Name :- Ahmad Ali.

ID :- 7746.

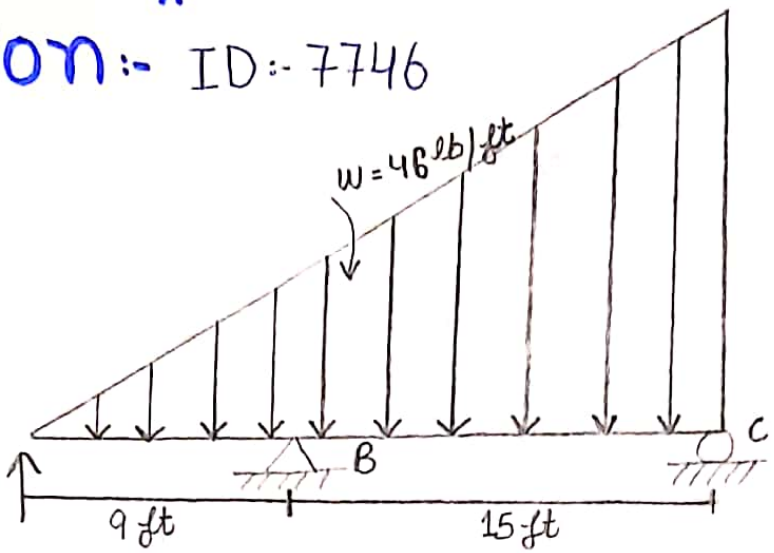
Subject :- Structure Analysis-1.

Instructor :- Engr. Saqib.

Data :- 26/9/2020.

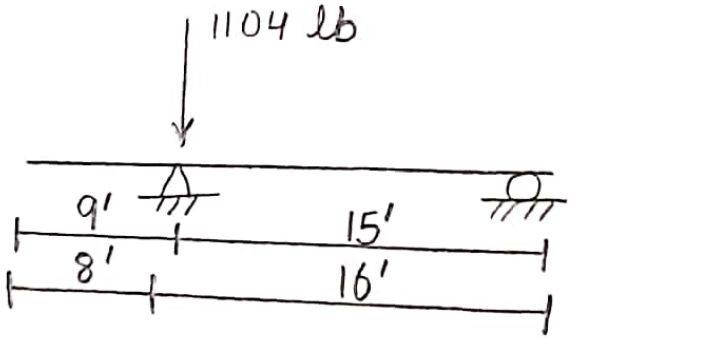
Q.NO :- 1.

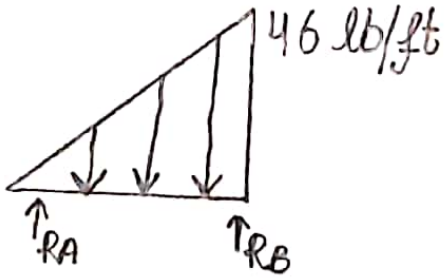
Solution :- ID :- 7746



To find Shear force and bending moment diagram :-

To find at the point Load at uniform varing Load.





To find support reaction :-

$(\overrightarrow{-}\ \uparrow^{+})\ \Sigma M_B = 0$

$$-15R_A + 1104(16) = 0$$

$$R_A = \frac{(1104)(16)}{15}$$

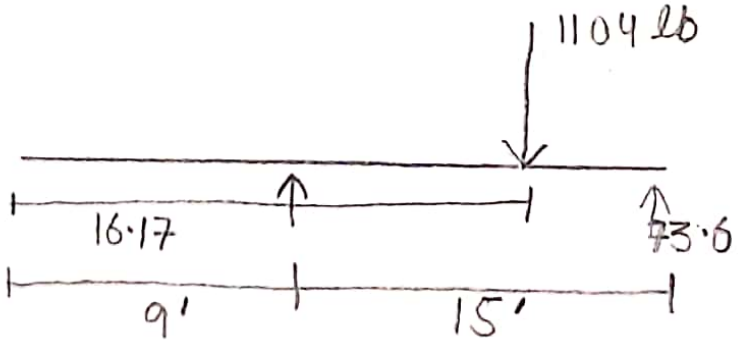
$$\boxed{R_A = 1177.6 \text{ lb}}$$

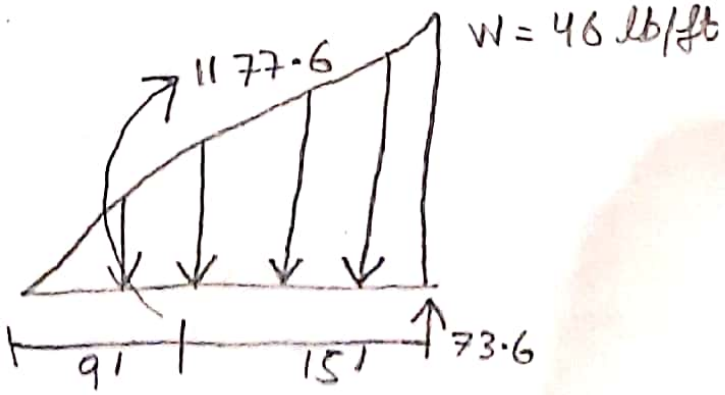
$$-\downarrow\uparrow + \Sigma F_y = 0$$

$$-1104 + R_A + R_B = 0$$

$$-1104 + 1177.6 + R_B = 0$$

$$\boxed{R_B = 73.6 \text{ lb}}$$





Now the Applicable Load is be :-

$$\frac{WoL}{4} - \frac{1}{2}\left(\frac{Wox}{L}\right)(x) = 0$$

$$276 - \frac{1}{2}\,\frac{46x^2}{L}$$

$$\frac{23x^2}{L} - 276 = 0$$

$$0.95x^2 - 276 = 0$$

$$\frac{0.95x^2}{0.95} = \frac{276}{0.95}$$

$$x^2 = 290.52$$

$$\sqrt{x^2} = \sqrt{290.52}$$

$$x = 17.04$$

$(\circlearrowleft +)\ \Sigma M = 0$

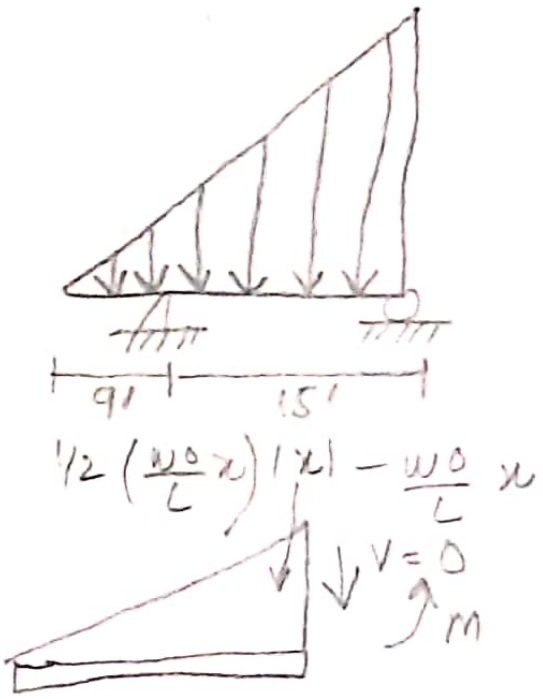
$$m = -\frac{1}{2}\left(\frac{46(17.04)}{24}\right)(17.04)\left(\frac{17.04}{3}\right)$$

$$+ \frac{46(24)}{4}\left(17.04 - 1/3\right) = 0$$

$m = 3030.50$ lb/ft

The +ive sign shows that moment reaction is in anti-clockwise direction.

Now a section.



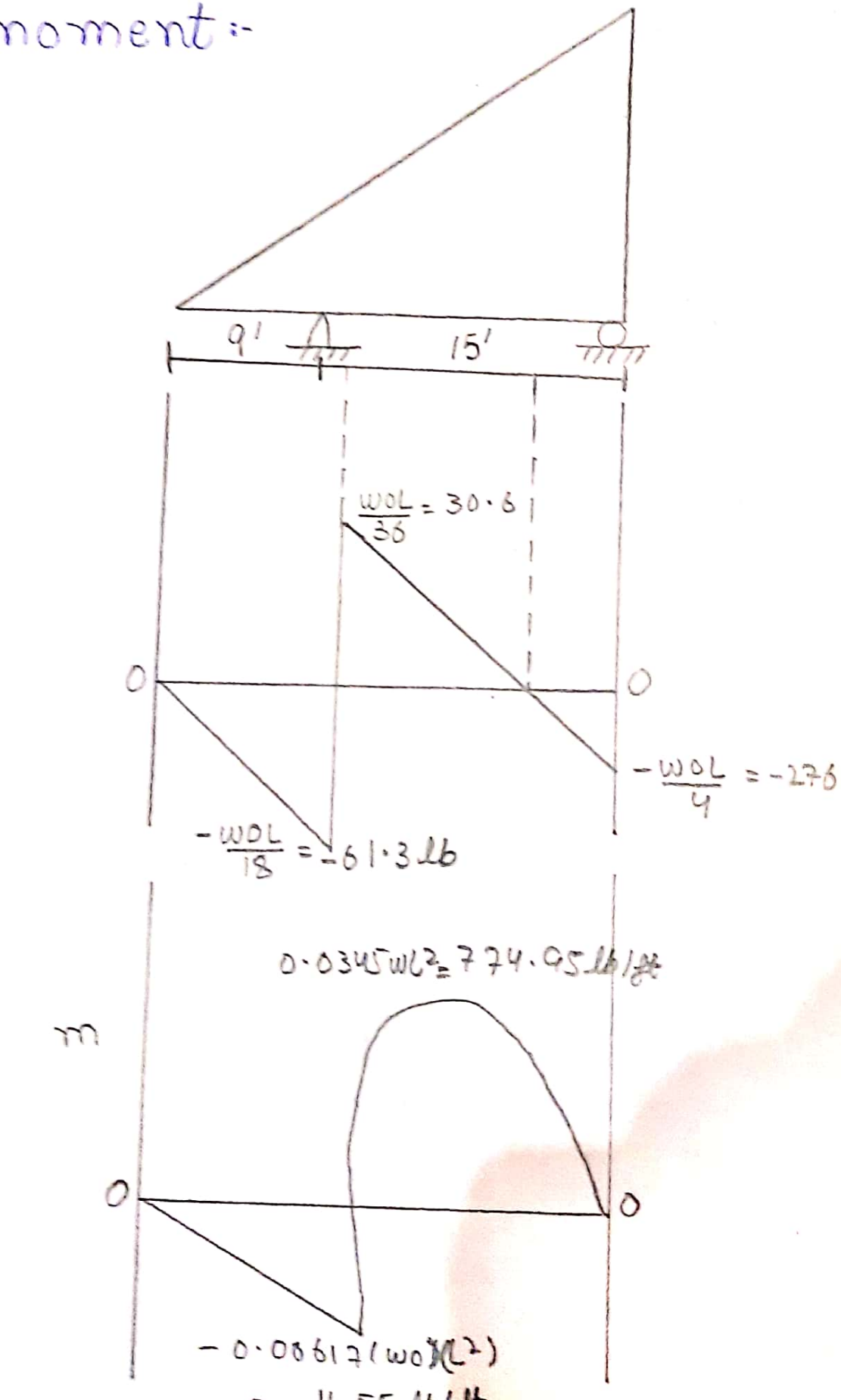
$$\frac{W_0 \ell}{4}$$

$$\frac{1}{2}\left(\frac{(46)(17.04)}{24}\right)(17.04)$$

$$= 278.26 \text{ lb}$$

$$\frac{W_0}{L}x = \frac{46}{24}(17.04) \quad \boxed{= 32.66 \text{ lb/ft}}$$

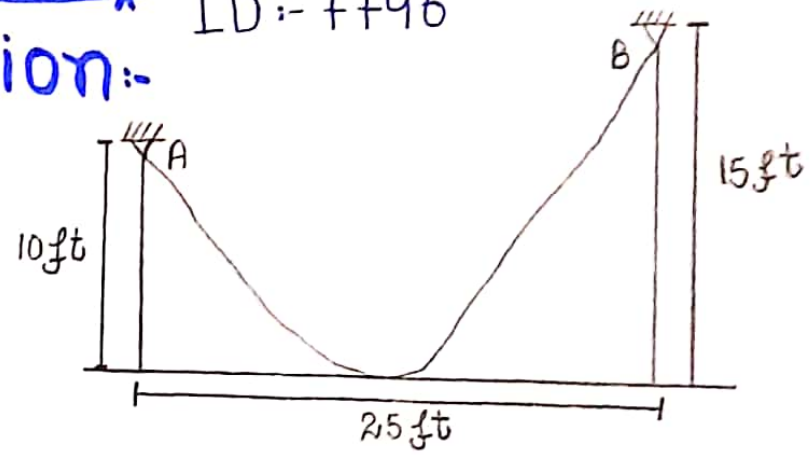
Now Shear force and bending moment :-



Q.NO:-2

ID:-7746

Solution:-



→ Cable support uniform Load = 746 lb/ft

→ Determine the tension in cable at,

Support A = ?

Support B = ?

Sol:-

$$Y = \frac{W_o}{2F_H} x^2$$

By putting values,

$$15 = \frac{746}{2F_H} x^2 \quad \text{——①}$$

$$10 = \frac{746}{2F_H} (25-x)^2 \quad \text{——②}$$

By solving both equations,

$$F_H = \frac{746}{2(15)} x^2 \quad , \quad F_H = \frac{746}{2(10)} (25-x)^2$$

Now, $F_H = F_H$

$$\frac{746}{2(15)} x^2 = \frac{746}{2(10)} (25-x)^2$$

$$24.86\, x^2 = 37.3\,(625 - 50x + x^2)$$

$$x^2 = \frac{37.3}{24.86}(625 - 50x + x^2)$$

$$x^2 = 1.500\,(625 - 50x + x^2)$$

$$0.5x^2 - 75x + 937.50 = 0 \quad \text{——} (1)$$

Now Choose root < 25 ft

By solving eq (1) :-

$$\boxed{x = 13.76 \text{ ft}}$$

Now,

$$25 - 13.76 \quad \boxed{= 11.25 \text{ ft}}$$

As,

$$F_H = \frac{746}{2(15)} x^2 = \frac{746}{30} (13.76)^2$$

$$F_H = 4708 \text{ lb} \quad \text{—} (A)$$

$$F_H = \frac{746}{2(10)}(25-x)^2 = \frac{746}{20}(11.25)^2$$

$$F_H = 4720 \text{ lb} \quad \text{— (B)}$$

Support :- B

$$y = \frac{W_o}{2F_H}x^2 = \frac{746}{2(4708)}x^2$$

$$\frac{dy}{dx} = \tan\theta_B = 0.079(x^2)$$

$$= 0.079(13.76)$$

$$\boxed{= 1.089}$$

we have,

$$\tan\theta_B = 1.089$$

$$\theta_B = \tan^{-1}(1.089)$$

$$\boxed{\theta_B = 47.439^\circ}$$

Tension at B

$$T_B = \frac{F_H}{\cos\theta_B} = \frac{4708}{\cos(47.439)} = 6960.63 \text{ lb}$$

$$\boxed{= 6.96 \text{ kips}}$$

* Support :- A *

$$y = \frac{wo}{2FH} x^2 = \frac{746}{2(4708)} (11.25)^2$$

$$\boxed{y = 10.027}$$

$$\frac{dy}{dx} = \tan \theta_A = 10.027$$

$$\theta_A = \tan^{-1}(10.027)$$

$$\theta_A = 84.304^\circ$$

Now,

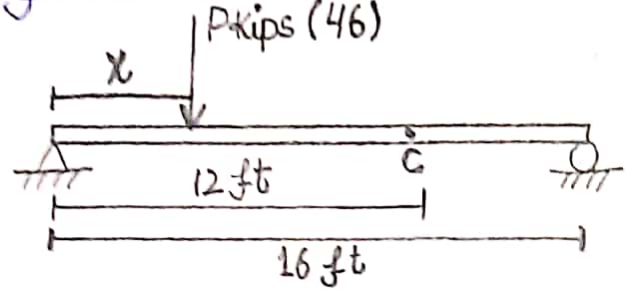
$$T_A = \frac{FH}{\cos \theta_A} = \frac{4708}{\cos(84.304)} = 47435.63 \text{ lb}$$

$$\boxed{= 47.43 \text{ kips}}$$

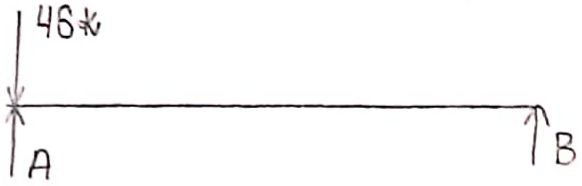
Q.NO :- 3.

Solution :-

→ Influence Line :-



For, $x = 0$, $R_A = ?$, ID :- 7746



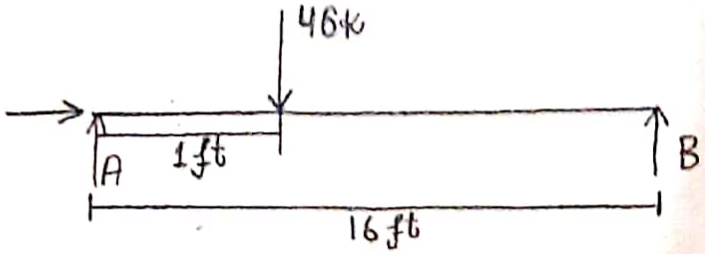
↳ $\Sigma M_B = 0$

$(46 \times 16) - R_A(16) = 0$

$\frac{736}{16} = R_A$

$\boxed{R_A = 46}$

For, $x = 1\ ft$, $R_A = ?$



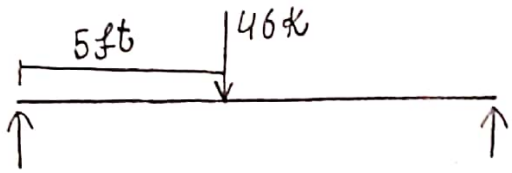
$\overset{+}{\circlearrowright} \Sigma M_B = 0$

$(46 \times 15) - R_A(16) = 0$

$\frac{690}{16} = R_A$

$\boxed{R_A = 43.125}$

For, $x = 5$, $R_A = ?$



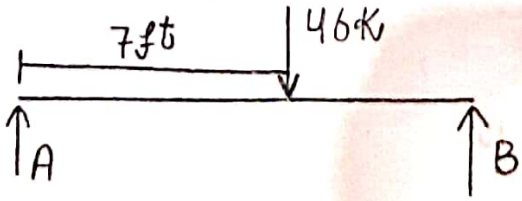
$\overset{+}{\circlearrowright} \Sigma M_B = 0$

$(46 \times 5) - R_A(16) = 0$

$\frac{230}{16} = R_A$

$\boxed{R_A = 14.37\ K}$

Put, $x = 7$, $R_A = ?$

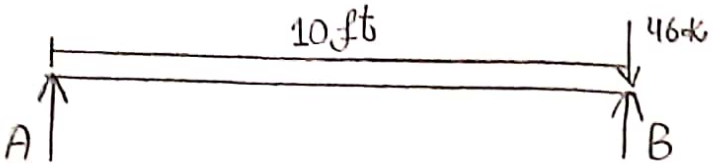


$\overset{+}{\circlearrowleft} \Sigma M_A =$

$(46 \times 7) - R_A(16) = 0$

$\frac{322}{16} = R_A$

$$R_A = 20.125$$



$$-R_A(16) + 46(0) = 0$$

$$R_A = 0$$