Name Farhat ullah Khan

ID 7883

Submitted to Engr Sir Saqib

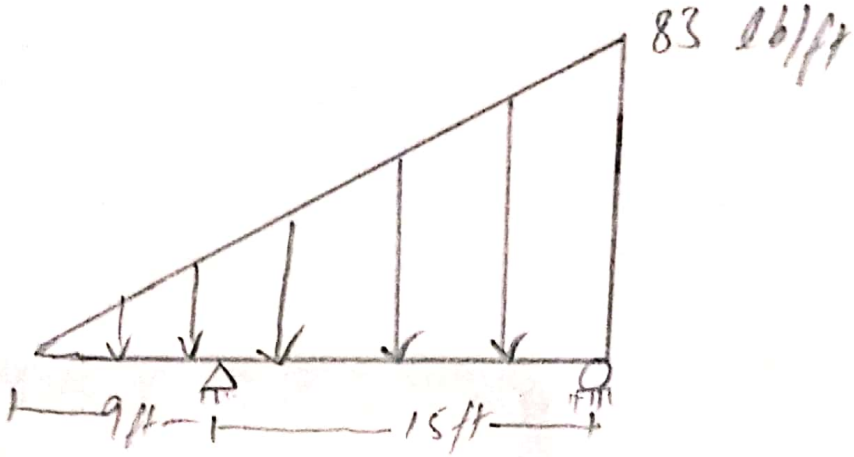
Subject Structure Analysis I

semester 6th

Section B

Date 26-09-02.

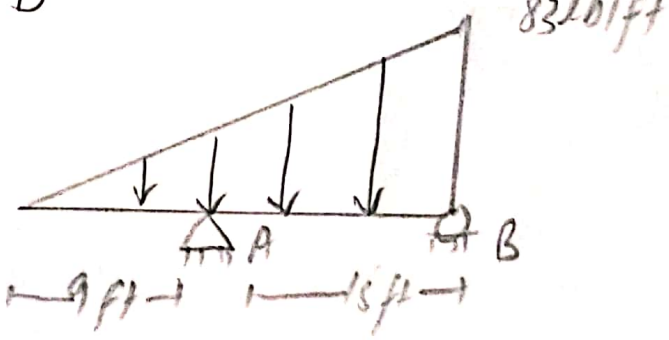
Q:- No:01



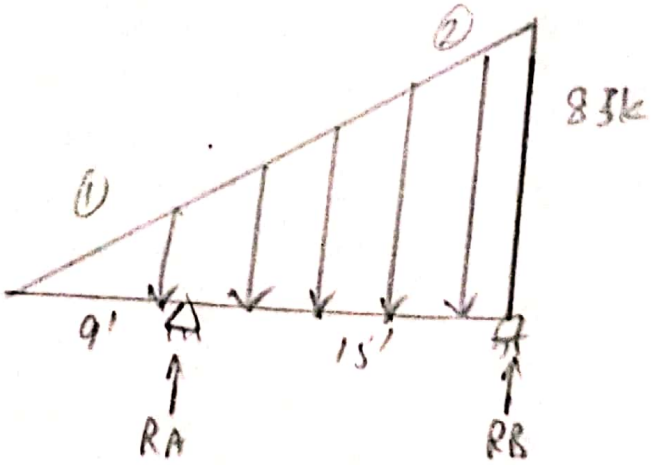
Sol:

To find shear force & Bending moment Diag.

F.B.D



To find out the point load at uniform varying load.



$\Sigma M_B = 0 \curvearrowright +$

$\Rightarrow \frac{1}{2} \times 83 \times 24 \times \frac{1}{2} \times 24 = R_A \times 15$

$\boxed{R_A = 531.2\ kN}$

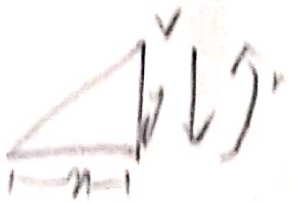
$\Sigma f_y = 0$

$R_A + R_B = \frac{1}{2} \times 83 \times 24$

$\Rightarrow R_B = 996 - 531.2$

$\boxed{R_B = 464.8\ kN}$

Now section ①-①



for y

$\frac{y}{x} = \frac{8}{24}$

$y = \left(\frac{8}{24}\right)x$

$\Sigma F_y = 0 \uparrow +$

$\Rightarrow -\frac{1}{2} \times x \times \left(\frac{8x}{24}\right)x - V_c = 0$

$\Rightarrow V_c = -\frac{8x^2}{48}$

At $x = 0$

$V_c = 0$

$\S$ at $x = 9$

$$\boxed{V_c = -140.062 \text{ lb}}$$

$$\Rightarrow M = -\frac{1}{2} \times x \times \left(\frac{97}{24} x\right) \times \frac{1}{3} x$$

$$\Rightarrow M = -\frac{97 x^3}{144}$$

At $x = 0$

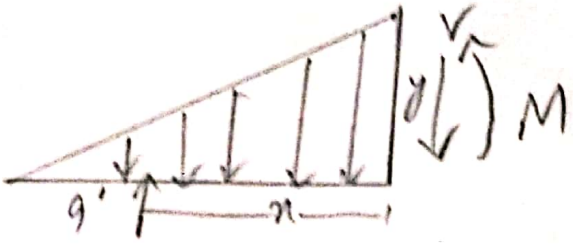
$M = 0$

at $x = 9$

$$\boxed{M = -420.18 \text{ lbs-ft}}$$

Now for section ②-②

for y



$$\frac{y}{(x+9)} = \frac{83}{24}$$

$$\Rightarrow y = \frac{83}{24}(x+9)$$

So $\Sigma F_y = 0 \uparrow$

$$531.2 - \frac{1}{2} \times (x+9) \left(\frac{83}{24} (x+9) \right) - V_c = 0$$

$$\Rightarrow V_c = 531.2 - \frac{83 \times (x+9)^2}{48}$$

at $x = 0$

$$V_c = 391.137$$

at $x = 15$

$$V_c = 531.2 - \frac{83 \times (15+9)^2}{48}$$

$$\boxed{V_c = -4164.8 \text{ k}}$$

$$M + \frac{1}{2} \times (x+9) \left(\frac{83}{24} (x+9) \times \frac{1}{3} \times (x+9) \right) - 531.2x = 0$$

$$\therefore M = 531.2x - \frac{83(x+9)^3}{144}$$

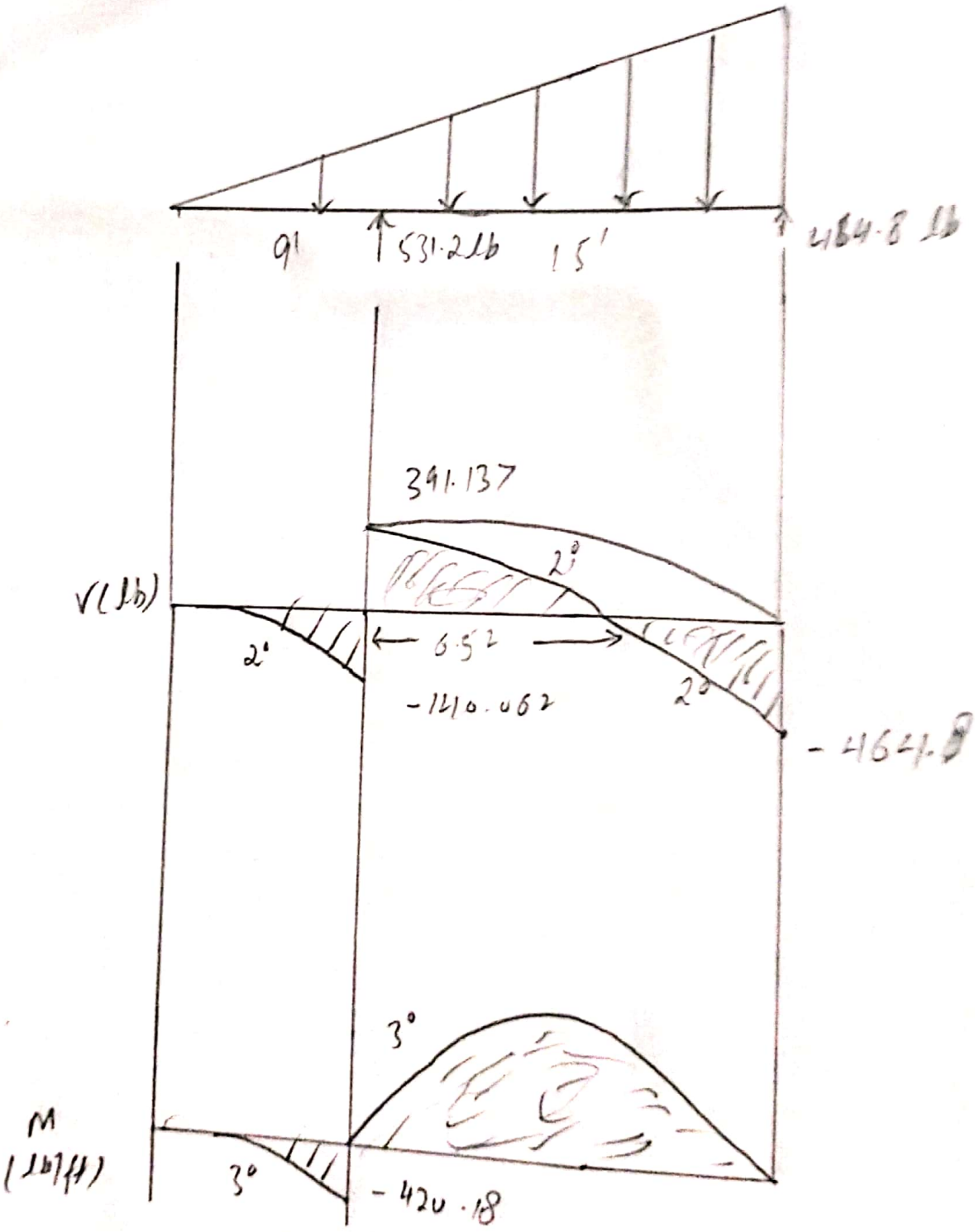
at $x = 0$

$$\boxed{M = -420.18 \text{ lb-ft}}$$

at $x = 15$

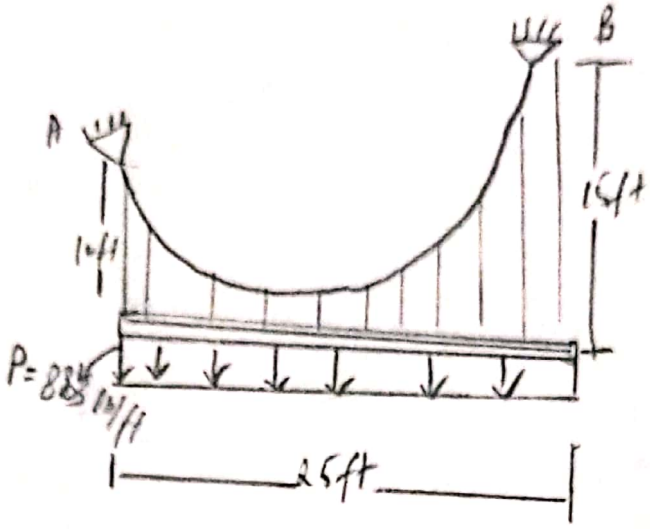
$$\boxed{M = 0}$$

Diagram



Q1. No:02

ob



Sol:

The cable supports the uniform load of

$W_o = 883$ lb/ft

Determine the tension in the cable at each support A and B

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

$$15 = \frac{883}{2F_H} x^2$$

$$10 = \frac{883}{2F_H} (25-x)^2$$

$$\frac{883}{2(15)} x^2 = \frac{883}{2(10)} (25-x)^2$$

$$\frac{883}{30} n^3 = \frac{883}{20} [(25)^2 + (n)^2 - 2(25)(n)$$

$$\frac{n^2}{30} = \frac{1}{20} (625 + n^2 - 50n)$$

$$n^2 = \frac{30}{20} (625 + n^2 - 50n$$

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

=> By using the calculator

$$0.5n^2 - 75n + 937.50 = 0$$

Choose root < 25 ft

$$n = 13.76 < 25 \text{ ft}$$

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

$$F_H = \frac{w_0}{2y} n^2 = \frac{883}{2(15)} (13.76)^2 = 5572 \text{ lb}$$

$$\boxed{F_H = 5572 \text{ lb}}$$

At B:

$$y = \frac{w_0}{2F_H} n^2 = \frac{883}{2(5572)} n^2$$

P.T.O

~~$y = \frac{883}{2(5572)} (n)^2$~~

$$\Rightarrow \frac{dy}{dx} = \tan\theta = 0.079 \Big|_{x=13.76} = 2.180$$

$$\Rightarrow \boxed{\theta_B = 65.30^\circ}$$

Now

$$T_B = \frac{FH}{\cos\theta_B}$$

$$= \frac{552}{\cos 65.30 \text{ lb/ft}}$$

$$T_B = 13334.38 \approx 13.0$$

$$\boxed{T_B = 13.0 \text{ kip}}$$

At Point A

we know that

$$y = \frac{w_o}{2FH} x^2 \quad \text{formula}$$

$$y = \frac{883}{2(5572)} x^2$$

$$= \tan\theta_A = 0.158x \Big|_{x = 25 - 13.7} = 1.780$$

$$= \theta_A = 60.67^\circ$$

Where

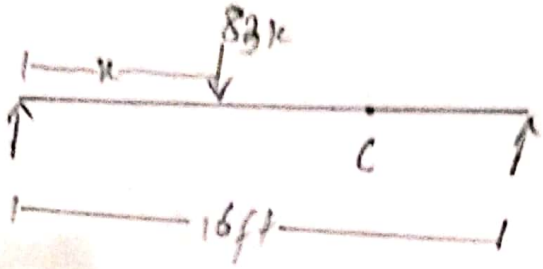
$$\Rightarrow T_A = \frac{5572}{\cos 60.67}$$

$$\Rightarrow T_A = 11375.16 \approx 11.0$$

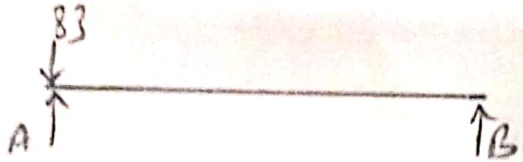
$$\Rightarrow \boxed{T_A = 11.0 \text{ kip}} \rightarrow \text{Ans}$$

Q:03

Shear force influence line for the beam.



$x = 0 \quad V_C = P$



$\Sigma M_B = 0$

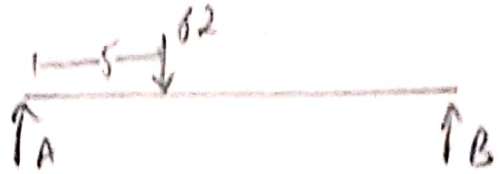
$-R_A(16) + 83(16) = 0$

$$\boxed{R_A = 83}$$

$83 - 83 - V_C = 0$

$$\boxed{V_C = 0}$$

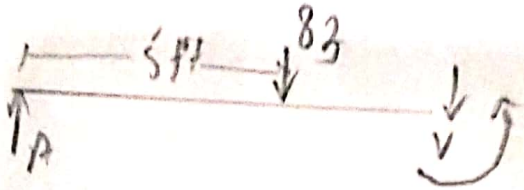
$x = 5$



↺ $\Sigma M_B = 0$

$-RA(16) + 83(11) = 0$

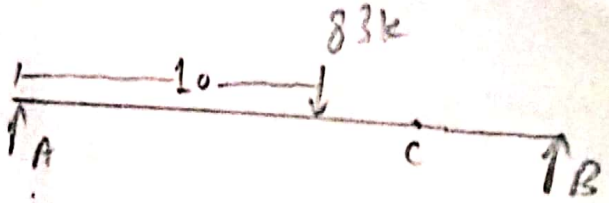
$RA = 57.062k$



$57.062 - 83 - V_c = 0$

$V_c = -25.93$

$x = 10$

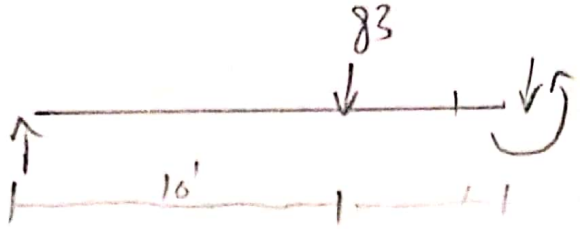


↺ $\Sigma M_D = 0$ $\quad V_c = ?$

$-RA(16) + 83(6) = 0$

$RA = 31.125$

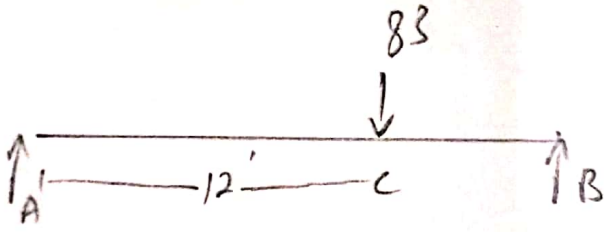
12



$31.125 - 83 - V_c = 0$

$\boxed{V_c = -51.875}$

$\boxed{x = 12}$



$83(4) - RA(16) = 0$

$\boxed{RA = 20.75}$

$20.75 - 83 - V_c = 0$

$\boxed{V_c = -62.25}$

$x = 12'$

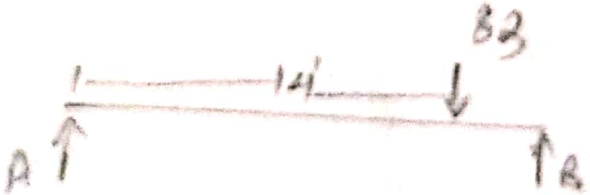
$-RA(16) + B2(4) = 0$

$RA = 20.5'$

$20.5 - V_c = 0$

$V_c = 20.5'$

$x = 14$



$-RA(16) + B2(12) = 0$

$RA = 10.75$

$10.75 - V_c = 0$

$V_c = 10.75$

$x = 16$

$-RA(16) + 83(0) = 0$

$$\boxed{RA = 0}$$

$0 - V_c = 0$

$$\boxed{V_c = 0}$$

x	V_c
0	0
5	-25.93
10	-51.875
12⁻	-62.25
12⁺	20.5
14	10.75
16	0

16 15