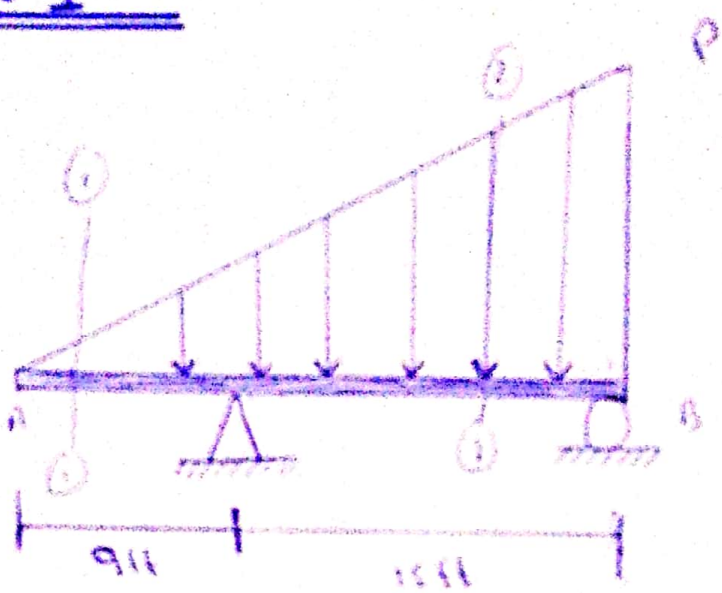
Name	M. Saleem
ID	7859
semester	7th
Subject	Structure - 1

Question No 1

Figure # 01



Solution:-

$$\Sigma M_B = 0 \quad \text{L.t}$$

$$\Rightarrow \frac{1}{2} \times 59 \times 24 \times \frac{1}{3} \times 24 = R_A \times 15$$

$$\Rightarrow \boxed{R_A = 377.6\ lb}$$

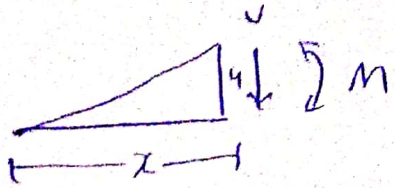
$$\Sigma f_y = 0 \uparrow$$

$$R_A + R_B = \frac{1}{2} \times 59 \times 24$$

$$R_B = 708 - 377.6$$

$$\boxed{R_B = 330.4\ lb}$$

Now section ① – ①



for y

$$\frac{y}{x} = \frac{59}{24}$$

$$\Rightarrow y = \left(\frac{59}{24}\right)x$$

So $\sum R_y = 0 \uparrow +$

$$\Rightarrow -\frac{1}{2} \times x \times \left(\frac{59}{24}\right)x - V_C = 0$$

$$\Rightarrow V_C = -\frac{59x^2}{48}$$

at $x = 0$

$V_C = 0$

and at $x = 9$

$$\boxed{V_C = -99.56}$$

$$\Rightarrow M = -\frac{1}{2} \times x \times \left(\frac{59}{24}x\right) \times \frac{1}{3} x$$

$$\Rightarrow \quad M = -\frac{59\,x^3}{144}$$

at $x = 0$

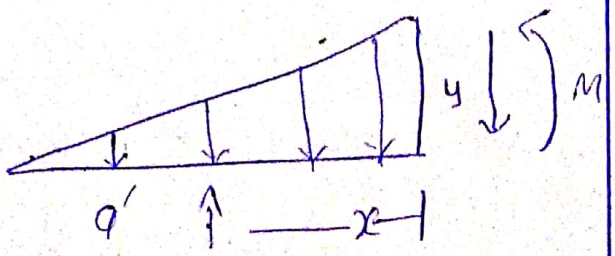
$M = 0$

at $x = 9$

~~$M = 33.18$ lbs-ft~~

$M = -298.68$ lbs-ft

Now for section ② – ②



~~62.68~~
377.6

for y

$$\frac{y}{(x+9)} = \frac{59}{24}$$

$$y = \frac{59}{24}(x+9)$$

so $\Sigma f_y = 0 \uparrow$

$$377.6 - \tfrac{1}{2} \times (x+9)\left(\frac{59}{24}\right)(x+9) - V_c = 0$$

$$V_C = 377.6 - \frac{59 \times (x+9)^2}{48}$$

at $x = 0$

$$V_C = 0$$

at $x = 15$

$$\boxed{V_C = -330.4}$$

$$M + \tfrac{1}{2} \times (x+9)\left(\frac{59}{24}(x+9)\right) \times \tfrac{1}{3} \times (x+9) - 377.6x = 0$$

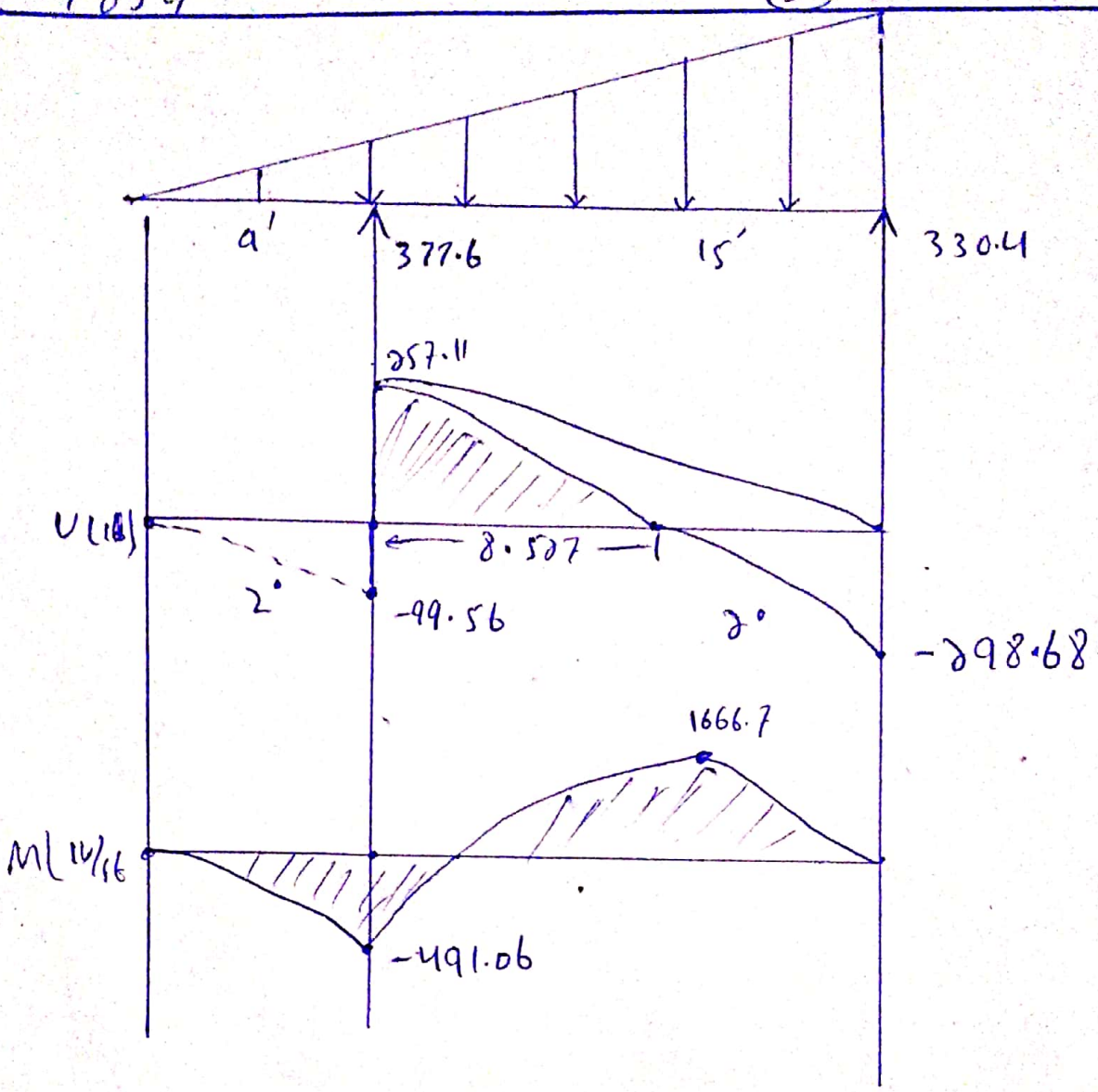
$$M = -377.6x - \frac{59(x+9)^3}{144}$$

at $x = 0$

$$M = 0$$ ~~491.06 lb-ft~~

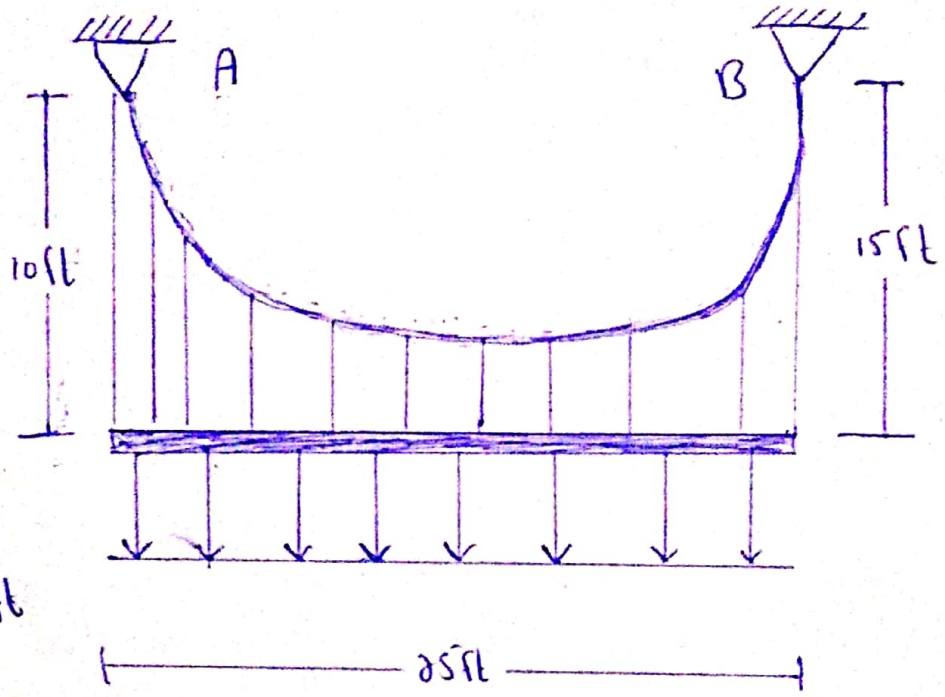
at $x = 15$

$$\boxed{M = -491.06 \text{ lb-ft}}$$



Question No 2

Figure # 02



Solution:-

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

ID - 7859

Putting the value

$$y = \frac{859}{2F_H} x^2$$

$$15 = \frac{859}{2F_H} x^2$$

$$10 = \frac{859}{\partial F_H}(\partial 5 - x)^\partial$$

$$\frac{859}{\partial(15)}x^2 = \frac{859}{\partial(10)}(\partial 5 - x)^\partial$$

$$\frac{859}{30}x^2 = \frac{859}{\partial 0}\left[(\partial 5)^\partial + (x)^\partial - \partial(\partial 5)(x)\right.$$

$$\frac{x^\partial}{30} = \frac{1}{\partial 0}\left(6\partial 5 + x^\partial - 50x\right)$$

$$x^2 = \frac{30}{\partial 0}\left(6\partial 5 + x^\partial - 50x\right)$$

$$x^\partial = 1.5\left(6\partial 5 - 50x + x^\partial\right)$$

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

Choose root $< \partial 5$ ft

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

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

$$= \frac{859}{2(15)} (13.76)^2 =$$

$$\boxed{F_H = 5421.3}$$

At B

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

$$= \frac{859}{2(5421.3)} x^2$$

$$= \frac{dy}{dx} = \tan\theta_B = 0.1583x \Big|_{x=13.76} = 2.180$$

$$\theta_B = 65.3^\circ$$

$$T_B = \frac{F_H}{\cos\theta_B} = \frac{5421.3}{\cos 65.3}$$

$$\boxed{T_B = 12973.74} \text{ lb/ft}$$

AL A

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

$$= \frac{859}{2(5421.3)} x^2$$

$$\frac{dy}{dx} = \tan\theta_A = 0.158\,x \Big|_{x=(25-13.76)}$$

$$= 1.780$$

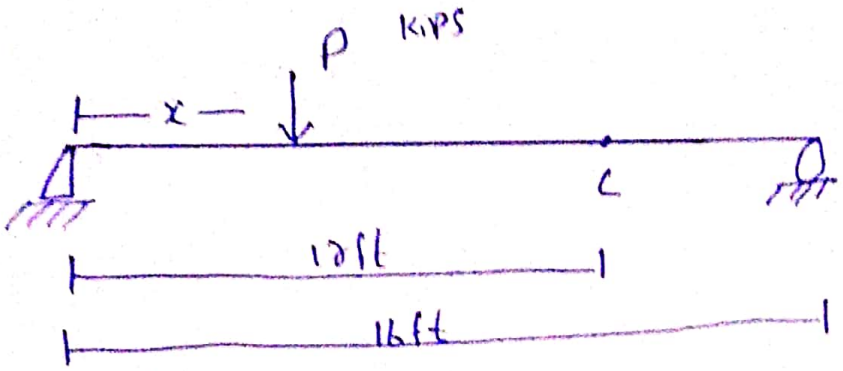
$$\theta_A = 60.67^\circ$$

$$T_A = \frac{F_H}{\cos\theta_A} = \frac{5421.3}{\cos 60.67^\circ}$$

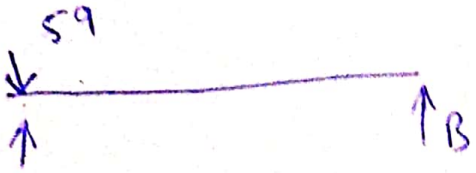
$$\boxed{T_A = 11067.5 \text{ lb/ft}}$$

Question No "3"

Figure :-



Solution:- $x = 0$ $\quad V_c = ?$



$$\Sigma M_B = 0$$

$$-R_A(16) + 59(16) = 0$$

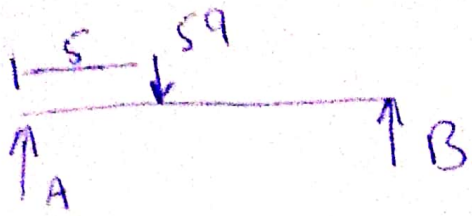
$$\boxed{R_A = 59}$$

$$59 - 59 - V_c = 0$$

$$\boxed{V_c = 0}$$

Now

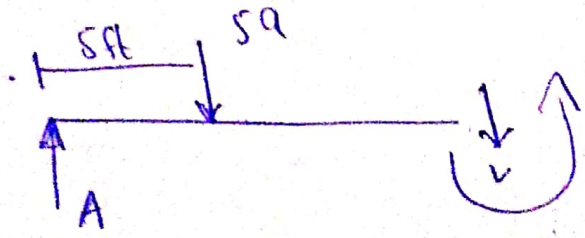
$x = 5'$



$\curvearrowleft \quad \Sigma M_B = 0$

$-R_A(16) + 59(11) = 0$

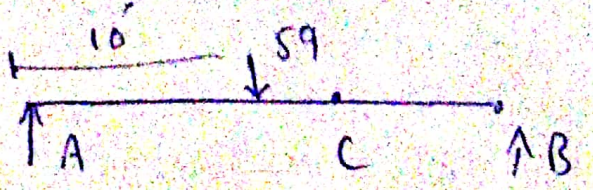
$$\boxed{R_A = 40.56\ K}$$



$40.56 - 59 - V_C = 0$

$$\boxed{V_C = -18.44}$$

Now $x = 10$

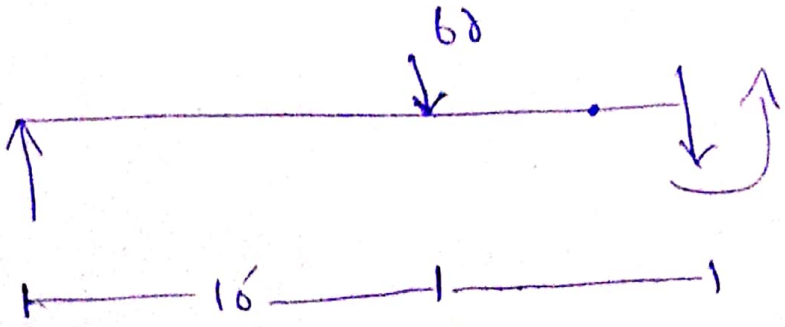


$\Sigma MB = 0$

$V_c = ?$

$$-RA(16) + 59(6) = 0$$

$$\boxed{RA = 22.125\ K}$$

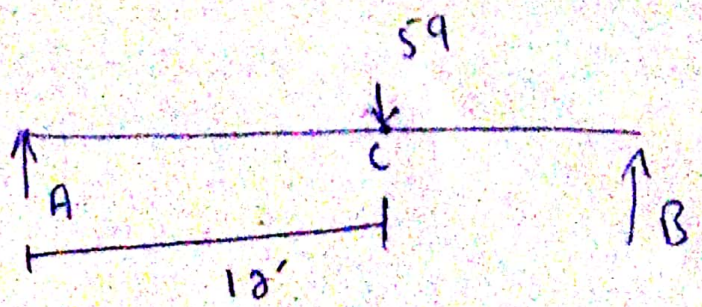


$$22.125 - 59 - V_c = 0$$

$$\boxed{V_c = -36.88}$$

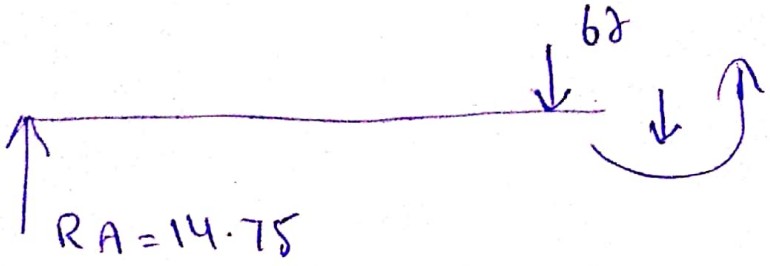
Now

$$x = 12$$



$$59(4) - RA(16) = 0$$

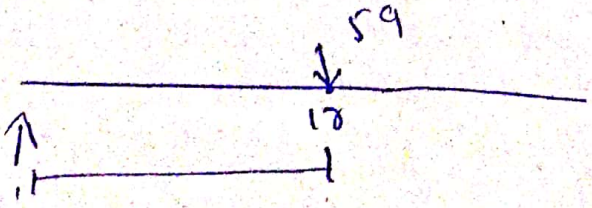
$$\boxed{RA = 14.75}$$



$$14.75 - 59 - V_c = 0$$

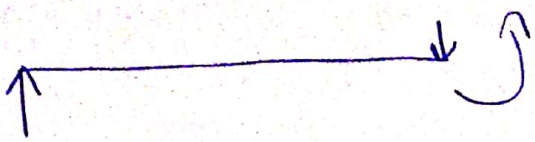
$$\boxed{V_c = -44.25}$$

$x = 12'$



$$-RA(16) + 59(4) = 0$$

$$\boxed{RA = 14.75}$$

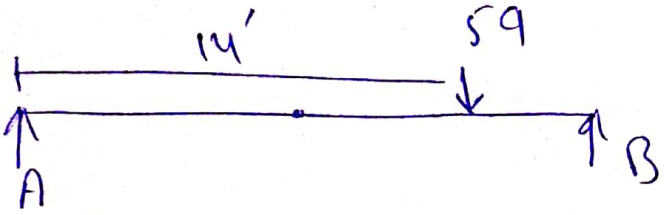


$$14.75 - V_C = 0$$

$$\boxed{V_C = 14.75}$$

Now

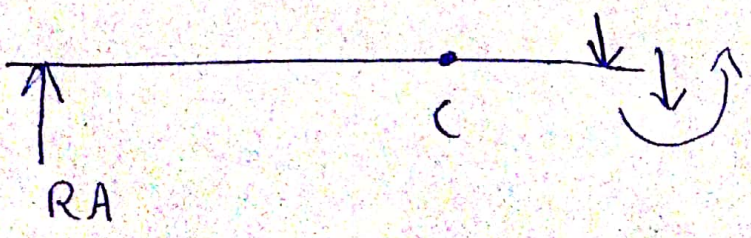
$$x = 14$$



~~$-RA(\quad) + \quad(x$~~

$$-RA(16) + 59(x) = 0$$

$$\boxed{RA = 7.37}$$

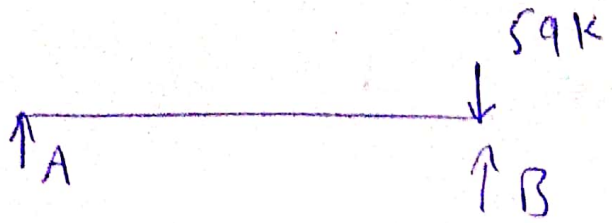


$$7.37 - V_C = 0$$

$$V_L = 7.37$$

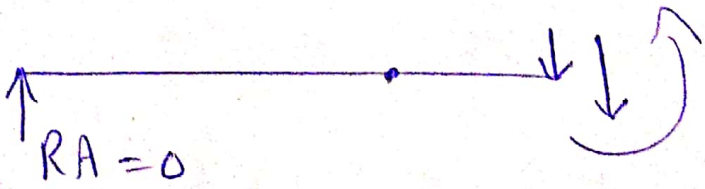
Now

$x = 16$



$$-R_A(16) + 59(0) = 0$$

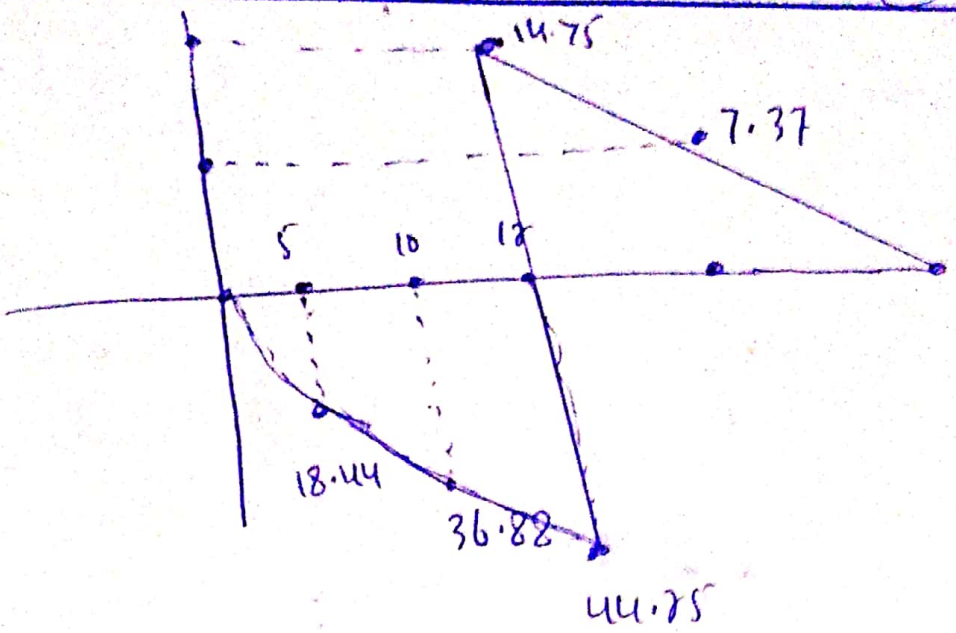
$$R_A = 0$$

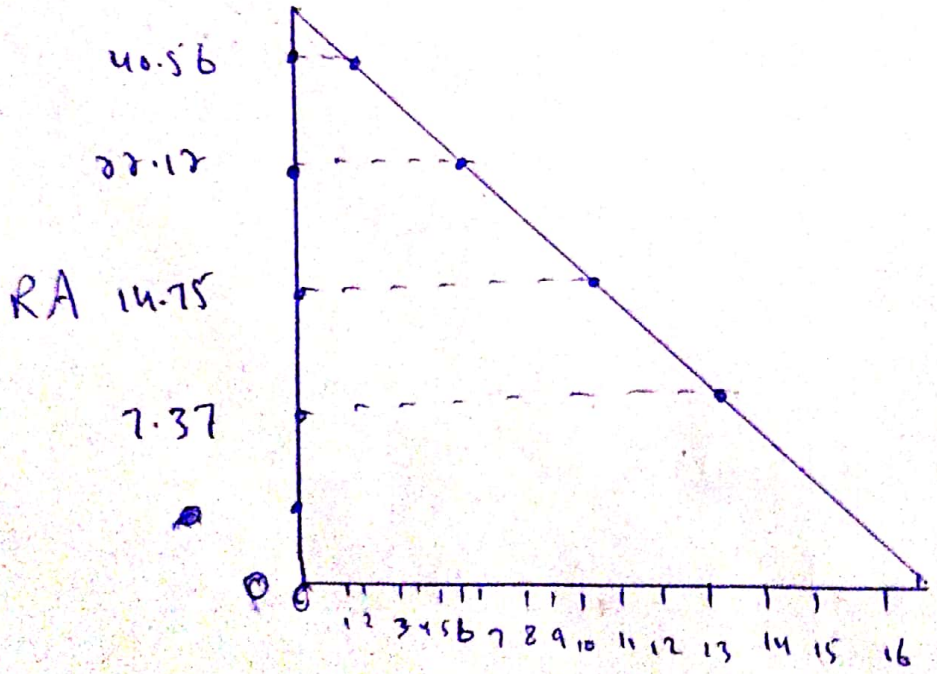


$$0 - V_C = 0$$

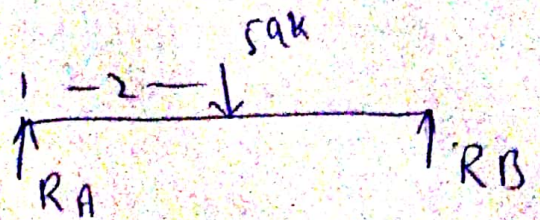
$$V_L = 0$$

x	V_L
0	0
5	-18.44
10	-36.88
12	-44.25
14	7.37
16	0

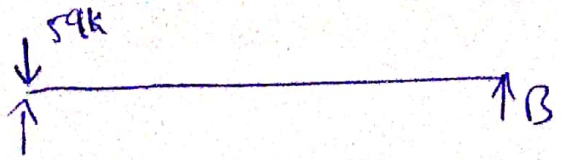




Now to Find Influence line for reaction A



$x = 0$ $\quad RA = ?$

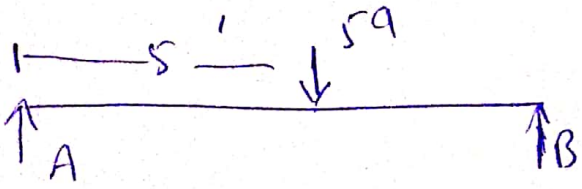


$\Sigma M_b = 0$

$$-RA(16) + 59(16) = 0$$

$$\boxed{RA = 59}$$

$\Rightarrow x = 5$ $\quad RA = ?$

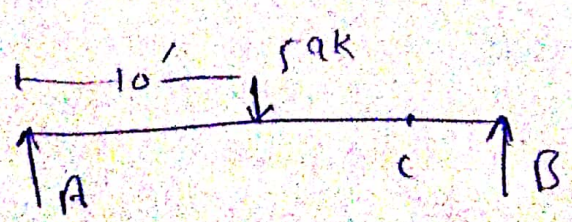


$C_1 + \Sigma M_B = 0$ $\quad$ ~~$RA(16) - 59(11)$~~

$$-RA(16) + 59(11) = 0$$

$$\boxed{RA = 40.56}$$

$x = 10$ $\quad RA = ?$



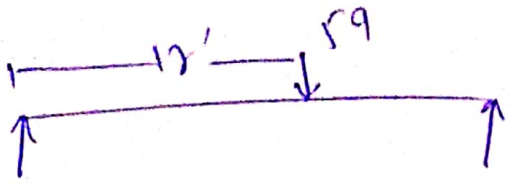
$\Sigma M_B = 0$

$$-RA(16) + 59(6) = 0$$

$$RA = 22.12k$$

$x = 12$ $\quad RA = ?$

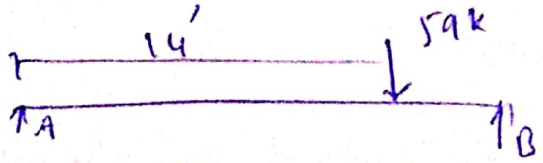
$$\Sigma M_B = 0$$



$$-RA(16) + 59(4) = 0$$

$$RA = 14.75k$$

$x = 14$



$\Sigma M_B = 0$ $\quad -RA(16) + 59(7) = 0$

$$RA = 7.75$$