Assignment No #4.

Topic : Cables and Arches

Subject : Structure- I

ID : 7940

Section : B

Submitted By

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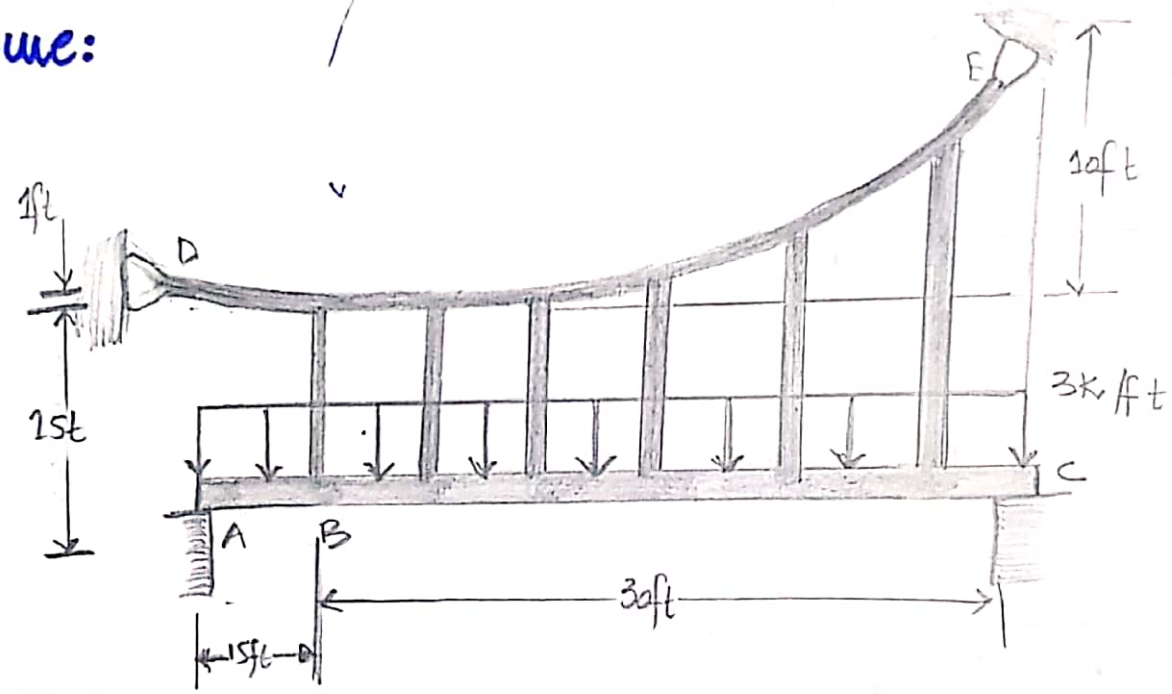
QUESTION No.1:

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.

Figure:



Solution:

Member BC

$$\overset{+}{\rightarrow} \Sigma F_x = 0$$

$$A_x = 0$$

Moment at A

$$\overset{+}{\circlearrowleft} \Sigma M_A = 0 \qquad F_H(1) - B_y(15) - 45(7.5) = 0 \quad \text{---(1)}$$

FBD

$$\overset{+}{\circlearrowright} \Sigma M_C = 0 - F_H(10) - B_y(30) + (45)(30) = 0$$

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

$$w_0 = \frac{2 F_H h}{L^2} \Rightarrow \frac{2(153.4)(10)}{30^2}$$

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

$w_0 = 3.40$ k/ft

$$F_{max} = w_0 L \sqrt{1 + \left(\frac{L}{24}\right)^2}$$

$F_{max} = 183.6$k

Each hanger carries 5ft w_0

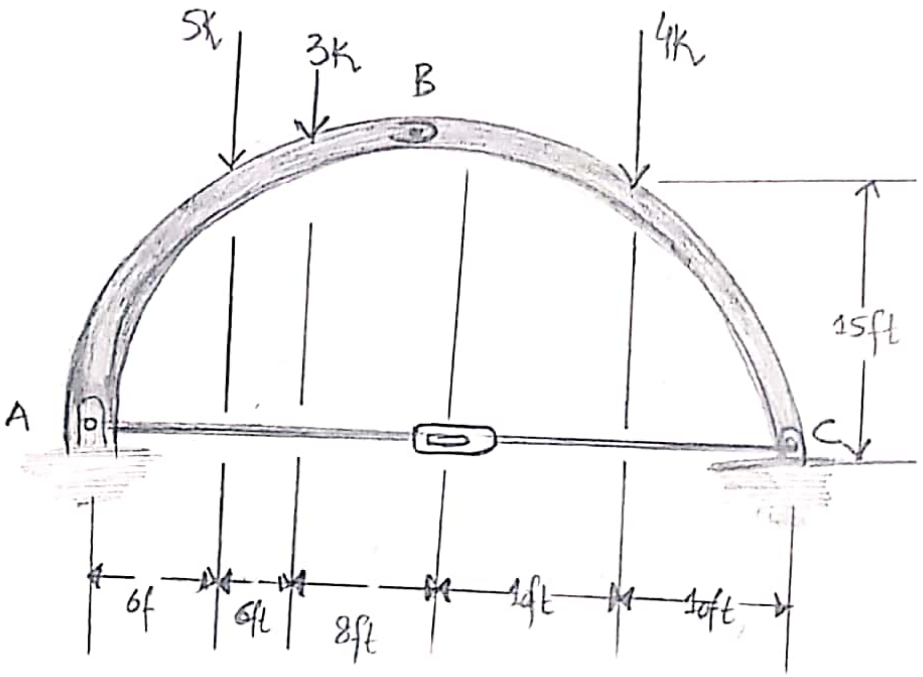
$T = (5ft)(3.40\ k/ft)$

$T = 17$k

QUESTION No.2:

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.

Figure



Solution

Entire arch:

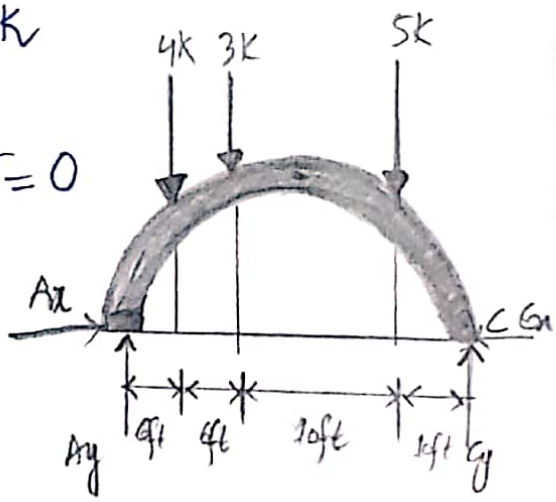
$$\circlearrowleft + \sum M_A = 0; \quad -4(6) - 3(12) - 5(30) + C_y(40) = 0$$

$$C_y = ~~5.25K~~ \; 5.25K$$

$$+\uparrow \sum F_y = 0; \quad A_y + 5.25 - 4 - 3 - 5 = 0$$

$$A_y = 6.75K$$

$$\pm \rightarrow \sum F_x = 0; \quad A_x = 0$$



Section: BC

$$(\circlearrowright)+\sum M_B = 0; \quad -5(10) - T(15) + 5.25(20) = 0$$

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