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I.D 7869

Section . B

Subject Structure Analysis I

Submitted To;

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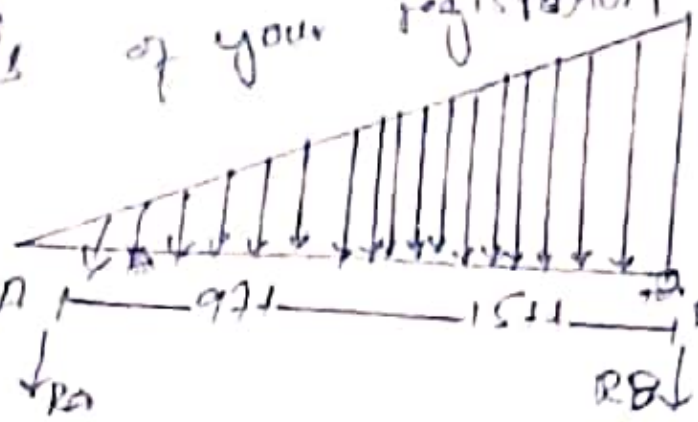
Q No 1:- Draw the Shear and bending moment equation and diagrams for the beam shown, the value of the uniformly varying load is the least two digits of your registration number.

= =

P = 69 lb/ft




diagrams:

= =

1.D 786 9

last two 69

Sol:-

$$\Rightarrow \sum M_B = C \quad (\curvearrowright +)$$

$$\Rightarrow \frac{1}{2} \times 69 \times 24 \times \frac{1}{3} \times 24 = R_A \times 15$$

$$\Rightarrow \boxed{R_A = 441.6 \text{ lb}}$$

$$\sum F_y = 0 \uparrow$$

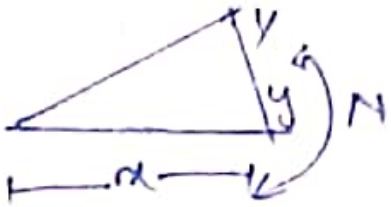
$$R_A + R_B = 1/2 \times 69 \times 24$$

$$\Rightarrow R_B = 828 - 441.6$$

$$\boxed{R_B = 386.4 \text{ lb}}$$

(a)

Now Section (1) and (2)




For y

$$y/x = \frac{6q}{24}$$

$$\Rightarrow y = \left(\frac{6q}{24}\right) x$$

So $\sum F_y = 0 \uparrow +$

$$\Rightarrow -1/2 \times x \times \left(\frac{6q}{24}\right) x - V_C = 0$$

$$\Rightarrow V_C = -\frac{6q\,x^2}{48}$$

at $x = 0$

$V_C = 0$

and at $x = 9$

$$V_C = -116.4335 \text{ lb}$$

(3)

$$M = -1/2 \times x \times \left(\frac{69}{24}x\right) \times 1/3\,x$$

$$\Rightarrow M = -\frac{69}{144}x^3$$

at $x = 0$

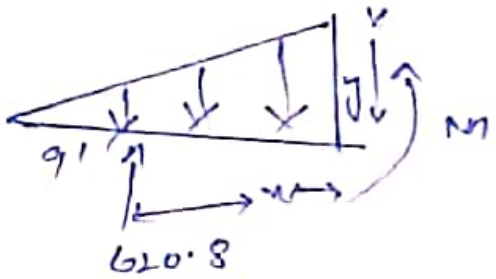
$M = 0$

at $x = 9$

$$\boxed{M = -349.3125\ \text{lb}}$$

Now for section ② and (3)

For y




$$\frac{y}{(x+9)} = \frac{69}{24}$$

$$y = \frac{69}{24}(x+9)$$

So $\sum F_y = 0 \uparrow$

$441.6 - 1/2 \times (x+9)\left(\frac{69}{24}(x+9)\right) - Vc = 0$

$$\Rightarrow Vc = 441.6 - \frac{69 \times (x+9)^2}{48}$$

at $x = 0$

$$\boxed{Vc = 107.2375}$$

at $x = 15$

$$\boxed{Vc = -314.23K}$$

$$M + 1/2 \times (x+9)\left(\frac{69}{24}(x+9) \times 1/3 \times (x+9)\right) - 441.6x = 0$$

$$\Rightarrow M = 441.6x - \frac{69(x+9)^2}{144}$$

at $x = 0$

$$\boxed{M = -387.0821b7t}$$

$x = 15$

(5)

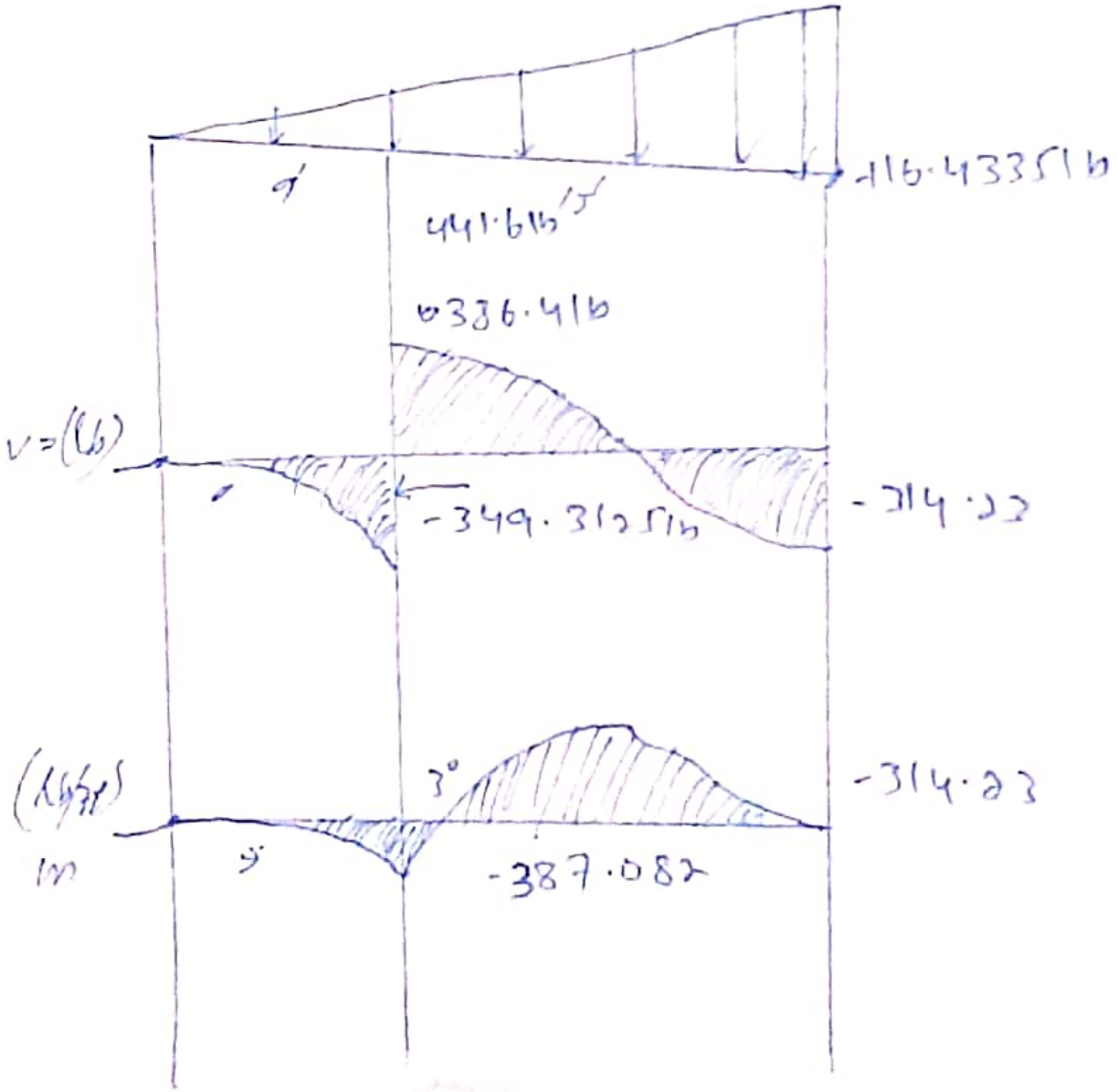
$$m = \frac{144.6x - 6[(x+9)]^3}{144}$$

at $x = 0$

$m = -387.082$ lb.ft

at $x = 15$

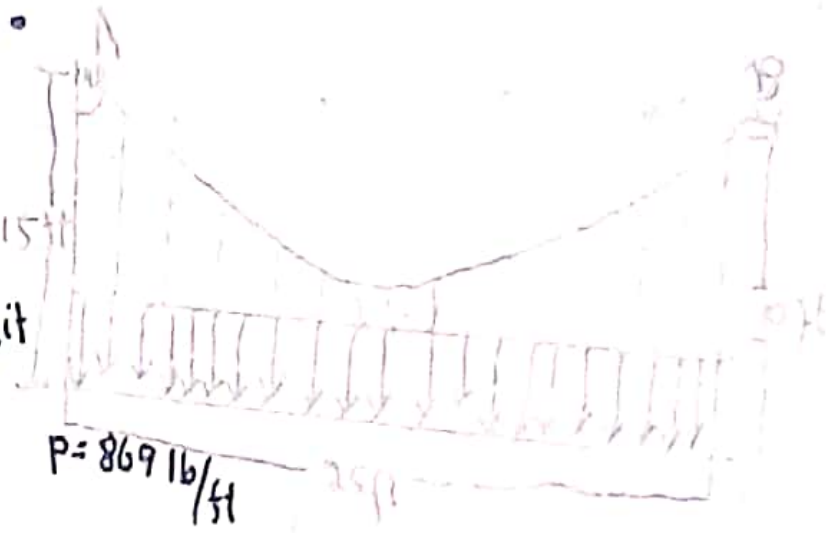
$\boxed{m = 0}$



(6)

Q No 2:- the cable supports the uniform load of p lb/ft. Determine the tension in the cable at each support A and B where p is your last three digits of your registration number.

diagrams:-




I.D:7869

Last three digit

I.D=869

Solution:-

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

$$15 = \frac{869}{2FH} x^2$$

$$10 = \frac{869}{2FH} (25 - x)^3$$

$$= \frac{869}{2(15)} x^3 = \frac{869}{2(10)} (25 - x^2)$$

(7)

$$x^3 = \frac{869}{20} - \frac{869}{30}(25-x)^2$$

$$x^3 = \frac{869 \times 30 + 869 \times 20}{600}(25-x)^2$$

$$x^3 = 26070 + 17380(25-x)^2$$

$$x^3 = \frac{43450}{600}(25-x)^2$$

$$x^3 = 72.4(625 - 50x + x^2)$$

$$x^3 = 45250 - 3620x + 72.4x^2$$

$$72.4x^2 - 3620x + 45250 = 0$$

Taking square root

$$\sqrt{x^3} = \sqrt{72.4x^2 - 3620x + 45250}$$

$$x = \sqrt{42.5440 - 134.5360 + 212.7204}$$

$$x = \sqrt{120.7282}$$

$$= \boxed{x = 10.987671}$$

A + (A) (8)

= =

$$y = \frac{P}{2FH} x^2 = \frac{869}{2(3497)} x^2$$

$$\frac{dy}{dx} = \tan\theta_A = 0.1244 x \Big|_{x=(25-10-9876)}$$

$$x = (14.0124)$$

$$= 1.7403$$

$$\theta_A = 60.670$$

$$T_A = \frac{FH}{\cos\theta_A} = \frac{3497}{\cos 60.67^\circ} = 7280 lb$$

$$= 7.28 kip$$

$$FH = \frac{P}{2y} x^2 = \frac{869}{2(15)} (10.9876)^2$$

$$\boxed{FH = 3497 lb}$$

At B..

$$y = \frac{P}{2FH} x^2 = \frac{869}{2(3497)} x^2$$

$$\frac{dy}{dx} = \tan\theta_H = 0.1243x \Big|_{10.9816} = 1.3646$$

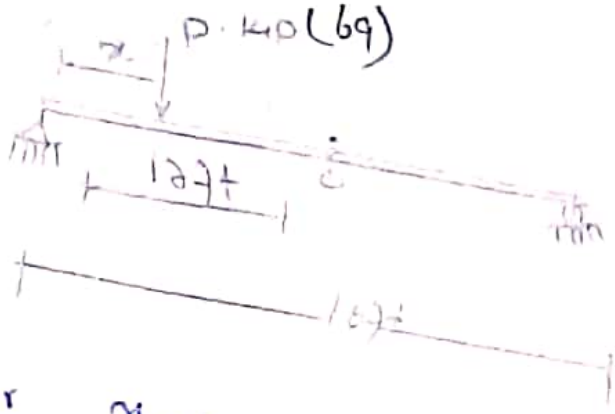
$$\theta = 65.36°$$

$$T_B = \frac{FH}{\cos\theta_H} = \frac{3497}{\cos 65.36} = 4277 lb$$

$$\boxed{= 4.277 kip}$$

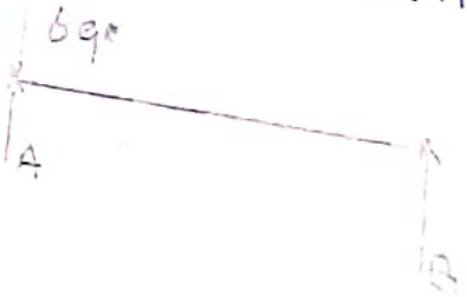
Q No 3:: Draw the Shear force influence line for the beam shown figure 3 at point c. also find the influence line for reaction (A)

diagrams::




Solution::

For $x=0$ , $R_A = ?$




$\curvearrowright \sum M_B = 0$

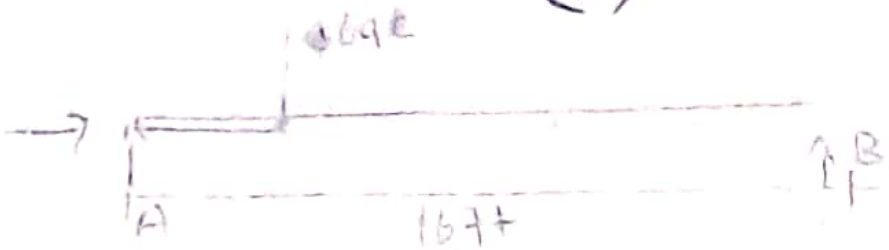
$(69 \times 16) - R_A(16) = 0$

$$\frac{1104}{16} = R_A$$

$$\boxed{R_A = 69}$$

For $x = 11ft$ , $R_A = ?$

(11)



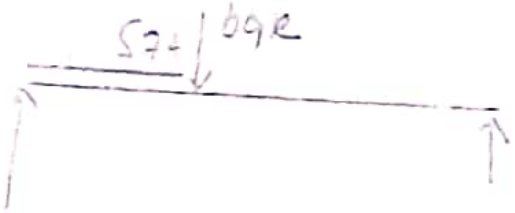

$\circlearrowleft + \sum M_B = 0$

$(69 \times 15) - R_A(16) = 0$

$\frac{1035}{16} = R_A$

$R_A = 64.687$

For, $x = 5$, $R_A = ?$




$\circlearrowleft + \sum M_B = 0$

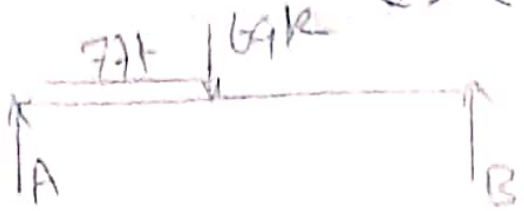
$(69 \times 5) - R_A(16) = 0$

$\frac{345}{16} = R_A$

$R_A = 21.56k$

put, $x = 7$, $R_A = ?$

(12)

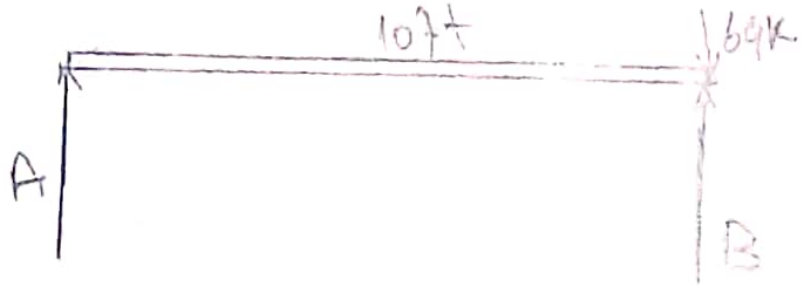



$\circlearrowleft \Sigma M_A =$

$(64 \times 7) - R_A(16) = 0$

$\frac{448}{16} = R_A$

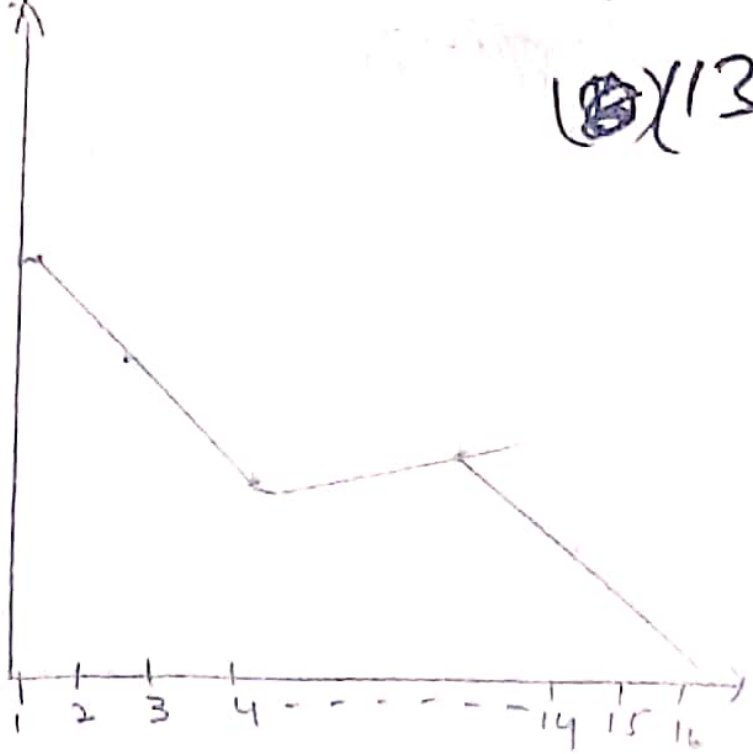
$R_A = 30.5$




$-R_A(16) + 64(0) = 0$

$R_A = 0$

(13)

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