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Section "B"

fourth semester

Subject: structural Analysis 1

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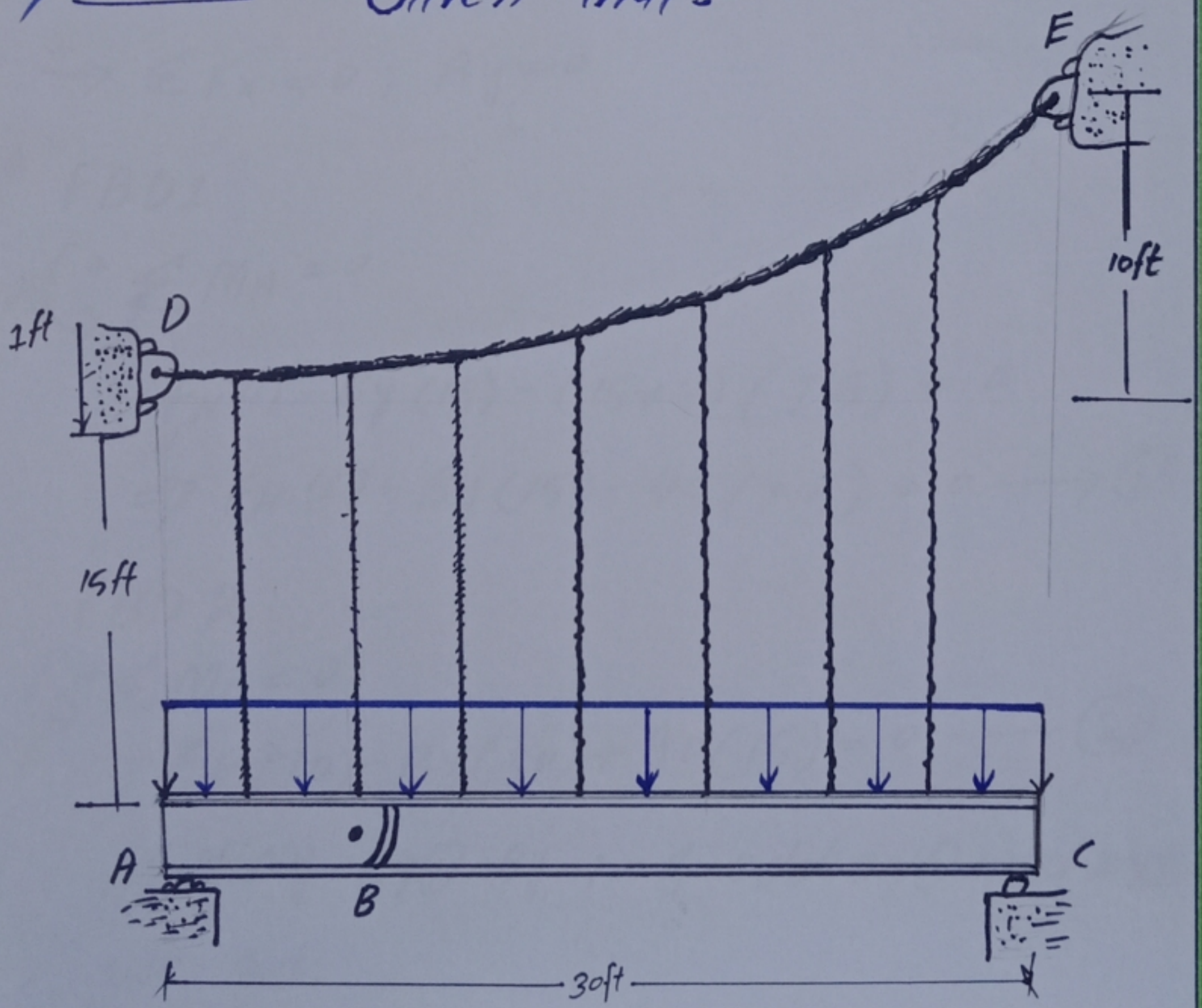
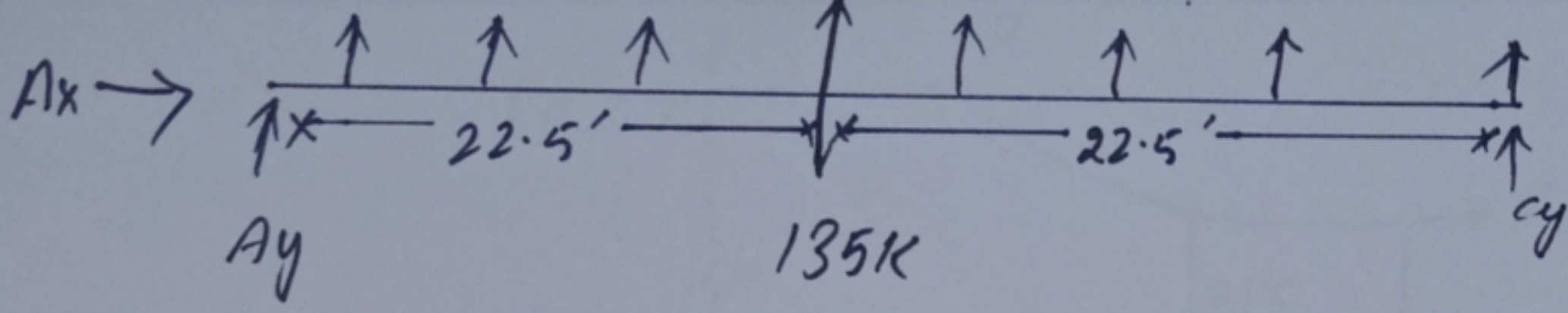
Department of civil Engineering.

Cables And Arches

QNO#01 Determine the maximum and Manimum tension in the parabolic cable and the face in each of the hangers. The Grider is subjected to the uniform Load and is pin connected at B.

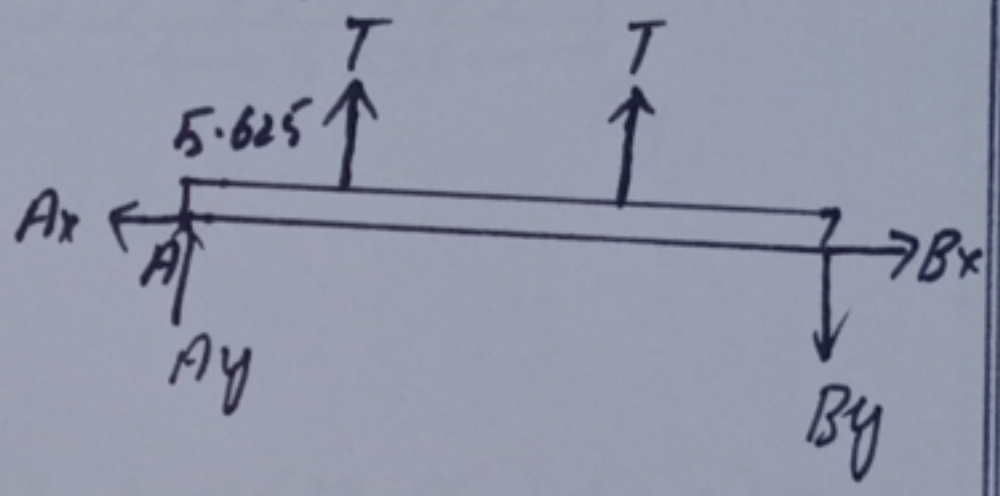
Solution Given that:





$$\Rightarrow (30' * K/ft) + (15' * 3K/ft) = 135K$$

Member BC:



$$\pm\rightarrow \Sigma F_x = 0; \quad B_x = 0;$$

Member AB;

$$\pm\rightarrow \Sigma F_x = 0; \quad A_y = 0$$

FBD1

$$\circlearrowleft^{+} \Sigma M_A = 0$$

$$F_H(1) - B_y(15) - (15*3)(7.5) = 0$$

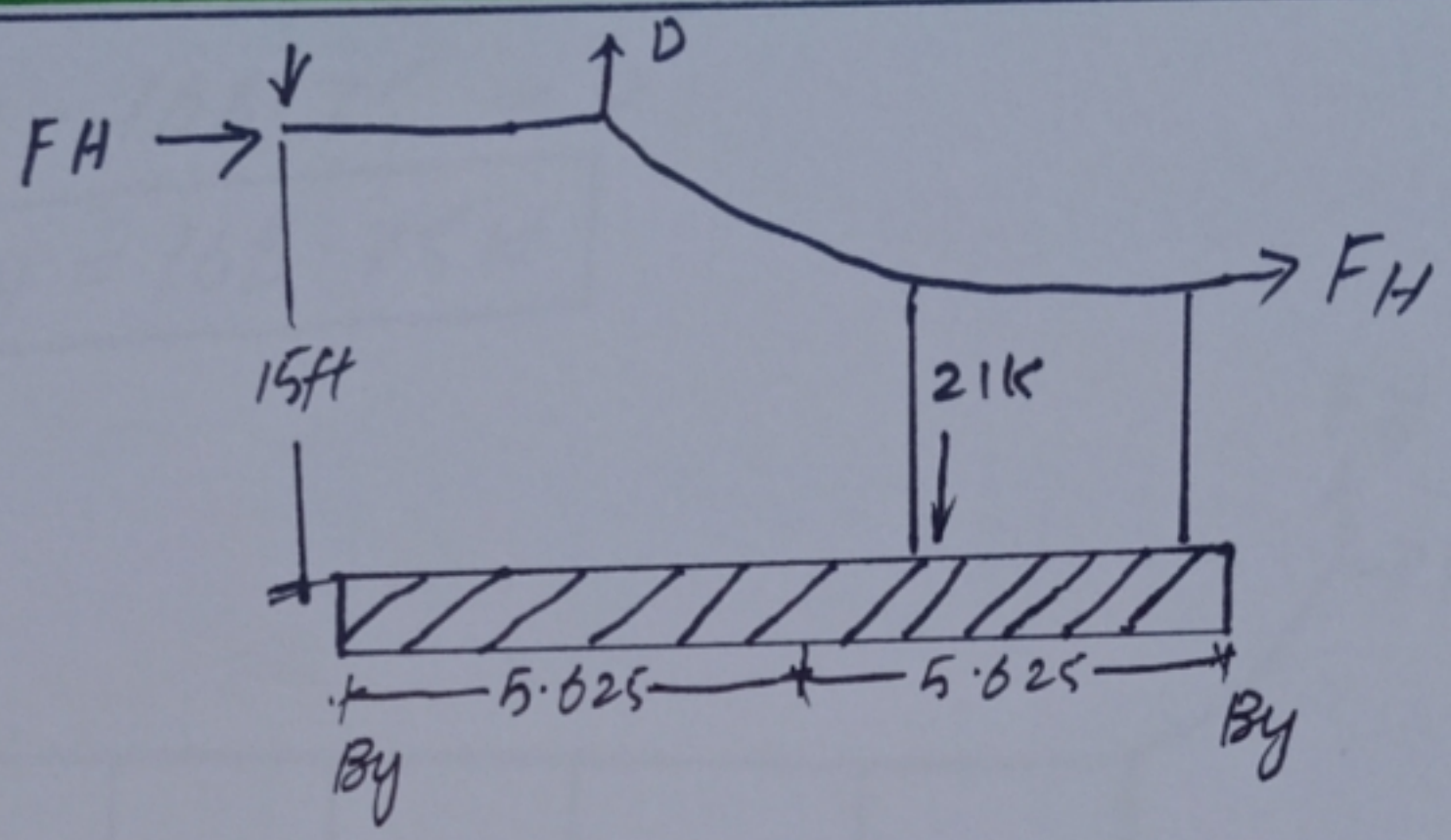
$$\Rightarrow F_H(1) - B_y(15) - 45(7.5) = 0 \longrightarrow (1)$$

FBD 2:

$$\circlearrowleft^{+} \Sigma M_C = 0$$

$$-F_H(10) - B_y(30) + 90(15) = 0 \longrightarrow (2)$$

Multiply eq(1) By 10 & add eq(1) and eq(2) we get:



So

$$\cancel{0}$$

$$F_H(10) - By(150) - 45(7.5)(10) = 0$$

$$-F_H(10) - By(30) - 90(15) = 0$$

$$-By\ 180 - 2035 = 0$$

$$By = -\frac{2035}{180} = -11.25K$$

$$\boxed{By = -11.25K}$$

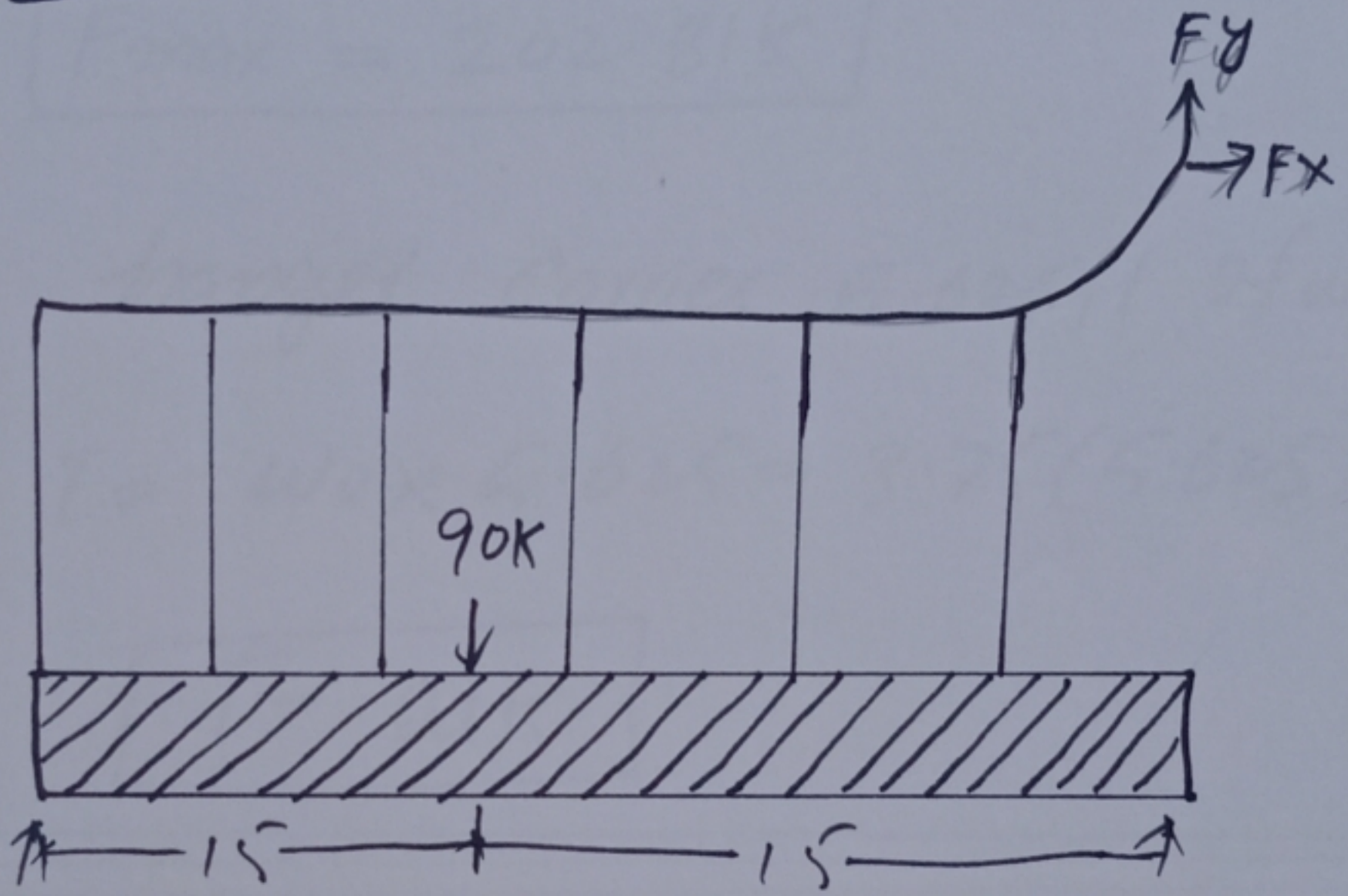
Put By in eq① we get the value of FH :→

$$\Rightarrow FH - (-11.25)(15) - 45(7.5) = 0$$

$$\Rightarrow FH + 168.75 - 337.5 = 0$$

$$\Rightarrow \quad FH - 168.75 = 0$$

$$\Rightarrow \quad \boxed{FH = 168.75K}$$



$$W_o = \frac{2FH}{L^2} = \frac{2(168.75)(10)}{(30)^2}$$

$$\boxed{W_o \doteq 3.75 \ K/ft}$$

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

$$\Rightarrow (3.75)(30)\sqrt{1 + \left(\frac{30}{210}\right)^2}$$

$\Rightarrow 112.5\,(1.80)$

$$\boxed{F_{max} = 202.81K}$$

Each hanger carries 5.625ft of wo

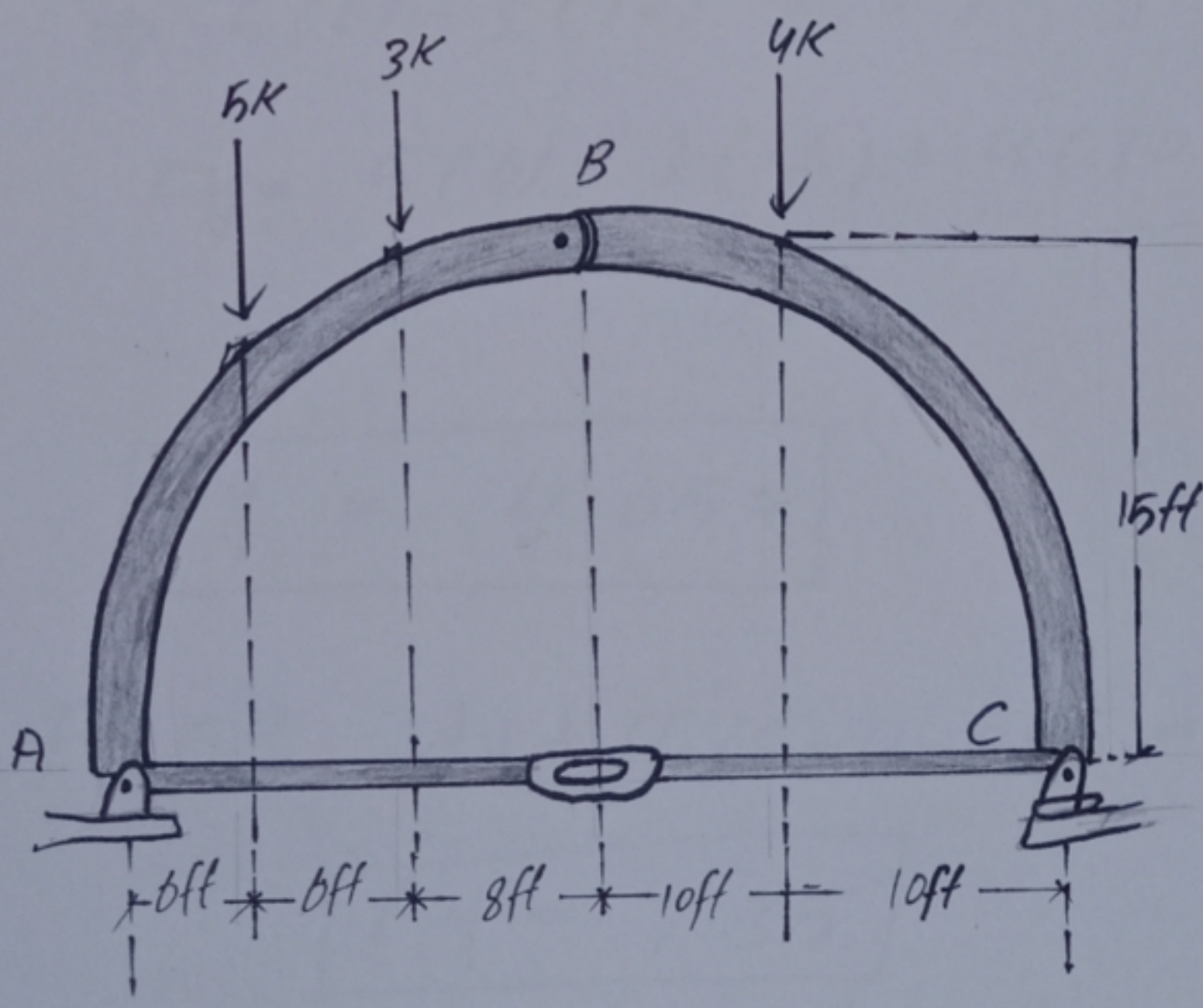
$$T = Wo * 5.625 = 3.75(5.625)$$

$$\boxed{T = 21K}$$

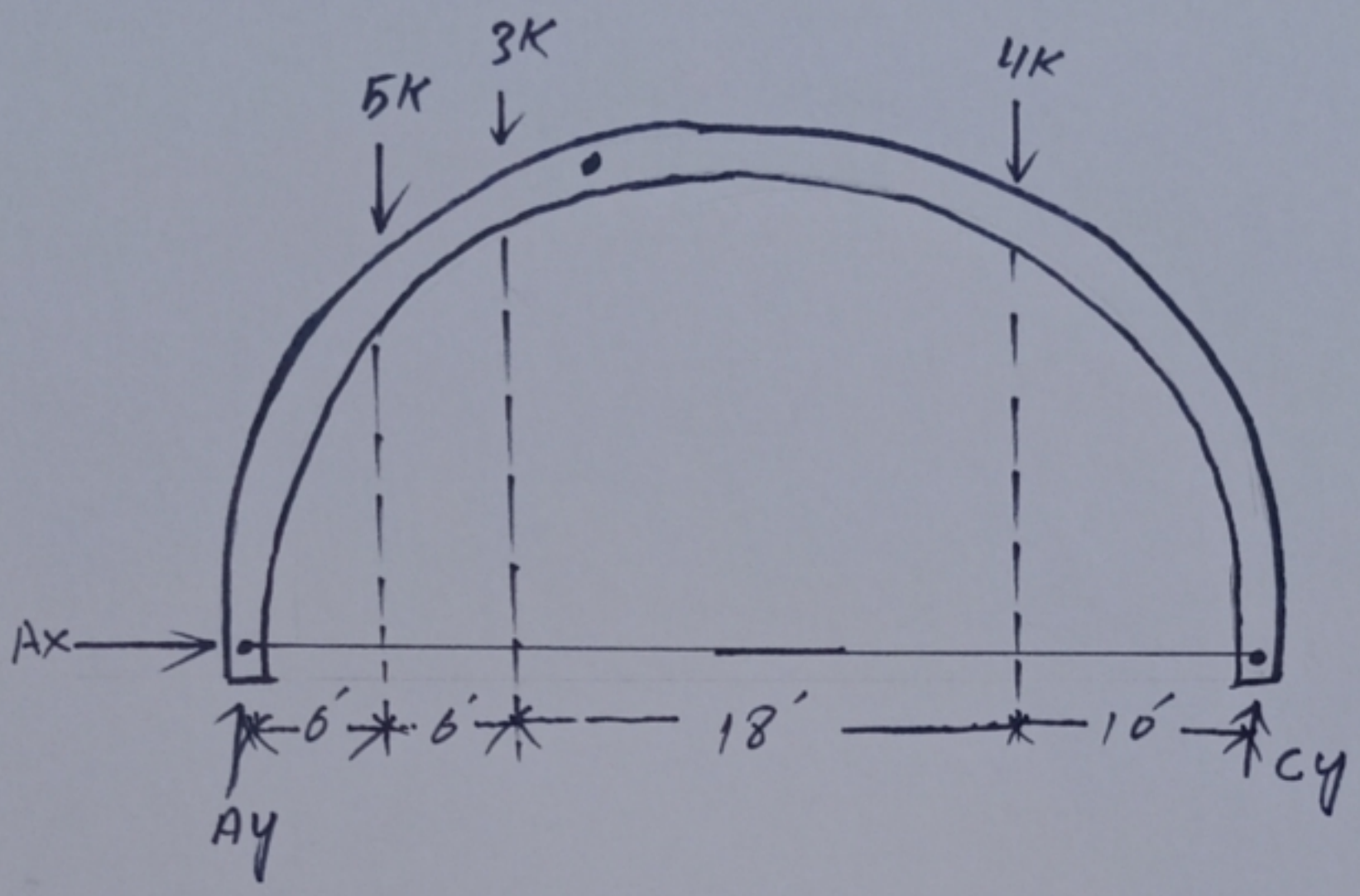
Q NO #02 : The tied three-hinged arch is subjected to the loading shown. Determine the components of Rection at A and C and the tension in the rod:

Solution

Given that



Entire Arch



$$\circlearrowleft^{+} \Sigma MA = 0;$$

$$\Rightarrow -5(6) - 3(12) - 4(30) + Cy(40) = 0$$

$$Cy = \frac{5(6) + 3(12) + 4(30}{40}$$

$$\boxed{Cy = 4.65K}$$

$$+\uparrow \quad Fy = 0 \qquad Ay + 4.65 - 4 - 3 - 5 = 0$$

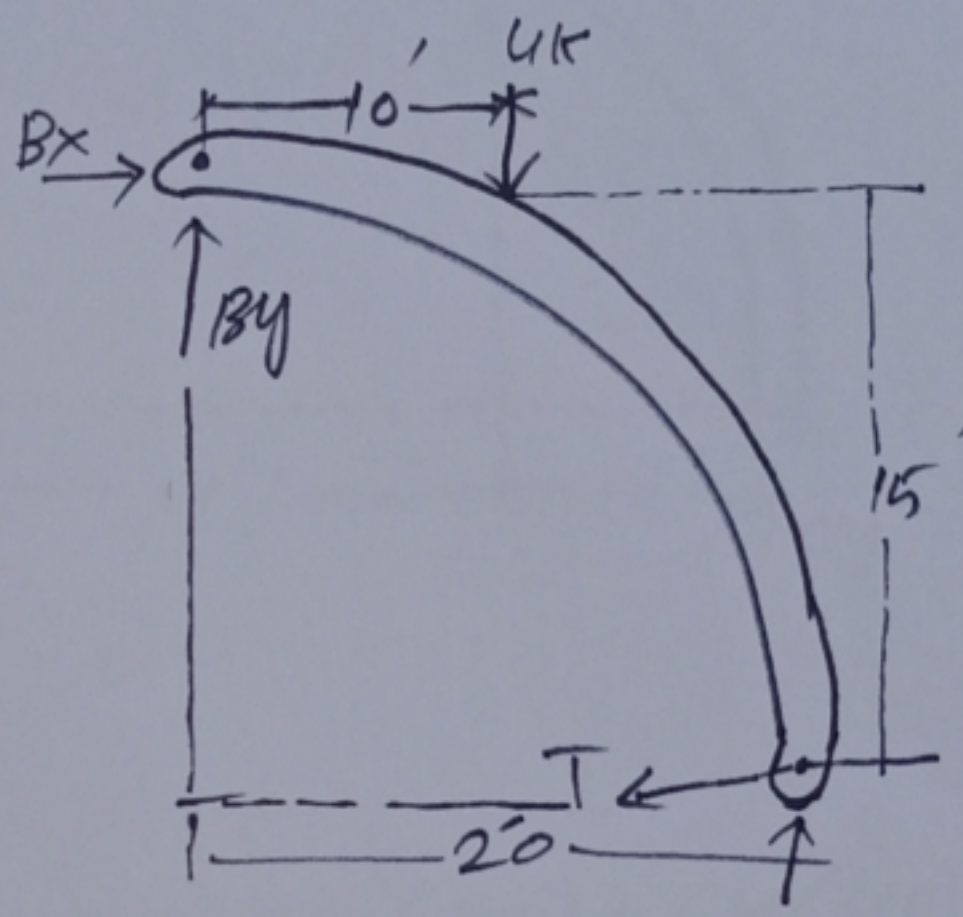
$$\boxed{Ay = 7.35}$$

$$\xrightarrow{+} \Sigma F_x = 0$$

$$A_x = 0$$

$\Rightarrow$ Section BC;

$$\circlearrowleft + \Sigma M_B = 0$$



$$-4(10) - T(15) + 4.65(20) = 0$$

$$T = \frac{-4(10) + 4.65(20)}{15}$$

$$\boxed{T = 3.53K}$$