Name ShahAB malook

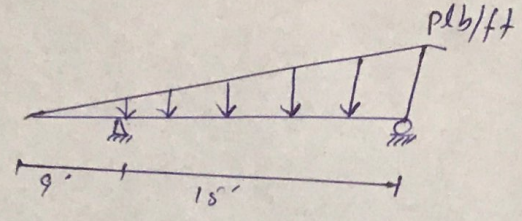
id 7878

Section A

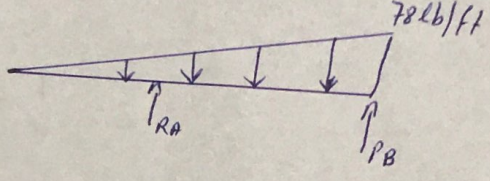
Subject Structural Analysis -1

Q1:- (1)

P=78



Solution:-



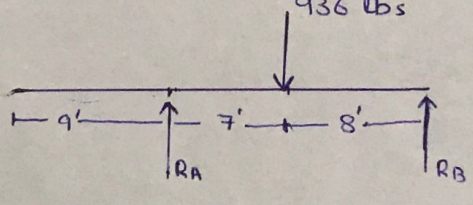
converting UVL into point load = $\frac{1}{2}(78)(24)$

$= 936$ lb.

The point load act an $\frac{2}{3}$ of beam length

$= \frac{2}{3} \times L = \frac{2}{3} \times 24$

$= 16$ ft



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

$R_A + R_B = 936 \text{ lb} \quad - \text{ eq}(*)$

$\Sigma M_A = 0 \; +\circlearrowleft$

$-(R_B \times 15) + (936 \times 7) = 0$

$-15 R_B + 6552$

$R_B = \frac{6552}{15}$

$\boxed{R_B = 436.8 \text{ lb}}$

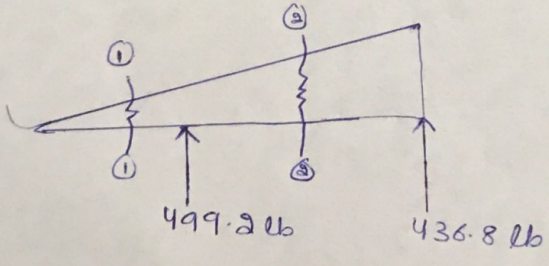
$(*) \Rightarrow R_A + R_B = 936$

$R_A + 436.8 = 936$

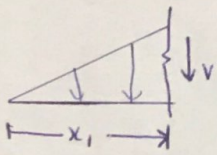
$R_A = 936 - 436.8$

$\boxed{R_A = 499.2 \text{ lb}}$

Now Finding Shear force equations



Section 1-1 ;



$$V_{1-1} = \frac{1}{2} \times x_1 \times \frac{78}{24} x_1 = \frac{78}{48} x_1^2$$

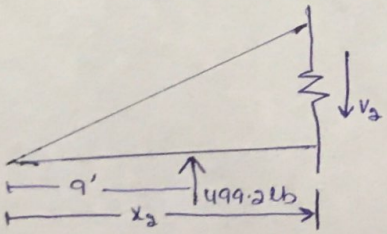
$$V_{1-1} = 1.625\, x_1^2$$

where $x_1 = 0 - 9$

$$\Rightarrow V_{1-1}\Big|_{x=0} = 1.625 \times 0^2 = 0$$

$$\Rightarrow V_{1-1}\Big|_{x=9} = 1.625 \times 9^2 = 131.625 \text{ lb}$$

Section 2-2:



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

$$-V_{2-2} + 499.2 - \frac{1}{2} \times \frac{78}{24} x_2 \times x_2 = 0$$

$$V_{2-2} = 499.2 - \frac{78}{48} x_2^2$$

where $x_2 = 9 \rightarrow 24$

$$\Rightarrow V_{2-2} = 499.2 - \frac{78}{48}(9)^2$$

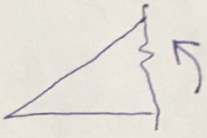
$$V_{2-2} = 367.575 \text{ lb}$$

$$\Rightarrow V_{2-2} = 499.2 - \frac{78}{48}(24)^2$$

$$V_{2-2} = -436.8 \text{ lb}$$

For Bending moment

For Section 1-1



$$M = \frac{-1}{2} \times x_1 \times \frac{78}{24} x_1 \times \frac{1}{3} x_1$$

$$M = \frac{-78}{144} x^3 \qquad x_1 = 0-9$$

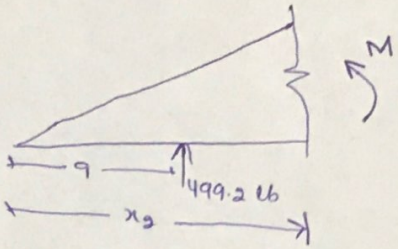
at $x = 0$

$$\Rightarrow M = \frac{-78}{144}(0)^3 = 0$$

at $x = 9$

$$\Rightarrow M = \frac{-78}{144}(9)^3 = -394.875 \text{ lb.ft}$$

For Section 2-2



~~M = 499.2~~

$$M = 499.2 \times (x_2 - 9) - \frac{78}{24} \times \frac{1}{2} \times \frac{78}{24} x_2 \times x_2 \times \frac{1}{3} \times x_2$$

$$M = 499.2(x_2 - 9) - \frac{78}{144} x_2^3 \qquad (x_2 = 9 - 24)$$

at $x_2 = 9'$

$$M = 499.2(9-9) - \frac{78}{144}(9)^3 = 0 - 394.875$$

$M = -394.875$ kb-ft

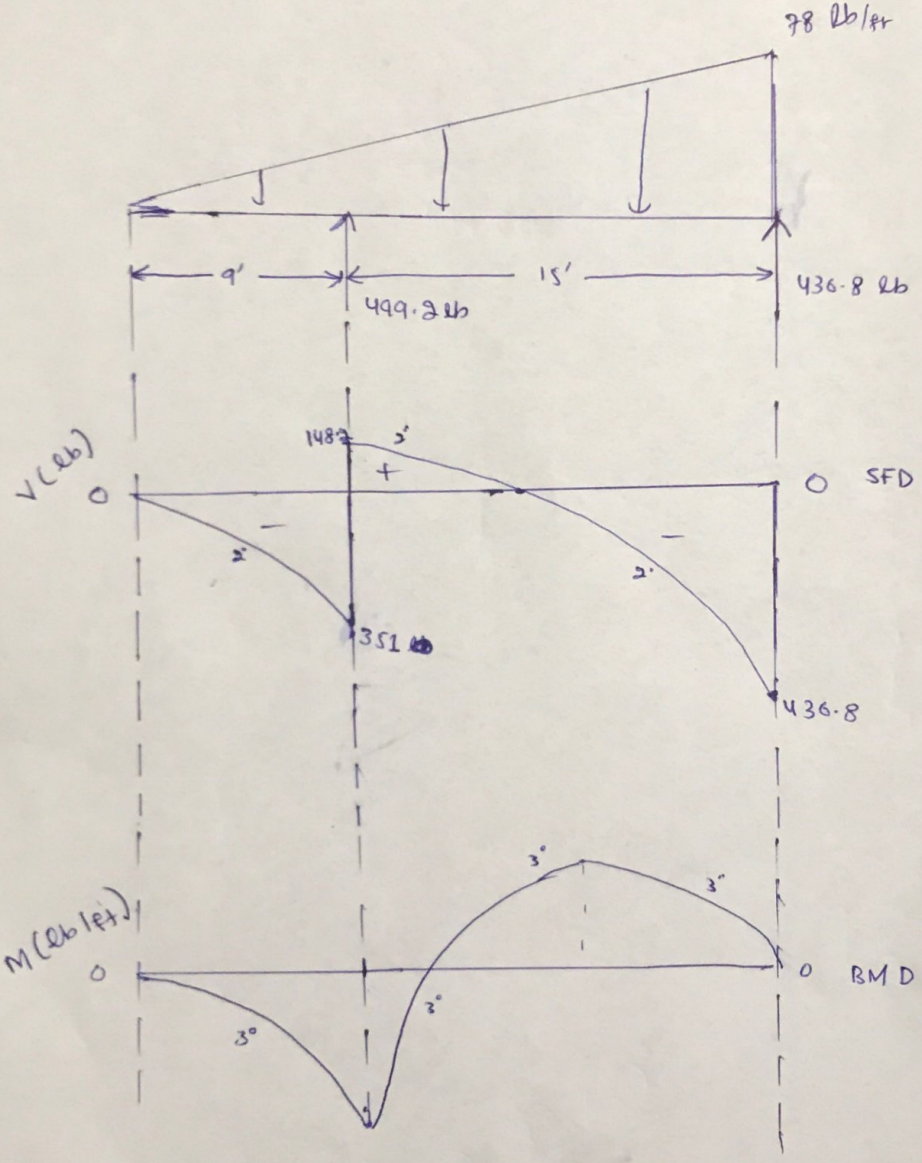
at $x_2 = 24'$

$$M = 499.2(24-9) - \frac{78}{144}(24)^3$$

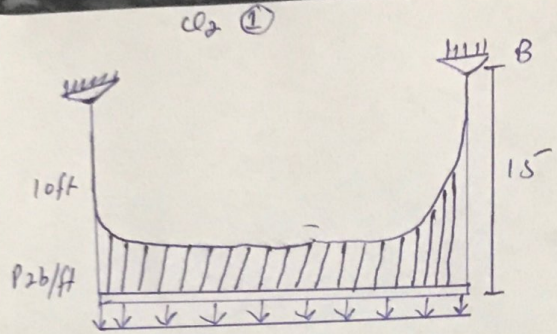
$$= 7488 - 7488$$

$M = 0$ kb-ft

6



Q NO 2



id = 7878

Given Data:-

uniformly Load $w_o = 878$ lb/ft

$T = ?$

formula:-

$$y = \frac{w_o}{2f_H} x^2$$

putting values

$$15 = \frac{878}{2F_H} x^2$$

$$10 = \frac{878}{2F_H} (25-x)^2$$

$$\frac{878x^3}{2(15)} \quad \frac{898}{2(10)} (25-x)^2$$

$$\frac{878}{878} x^3 = \frac{2(15)}{2(10)} (25-x)^2$$

$$x^2 = 1.5(625 - 50x + x^2)$$

$$x^2 = 937.5 - 75x + 1.5x^2$$

$$x^2 - 1.5x^2 + 75x + 937.5 = 0$$

$$0 = 0.5x^2 - 75x + 937.5$$

Q2 (2)

By quadratic equation

$x_1 = 136.23 ft$

$x_2 = 13.76 ft$

By quadratic eq given value is

$x_2 = 13.76 ft$

$F_H = \frac{w \cdot x^2}{2y} \Rightarrow F_H = \frac{878}{2 \times 15} (13.76)^2$

$F_H = 55541.154$

At B:-

$y = \frac{w_o}{2F_H} x^2 \Rightarrow \frac{878}{2 \times 55541.154}$

$\frac{dy}{dx} = \tan \theta_B \Rightarrow 0.158x \Big|_{x=13.76}$

$\frac{dy}{dx} = \tan \theta_B = 2.17$

Now to find the angle

$\tan \theta_B = \tan^{-1} 2.17 = \theta_B$

$\theta_B = \tan^{-1} 2.17$

$\theta_B = 65.25^\circ$

Q_2 (3)

At point : B

$$y = \frac{w_0}{2FH} x^2 \Rightarrow \frac{878 \times x^2}{2 \times 5541.154}$$

$$dy/dx = \tan\theta_H = 0.158 \times (25 - 13.76)$$

$$\tan\theta_A = 1.77$$

$$\theta_A = \tan^{-1} = 1.77$$

$$\theta_A = 60.53^\circ$$

$$T_A = FH/\cos\theta_A$$

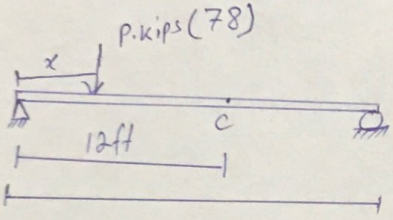
$$= \frac{878}{\cos(60.53)}$$

$$\boxed{T_A = 1784.67 \text{ lb.ft}}$$

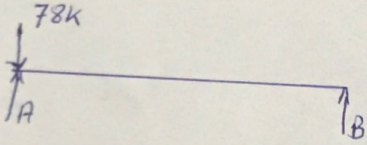
Q NO:3 Q3 ①

Solution

→ Influence Line:.



For, $x = 0$, $RA = ?$ ID: 7878



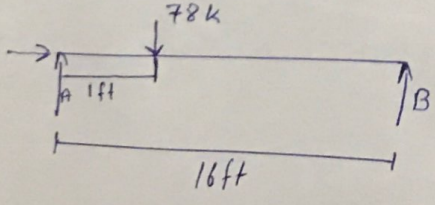
↳ $\Sigma MB = 0$

$(78 \times 16) - RA(16) = 0$

$\frac{1248}{16} = RA$

$\boxed{RA = 78}$

for, $x = 1$ ft , $RA = ?$



Q3 (2)

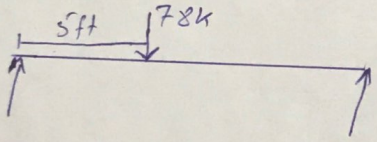
$\circlearrowleft^{+} \Sigma M_B = 0$

$(78 \times 15) - RA(16) = 0$

$\frac{1170}{16} = RA$

$\boxed{RA = 73.125^{-}}$

for, $x = 5^{-}$, $RA = ?$



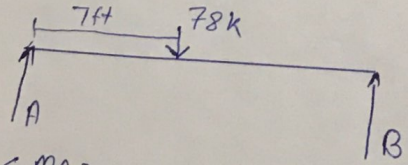
$\circlearrowleft^{+} \Sigma M_B = 0$

$(78 \times 5^{-}) - RA(16) = 0$

$\frac{390}{16} = RA$

$\boxed{RA = 24.375^{-}k}$

put, $x = 7$, $RA = ?$



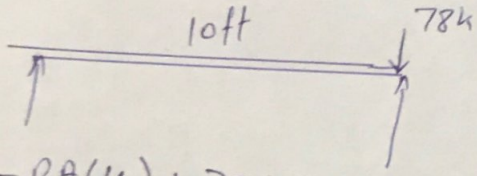
$\circlearrowleft^{+} \Sigma M_A =$

$(78 \times 7) - RA(16) = 0$

Q3 ③

$\frac{546}{16} = RA$

$\boxed{RA = 34.125}$



$-RA(16) + 78(0) = 0$

$RA = (0)$