ID	7655
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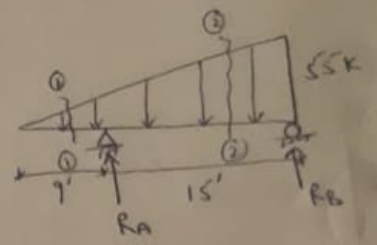
Subject	Structure I
Date	26/9/20
Semester	(Summer 20) (11th)
Submitted to	Engr Saqib Khan

Q # 01

Solution:



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

$$\Rightarrow \frac{1}{2} \times 55 \times 24 \times \frac{1}{3} \times 24 = R_A \times 15$$

$$R_A = 352 \text{ lbs}$$

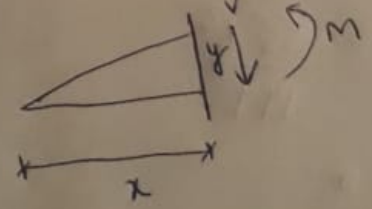
$$\Sigma F_y = 0 \quad \uparrow +$$

$$R_A + R_B = \frac{1}{2} \times 55 \times 24$$

$$R_B = 660 - 352$$

$$R_B = 308 \text{ lbs}$$

Now Section ①—①



for y

$$\frac{y}{x} = \frac{55}{24}$$

$$y = \left(\frac{55}{24}\right)x$$

So $\Sigma F_y = 0 \uparrow +$

$$\Rightarrow -\frac{1}{2} \times x \times \left(\frac{55}{24}\right)x - V_c = 0$$

$$\Rightarrow V_c = -\frac{55x^2}{48}$$

at $x = 0$

$V_c = 0$

& at $x = 9$

$V_c = -92.8125$ lbs

$$\Rightarrow M = -\frac{1}{2} \times x \times \left(\frac{55}{24}x\right) \times \frac{1}{3}x$$

$$\Rightarrow M = -\frac{55x^3}{144}$$

at $x = 0$

$M = 0$

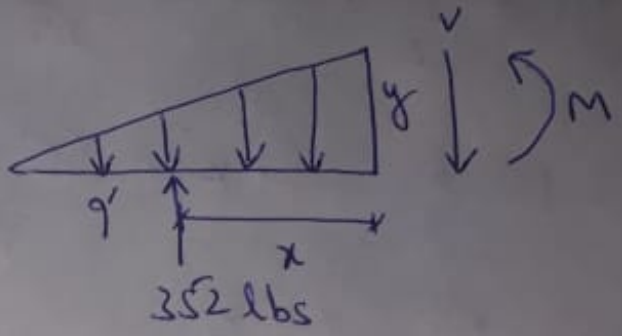
at $x = 9$

$M = -278.4375$ lbs·ft

Now for section ②–②

for y

$$\frac{y}{x+9} = \frac{55}{24}$$



$$y = \frac{55}{24}(x+9)$$

So

$\Sigma f_y = 0 \uparrow +$

$$352 - \frac{1}{2} \times (x+9) \times \frac{55}{24} \times (x+9) - V_c = 0$$

$$V_c = 352 - \frac{55 \times (x+9)^2}{48}$$

at $x = 0$

$V_c = 259.1875$ lbs

at $x = 15'$

$V_c = -308$ lbs

$$M + \frac{1}{2} \times (x+9) \times \frac{55}{24} \times (x+9) \times \frac{1}{3} \times (x+9) - 352x$$

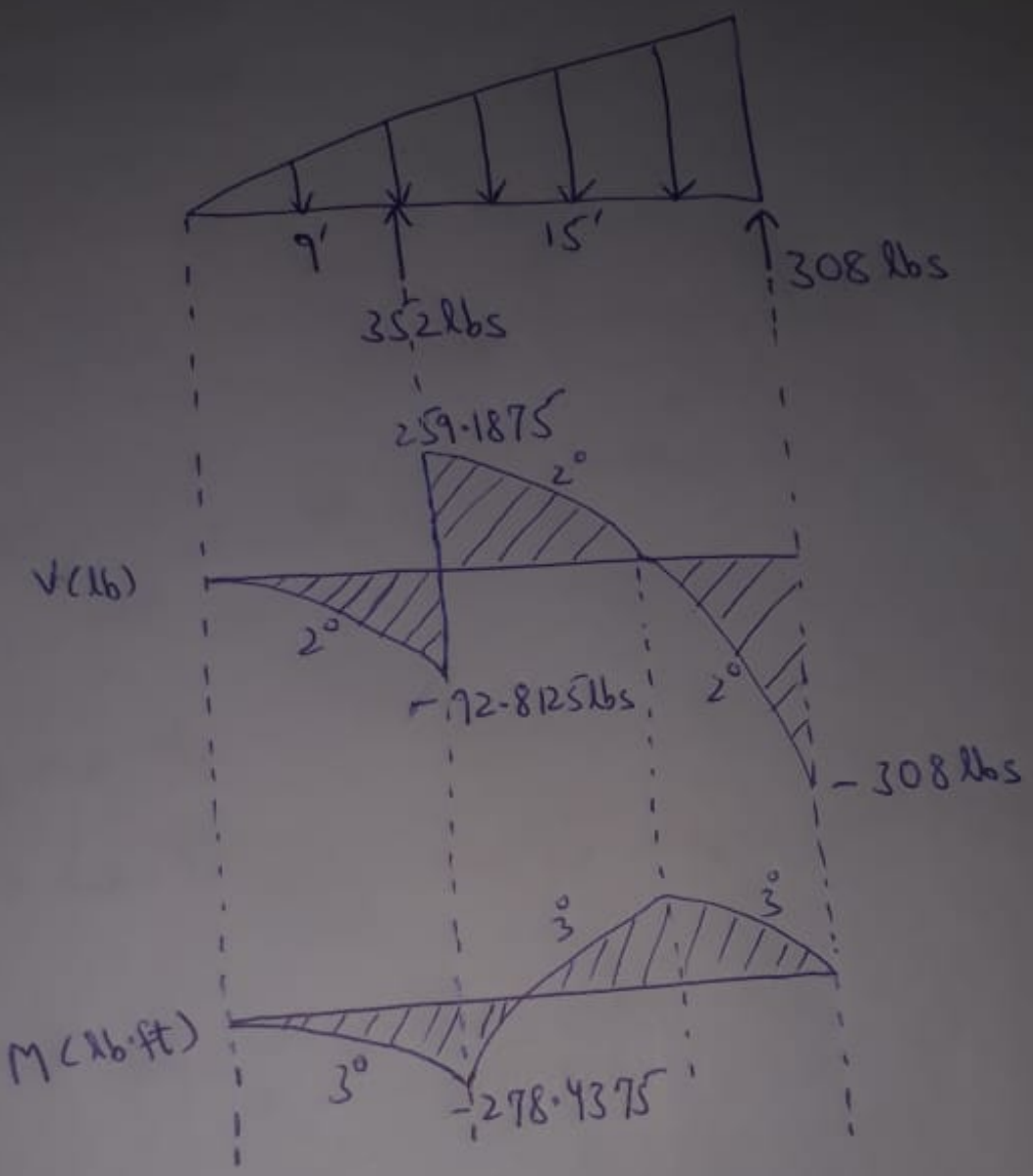
$$M = 352x - \frac{55(x+9)^3}{144}$$

at $x = 0$

$M = 278.4375$ lb·ft

at $x = 15'$

$M = 0$


9'
15'
352 lbs
308 lbs
259.1875
2°
V(lb)
2°
-72.8125 lbs
2°
-308 lbs
3°
3°
M(lb·ft)
3°
-278.4375

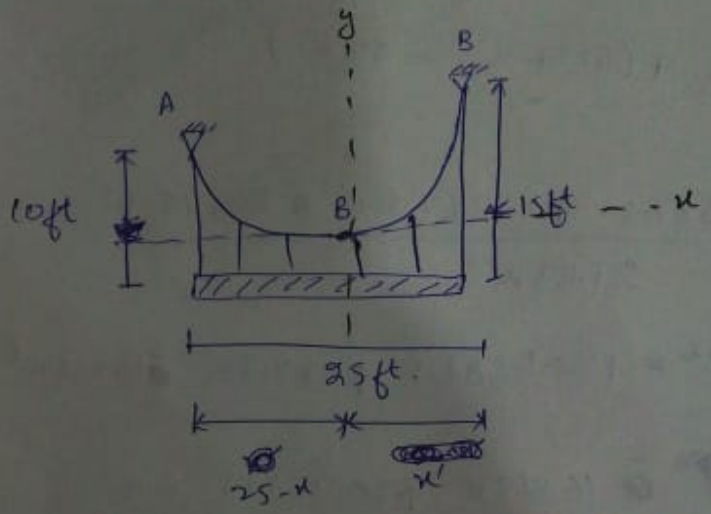
$= \frac{655}{-7.83} \times 15$

Que 2 :-> The cable ... P lb/ft ①

Tension at A & B , P = Last Three digits of your reg numbers

Sol As Reg numbe = 7655

so P = 655 lb/ft.



As $y = \frac{w_o}{2T_o} x^2$, $w_o = 655$ lb/ft ⇒

$y = \frac{655}{2T_o} \times x^2 \Rightarrow$ $\boxed{y = \frac{327.5}{T_o} x^2}$ → eq ①

Let "B" is at dist (x') from "B" (lowest

so at $x = x'$, $y = 15$ ft

$15 = \frac{327.5}{T_o} \times x'^2$

$\boxed{T_o = 327.5 x'^2}$ $\boxed{T_o = 21.83 x'^2}$

(2) at For A

ie $y = 10$, $x = 25 - x$

$$\left[10 = \frac{327.5}{T_0}\left(-(25-x')^2\right)^2\right] \rightarrow (2)$$

& $T_0 = 21.83 x'^2$ By putting in eq (2)

$$10 = \frac{327.5}{21.83 x'^2} + (625 + x'^2 - 50x')$$

$$10 = +\frac{204687.5 + 327.5 x'^2 - 16375 x'}{21.83 x'^2}$$

$$218.3 x'^2 = +204687.5 + 327.5 x'^2 - 16375 x'$$

$$109.2 x'^2 - 16375 x' + 204687.5 = 0$$

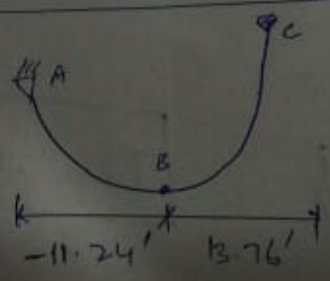
By quadratic eq we have.

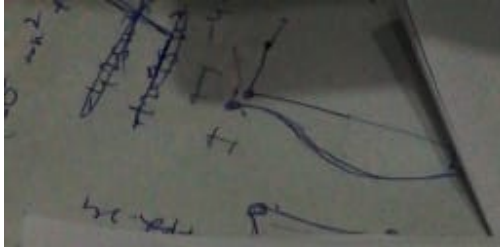
so $\boxed{x' = 13.76 \text{ ft}}$

$T_0 = 21.83 \times (13.76)^2 \text{ ft}$

$\boxed{T_0 = 4133.23 \text{ lb}}$

so





Point A =

$$\cos\theta_A = \frac{T_0}{T_A}$$

$$T_A = T_0 / \cos\theta_A$$

$\theta_A = ?$ At $y = \frac{327.5 x^2}{T_0}$

$$\frac{dy}{dx} = \frac{327.5 \times 2x}{T_0}$$

$$\tan\theta = \frac{dy}{dx} = \frac{655}{T_0} x$$

and at A = 11.24 ft

so $\therefore \tan\theta_A = \frac{655}{4133.23} \times (-11.24)$

$$\tan\theta_A = -1.78$$

$$\theta_A = \tan^{-1}(1.78)$$

$$\boxed{\theta_A = -60.68^\circ}$$

Now $T_A = \frac{T_0}{\cos\theta_A} = \frac{4133.23}{\cos(-60.68)}$

$\boxed{T_A = 8.440 \text{ K}}$ Tension at Point A.

Tension at point B = $x = 0$

$$\tan\theta_B = \frac{655}{T_0}(0)$$

$$\theta_B = 0$$

$$T_B = \frac{T_0}{\cos(0)} \Rightarrow T_B = \frac{T_0}{1} \Rightarrow \boxed{T_B = T_0 = 4133 \text{ K}}$$

Tension in cable at Point B

At point C where $x = 13.76'$

$$\tan \theta_c = \frac{655}{T_o} x$$

$$\tan \theta_c = \frac{655}{4133.23} \times 13.76$$

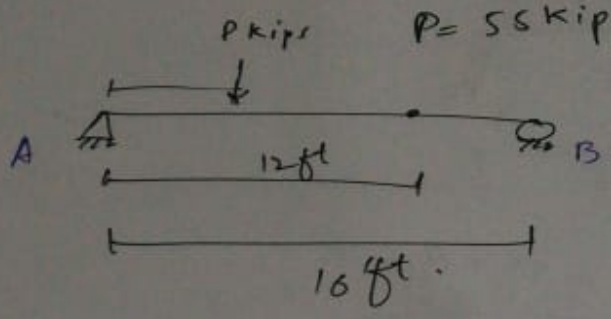
$$\tan \theta_c = 2.18$$

$$\boxed{\theta_c = 65.36}$$

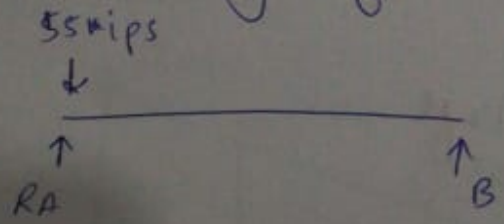
$$T_c = \frac{T_o}{\cos \theta_c} = \frac{4133.23}{\cos 65.36} = 9915.34$$

$\boxed{T_c = 9.915\ K}$ Tension in cable at Point C.

Que (3) Draw V_C influence line for beam at point C Eq. for reaction at A (1)



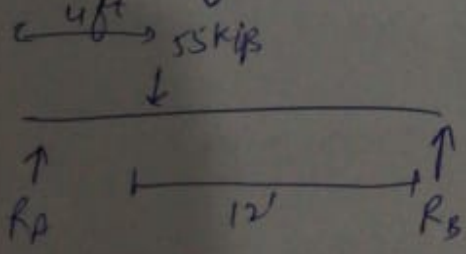
Sol starting from Point 'A' for $x = 0$



$$\Sigma M_B = R_A \times 16 - 55 \times 16 = 0$$

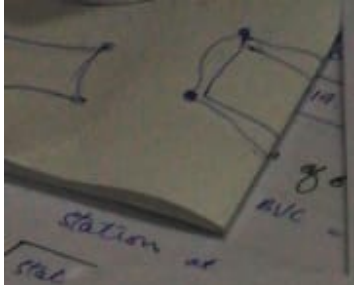
$$\boxed{R_A = 55 \text{ kips}}$$

at $x = 4$ ft.

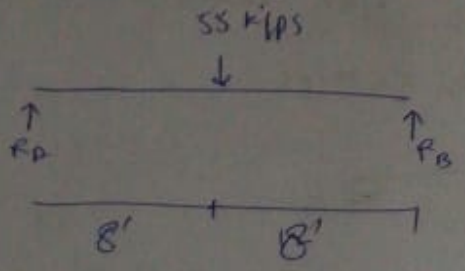


$$\Sigma M_B = R_A \times 16 - 55 \times 12 = 0$$

$$\boxed{R_A = 41.25 \text{ kips}}$$



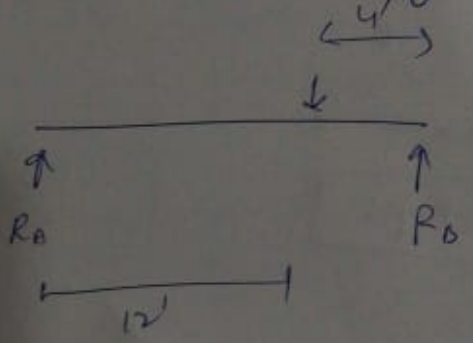
(3) at $x = 8$ ft



$\Sigma M_B = R_A \times 16 - 55 \times 8 = 0$

$R_A = 27.5$ kips

(4) at $x = 12$ ft

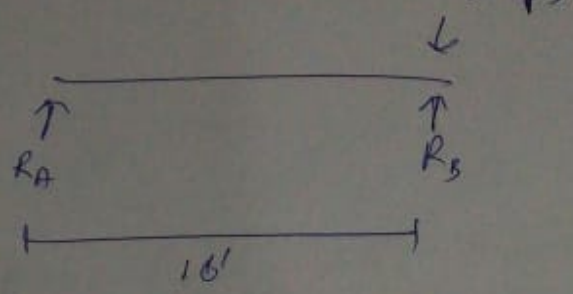


$\Sigma M_B = R_A \times 16 - 55 \times 4 = 0$

$R_A = 13.75$ kips

P.T.O

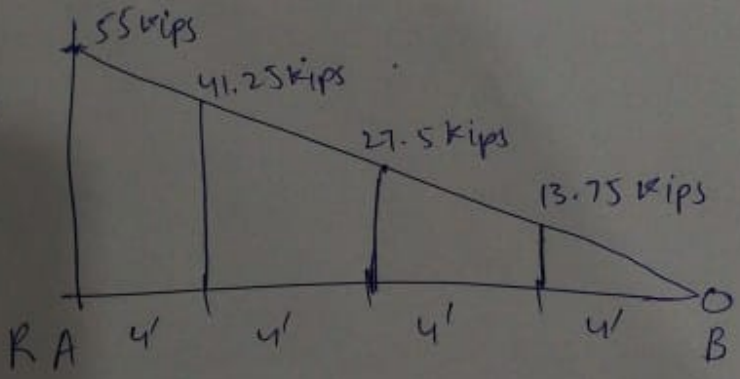
(5) at x = 16 ft

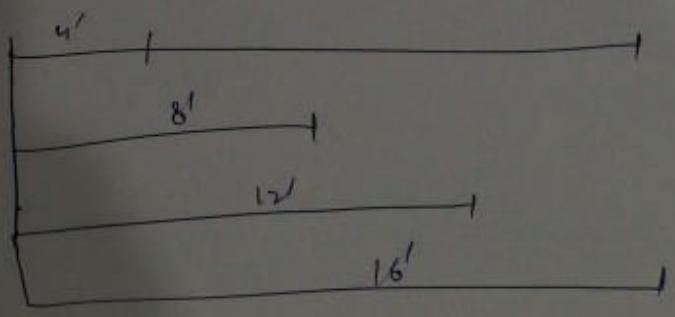


$\Sigma M_B = R_A \times 16 - 55 \times 0 = 0$

$\boxed{R_A = 0}$

(6)





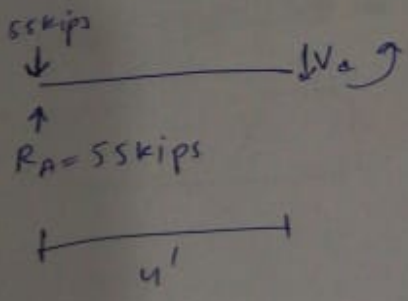
Now for V_c = ?

for shear force at V_c = ?

as $x = 12ft'$

So starting from $x=0$ we have

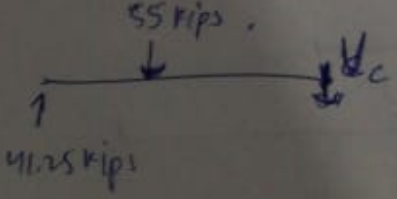
As at $x=0$ $R_A = 55$



So $\boxed{V_c = 0}$ at $x=0$

at $x = 4'$

R_A = 41.25 kips

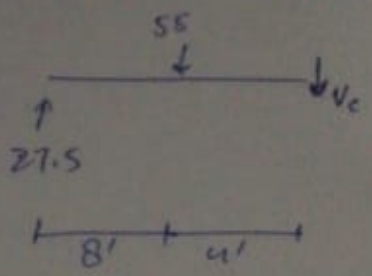


~~Σ 41.25 × 12 − 55 × 8 = 0~~

$V_c + 55 - 41.25 =$

$\boxed{V_c = -13.75}$ kips

(3) Now at x = 8

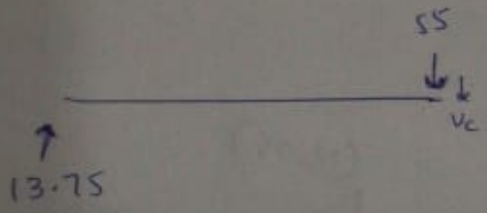


$V_c + 55 - 27.5 = 0$

$V_c = -27.5$ kips

(4)

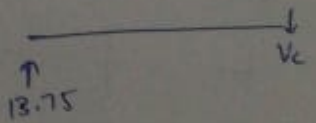
at x = 12 (+)



$V_c + 55 - 13.75 = 0$

$V_c = -41.25$ kips

at x = 12 (−)



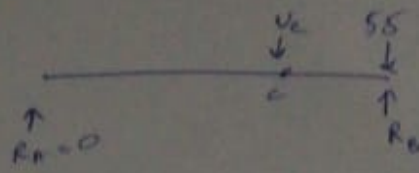
$V_c - 13.75 = 0$

$V_c = 13.75$ kips

(5)

(6)

at x = 16



$$V_c + 55 - R_B = 0$$

$$V_c + 55 - 55 = 0$$

$$V_c = 0$$