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NASRULLAH

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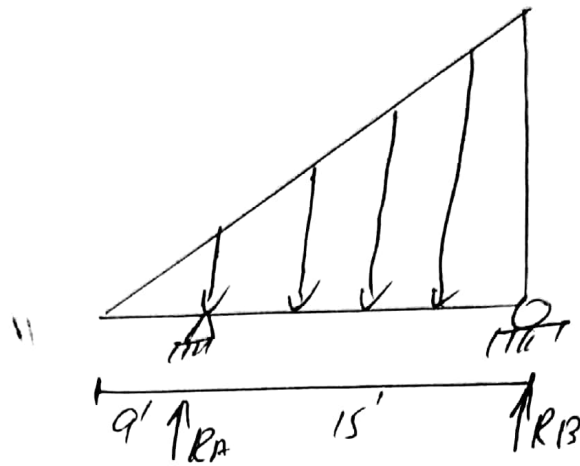
B

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Structural Analysis I

28-09-2020

Q no # 01

 $P = 70 \text{ lb/ft}$ Solution

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

$$R_A + R_B - \frac{1}{2}(70)(24) = 0$$

$$R_A + R_B = 840 \quad \text{--- (1)}$$

$$\sum M_A = 0 \uparrow \downarrow$$

$$-(R_B)(15) + \left(\frac{1}{2}(70)(15)\right)\left(\frac{2}{3} \times 15\right) = 0$$

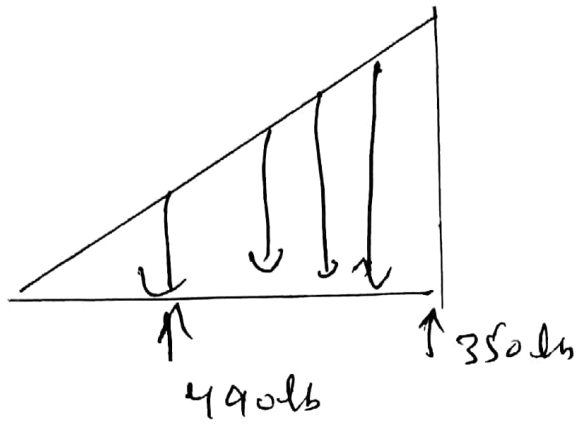
$$-15R_B + 5250 = 0$$

$$+R_B = +\frac{5250}{15}$$

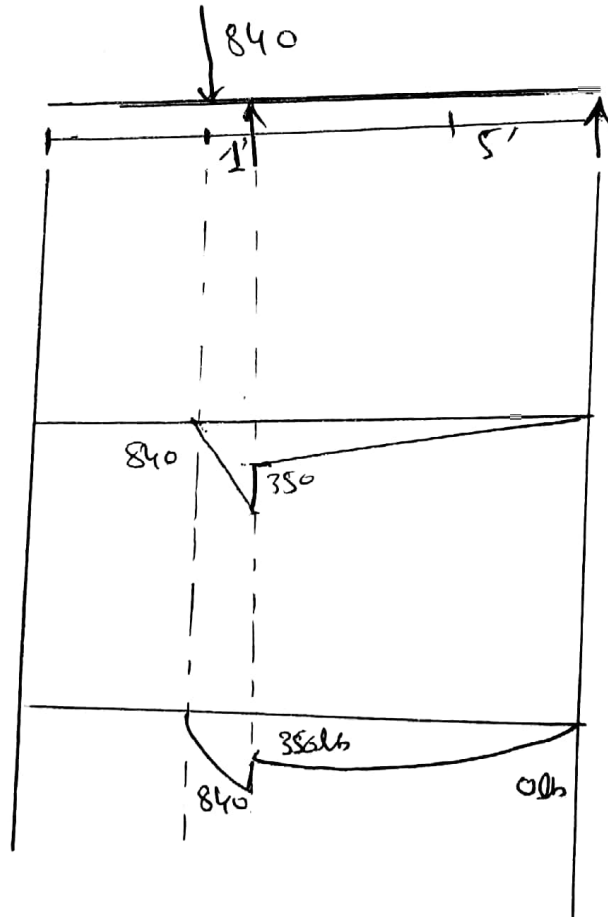
$$\boxed{R_B = 350 \text{ lb}}$$

put in equ (1) we get

$$\boxed{R_A = 490 \text{ lb}}$$

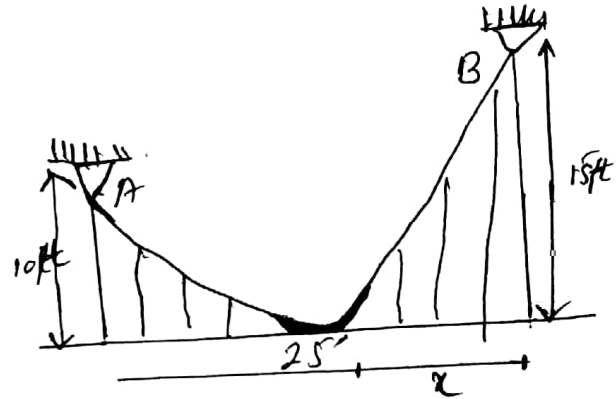


F · B · D



S · F · D

Q no # 02

Solution

$$w_0 = 870$$

$$y = \frac{w_0}{2F_H} x^2$$

$$15 = \frac{870}{2F_H} (25-x)^2$$

$$\frac{870}{2(15)} x^2 = \frac{870}{2(10)} (25-x)^2$$

$$\frac{870}{30} x^2 = \frac{870}{20} [(25)^2 + x^2 - 2(25)(x)]$$

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

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

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

∴ by Quadratic Formula
we get $x = 13.76$

Choose root < 25 ft

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

$$F_H = \frac{w_0}{2y} x^2 = \frac{870}{2(15)} (13.76)^2 = 5490.7904$$

At B

$$y = \frac{w_0}{2T} x^2 = \frac{870}{2(15)} \times 13.75^2 = \frac{870}{2} \times 189.0625$$

$$= 0.0792 x^2$$

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

NOW we have to find the tension at given points.

by using formula

$$y = \frac{w_0}{2FH} x^2$$

$$= \frac{870}{2FH} x^2$$

$$= \frac{435}{FH} x^2$$

Differentiate the ~~following~~ above eq w.r.t x

$$\frac{dy}{dx} = \frac{d}{dx} \left(\frac{435}{FH} x^2 \right)$$

$$\frac{435}{FH} 2x$$

$$\frac{dy}{dx} = \frac{870}{T_0} x$$

$$\text{Also } \tan \theta = \frac{dy}{dx}$$

So

$$\tan \phi = \frac{870}{T_0} x$$

As point (A) is -11.24 away from 0

So at point A

$$\tan \phi_A = \frac{870}{5490.7904} (-11.24)$$

$$\phi_A = \tan^{-1}(-1.780)$$

$$\phi_A = -60.600^\circ$$

Now tension at point A

$$T_A = \frac{F_H}{\cos \phi_A}$$

$$= \frac{5490.79}{\cos(-60.60^\circ)} = 11212.75 \text{ lbs}$$

$$= 11.2 \text{ KPS}$$

Now point B where $x = 13.76$

$$\tan \phi_B = \frac{870}{F_H} (13.26)$$

$$= \frac{870}{5490.7904} (13.76)$$

$$\phi_B = \tan^{-1}(2.180)$$

$$\theta_B = 65.36^\circ$$

tension at c

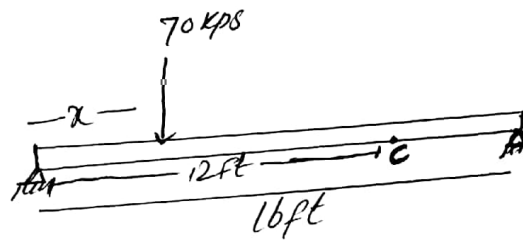
$$T_c = \frac{FH}{\cos \theta_B}$$

$$= \frac{5490.79}{\cos(65.36)}$$

$$= 13170.3 \text{ lbs}$$

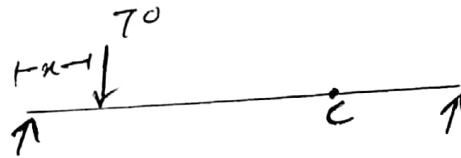
$$\boxed{13.17 \text{ kips}}$$

Q) NO #03

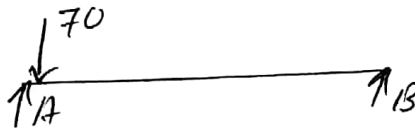


Influence at "C"
 E. "A".

Solution Shear force influence line - $P = 70K$



$$x = 0, V_C = ?$$



$$\sum M_B = 0$$

$$-R_A(16) + 70(16) = 0$$

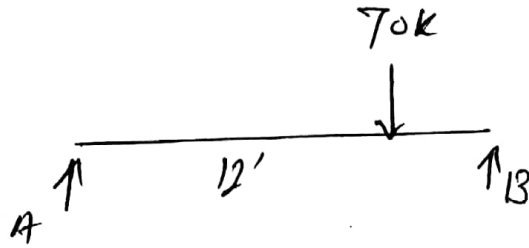
$$R_A = 70$$



$$70 - 70 - V_C = 0$$

$$\boxed{V_C = 0}$$

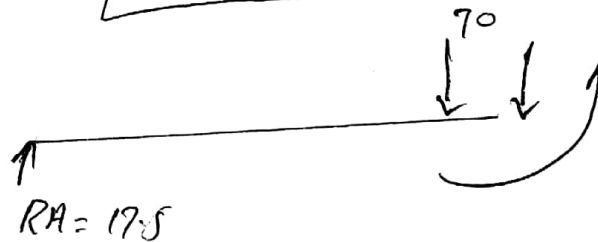
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Now $x = 12$ 

$$\sum \epsilon_{MB} = 0$$

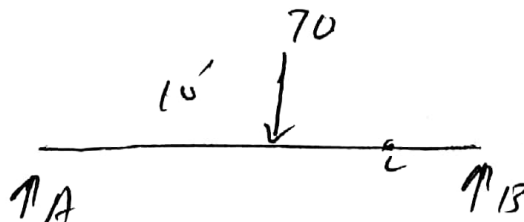
$$-RA \times 16 + 70(4) = 0$$

$$RA = 17.5$$



$$17.5 - 70 - VC = 0$$

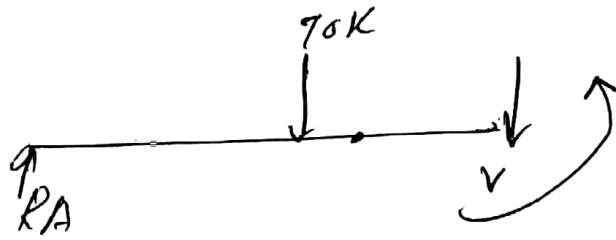
$$VC = -52.5$$

Now $x = 10$ 

$$\sum \epsilon_{MB} = 0$$

$$-RA(16) + 70(6) = 0$$

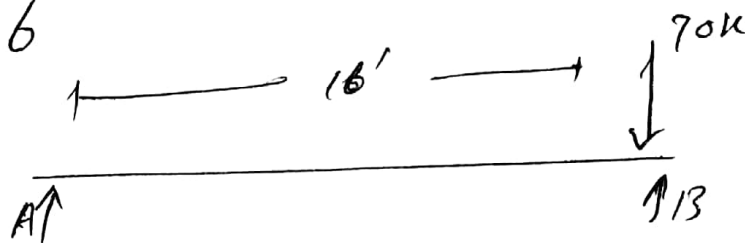
$$RA = 26.25$$



$$26.25 - 70 - V_C = 0$$

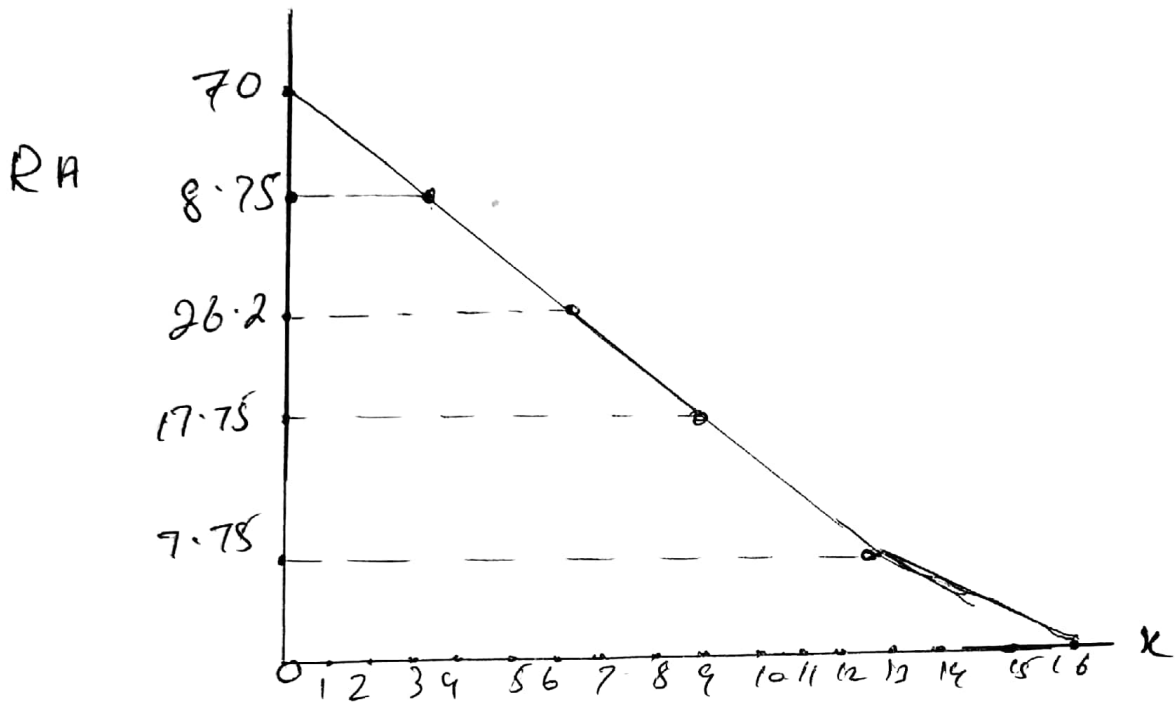
$$V_C = -43.75$$

$$x = 16$$



$$- R_A(16) + 70(0) = 0$$

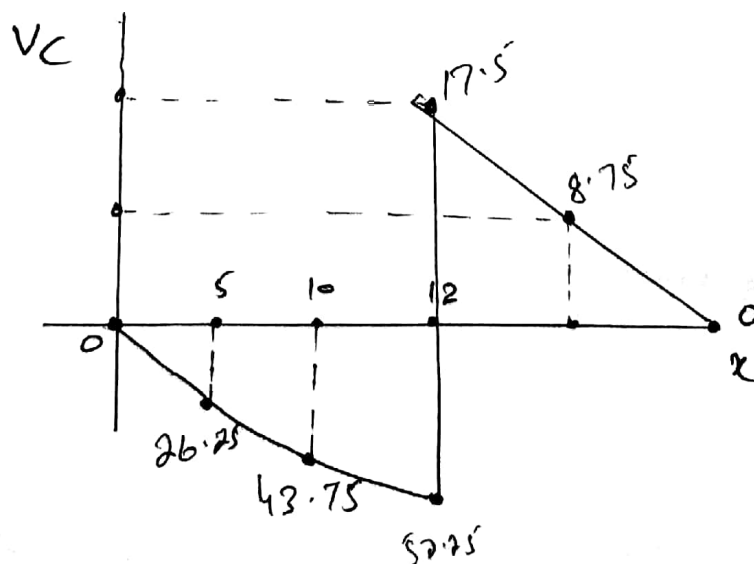
$$R_A = 0$$



Influence line of RA

Influence line of RA

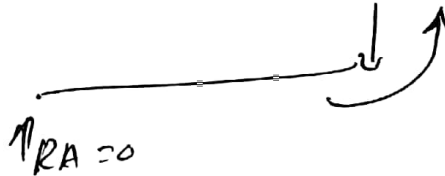
x	VC
0	0
5	-21.875
10	-43.75
12 ⁻	-52.5
12 ⁺	17.5
14	8.75
16	0



$$\sum \epsilon_{MB} = 0$$

$$-R_A(16) + 70(0) = 0$$

$$R_A = 0$$

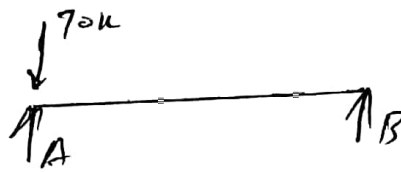


$$0 - VC = 0$$

$$VC = 0$$

Now to find influence line

$$\Rightarrow x = 0$$



$$\sum M_B = 0$$

$$-R_A(16) + 70(16) = 0$$

$$R_A = 70$$

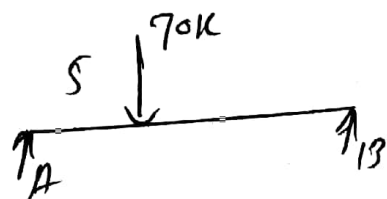
$$\Rightarrow x = 5$$

RA = ?

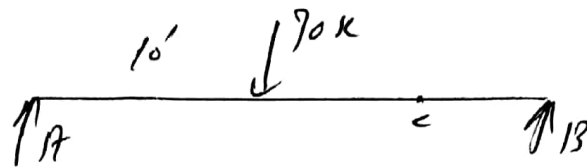
$$\sum \epsilon_{MB}$$

$$-R_A(16) + 70(11) = 0$$

$$R_A = 48.125$$



$$\Rightarrow x = 10$$

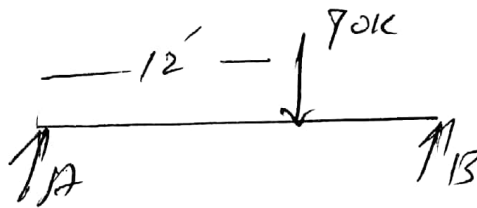


$$+\circlearrowleft \sum M_B = 0$$

$$-R_A(16) + (70)(6) = 0$$

$$\boxed{R_A = 26.25}$$

$$\Rightarrow x = 12$$

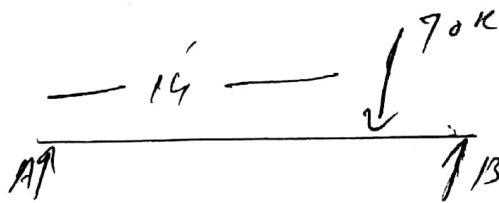


$$+\circlearrowleft \sum M_B = 0$$

$$-R_A(16) + 70(4) = 0$$

$$\boxed{R_A = 17.5}$$

$$\Rightarrow x = 14$$



$$+\circlearrowleft \sum M_B = 0$$

$$-R_A(16) + 70(2) = 0$$

$$\boxed{R_A = 8.75}$$