Date: _____

NAME : MUHAMMAD ILYAS

ID : 7956

SECTION : B

SEMESTER : 4th

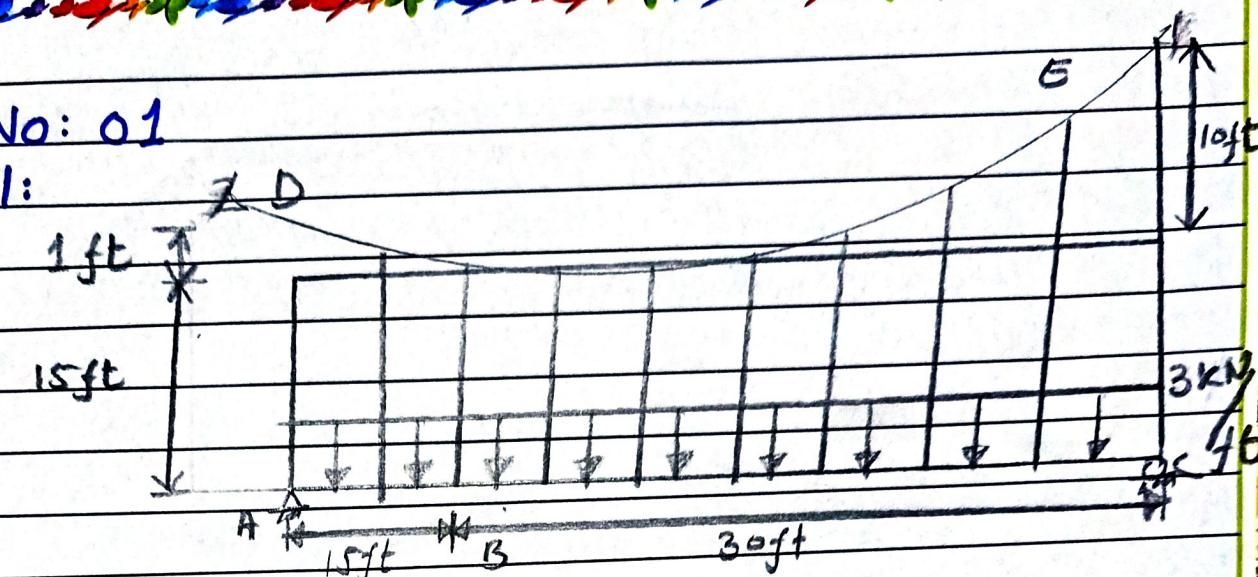
ASSIGNMENT # 04

INFINITY

Date: _____

Q: No: 01

Sol:



MEMBER BC:

$\overset{+}{\rightleftarrows}_{-}$ $\Sigma F_x = 0$ $\quad B_x = 0$

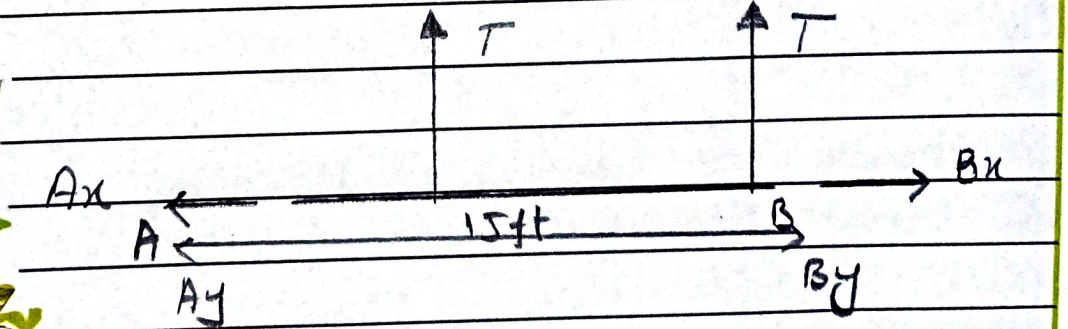
MEMBER AB

$\overset{+}{\rightleftarrows}_{-}$ $\Sigma F_x = 0$ $\quad A_x = 0$

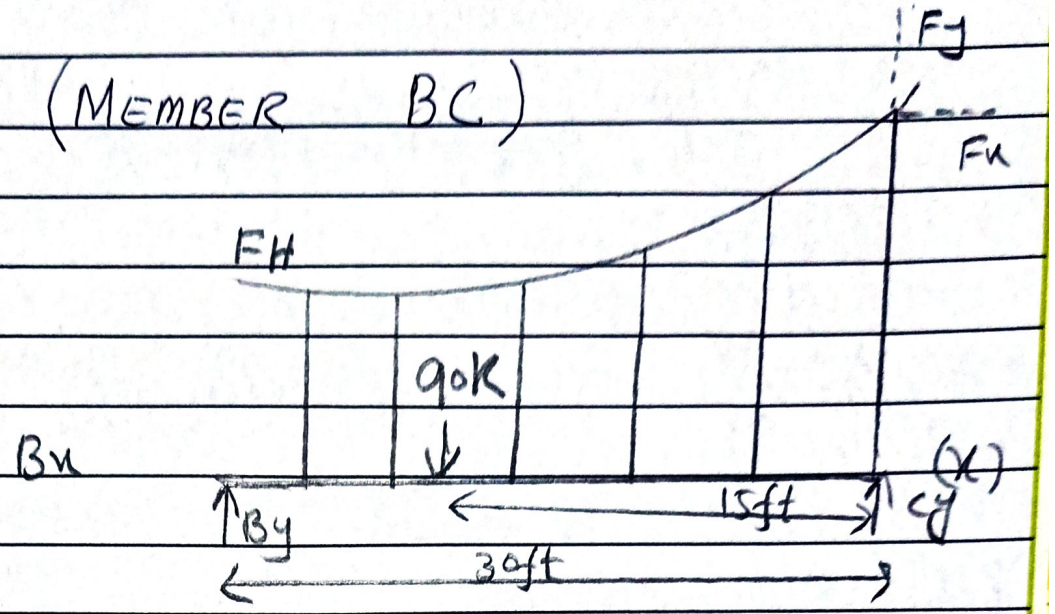
FBD 1 (member AB)

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

$E_H \times 1 - B_y \times 15 - 45 \times (7.5) = 0 \rightarrow (i)$



FBD : 2 (MEMBER BC)



$\circlearrowleft + \Sigma M_C = 0$

$-By \times 30 - FH \times 10 + 90 \times 5 = 0$

$350 - 10\,FH - 30By = 0$ ↓(ii)

Now multiplying eq (i) by 2 and subtracted from eq (ii)

$1350 - 10FH - 30By = 0$

$\mp 675 \pm 2FH \mp 30By = 0$

$205 - 2FH = 0$

$FH = 168.75K$ and $By = -11.25K$

$FH = Fmin = 168.75K$

Because we determine the force at a slop therefore $FH = Fmin$

Max force occurs at point E, where slop is max.

Now;

$$w_o = \frac{2FH}{L^2}h = \frac{2 \times 168.75 \times 10}{(30)^2}$$

$$w_o = 3.75 \text{ K/ft}$$

As we know that

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

$$F_{max} = 3.75 \times 30 \sqrt{1 + \left(\frac{30}{2 \times 10}\right)^2}$$

$$\boxed{F_{max} = 202.81 \text{ N}}$$

"Load on each hanger in member BC".

Each hanger carries 5ft of w_o.

$$T = 3.75 \times 5 = 18.75 \text{K}$$

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W.o for member AB.

Each hanger carries 7.5ft of w.o.

$$T = 7.5 \times 7.5 = 11.25K$$

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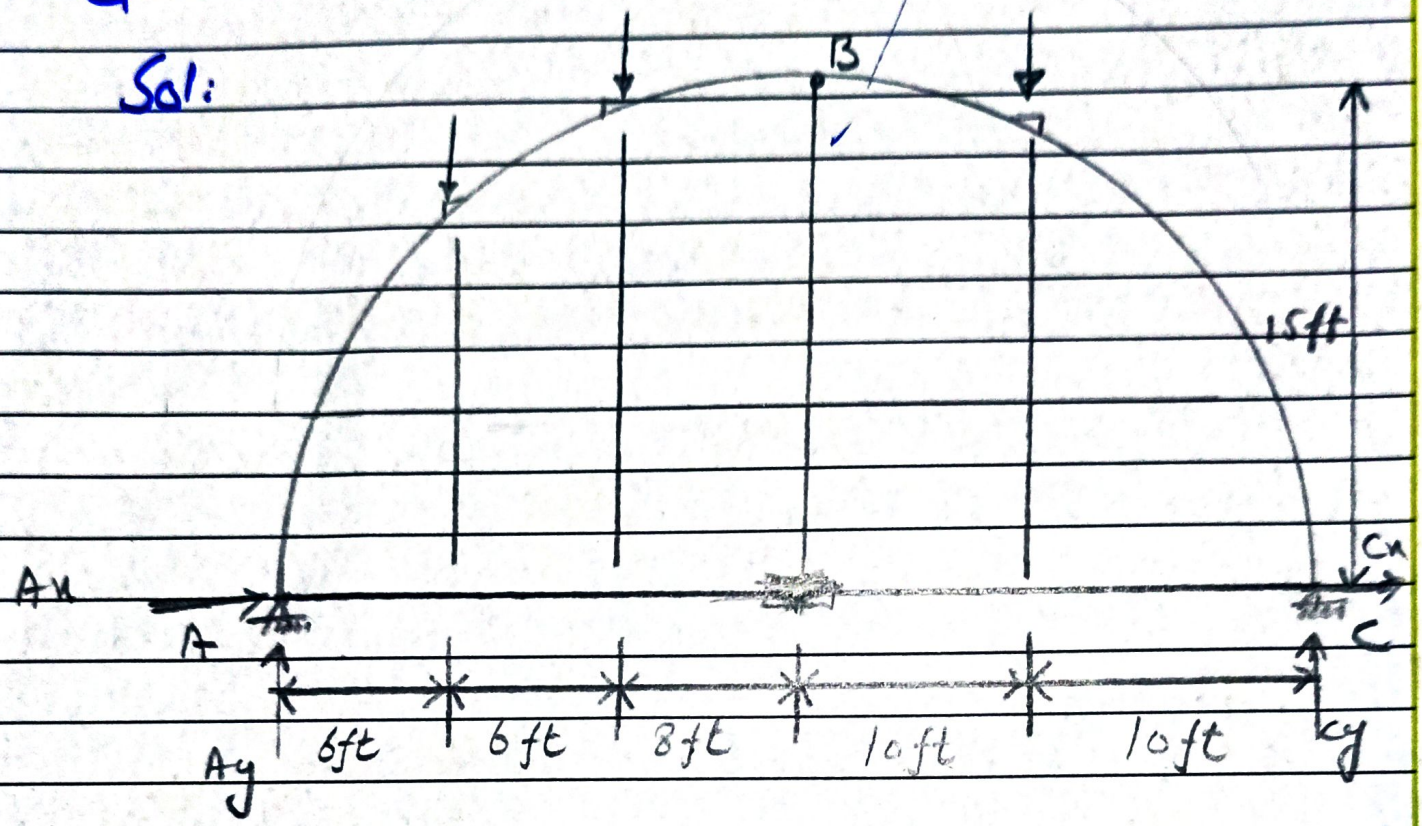
Q: No: 02

Sol:



Required;

$A_x = ?$, $A_y = ?$, $C_y = ?$, $T = ?$

Calculations;

Entire Arch

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

↻ $\Sigma M_A = 0$

$Cy \times 40 - 4 \times 30 - 3 \times 12 - 5 \times 6 = 0$

$40cy = 186$

$\boxed{Cy = 4.65\ K}$

↻ $\Sigma M_C = 0$

$-Ay \times 40 + 5 \times 3 + 3 \times 28 + 4 \times 10 = 0$

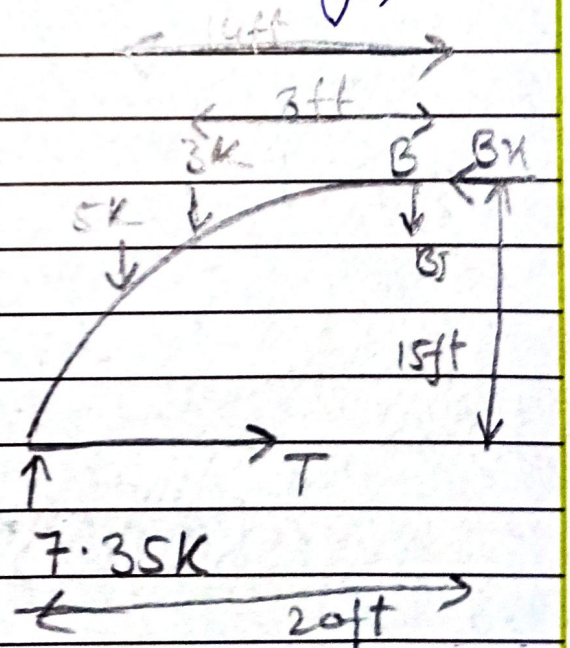
$\boxed{Ay = 7.35k}$

↑ + $\Sigma Fy = 0$

$7.35 + 4.65 = 5 + 3 + 4$

$12 = 12$ (okay)

MEMBER AB



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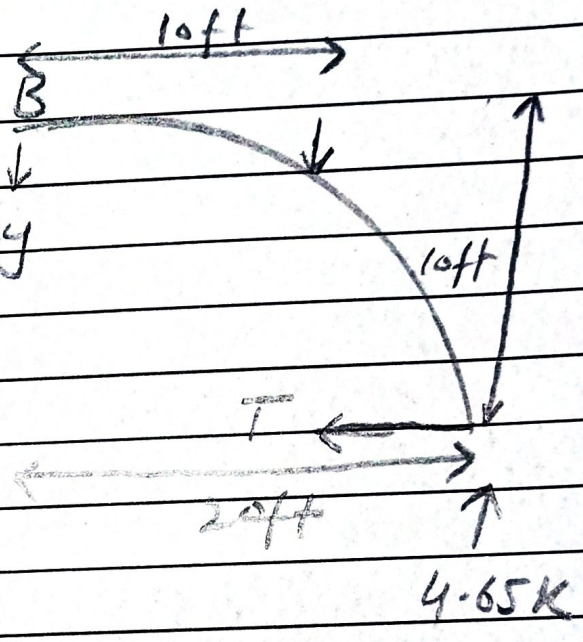
$\zeta+ \quad \Sigma M_B = 0$

$-7.35 \times 20 + T \times 15 + 5 \times 14 + 3 \times 8 = 0$

$15T = 53$

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

MEMBER CB



$\zeta+ \quad M_B = 0$

$-T \times 15 + 4.65 \times 20 - 4 \times 10 = 0$

$15T = 53$

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

HENCE;