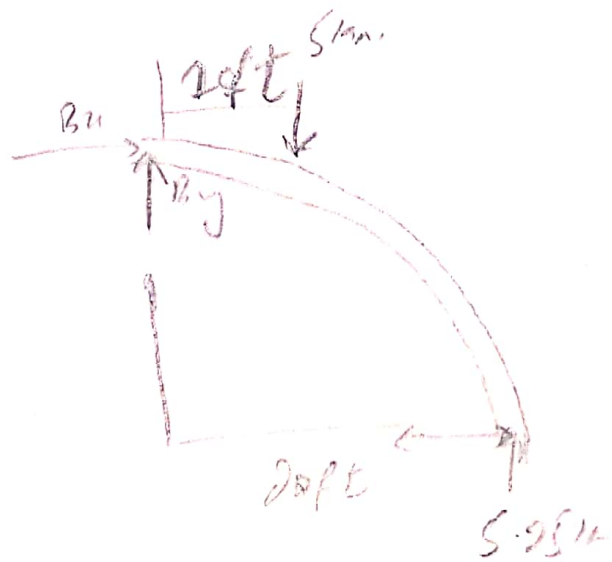
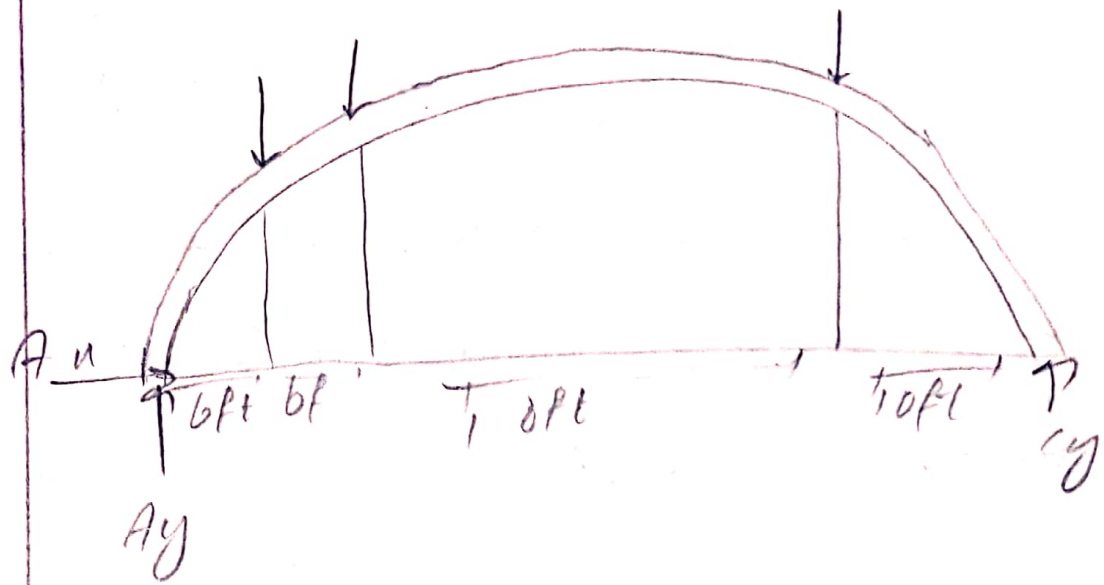
question #02

The tied three-hinged arch is subjected to the loading shown. Determine the components of reaction at A and C and the tension in the rod.



SOLUTION:-

5



Entire arch h.o.

$$\sum M_A = 0 ; -4(6) - 3(12) - 4(30) + C_y(40) = 0$$

$$C_y = 5.25 \text{ k}$$

⑥

$$+\uparrow \sum F_y = 0$$

$$A_y + 5 \cdot 25 - 4 - 3 - 5 = 0$$

$$A_y = 6.75 \text{ k}$$

$$+\rightarrow \sum F_x = 0 \quad A_x = 0$$

SECTION BC :-

$$\downarrow + \sum M_B = 0$$

$$-4(10) - T(15) + 5 \cdot 25(20) = 0$$

$$\boxed{T = 3.67 \text{ k}}$$

