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Subject # Structural Analysis

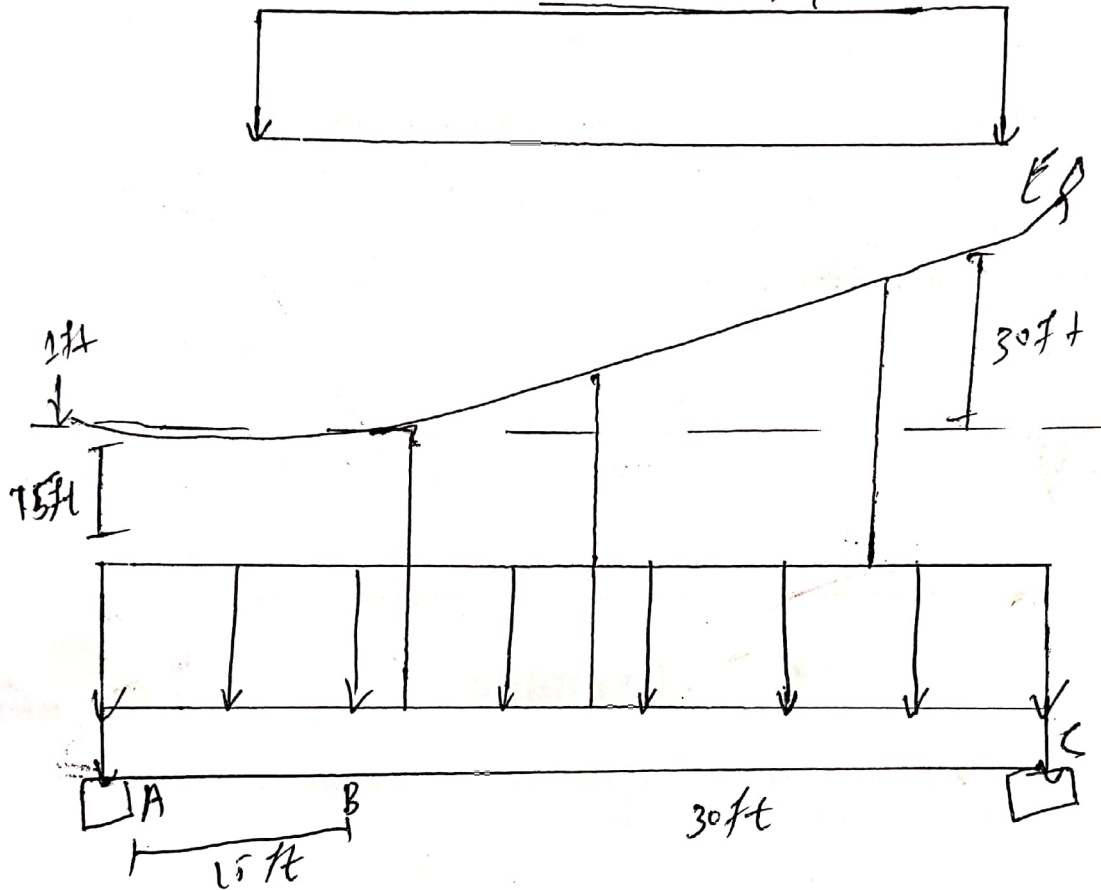
Assignment # 04

Date : 13 July 2020

1

Cables and Arches

Q# 1) Determine the maximum and minimum tension and the parabolic cable and the force in each of the hangers. The girder is subjected to the uniform load is pin connected at B



Solution: Member BC

$$\sum F_x = 0$$

$$B_x = 0$$

Member AB

$$\sum F_x = 0$$

$$A_x = 0$$

member at A

$$\sum A = 0 \Rightarrow -F_H(10) - B_y(30) + (15)(30) = 0$$

$$F_H = 153.4 \quad B_y = 0$$

$$w_0 = \frac{2FHh}{L^2} = \frac{2(153.4)(10)}{(30)^2}$$

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

$$w_0 = 3.40 \text{ k/ft}$$

$$F_{\max} = w_0 L \sqrt{1 + \left(\frac{L}{2h}\right)^2}$$

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

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

Each hanger carries 5 ft of wt

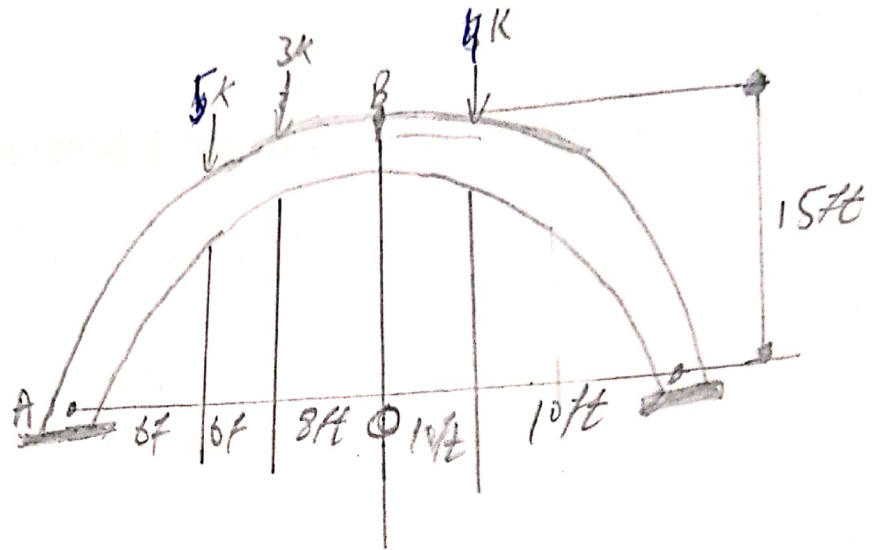
~~$$T = (5 \text{ ft})(3.40 \text{ k/ft})$$~~

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

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

①

Q#2



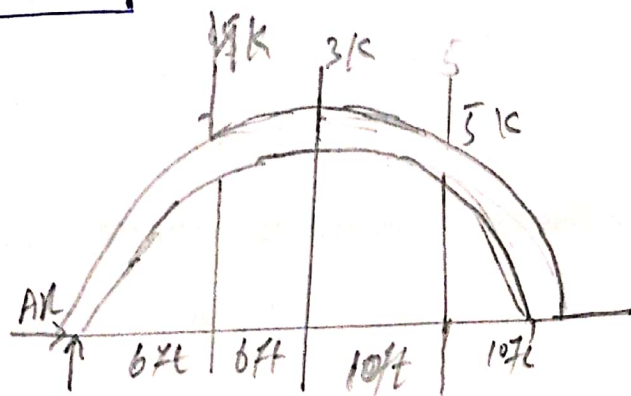
Entire Arch:

$$\sum M_A = 0;$$

$$-4(6) - 3(12) - 5(30) + C_y(40) = 0$$

$$C_y = 5.75 K$$

$$\sum F_y = 0;$$



$$A_y + 5.75 - 4 - 3 - 5 = 0$$

$$A_y = 6.75 K$$

②

$$\rightarrow \sum F_H = 0 \quad A_H = 0$$

Section BC:

$$\curvearrowright \sum M_B = 0$$

$$-5(10) - T(15) + 5.25(20) = 0$$

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

