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ID 7463

Subject Structure Analysis-I

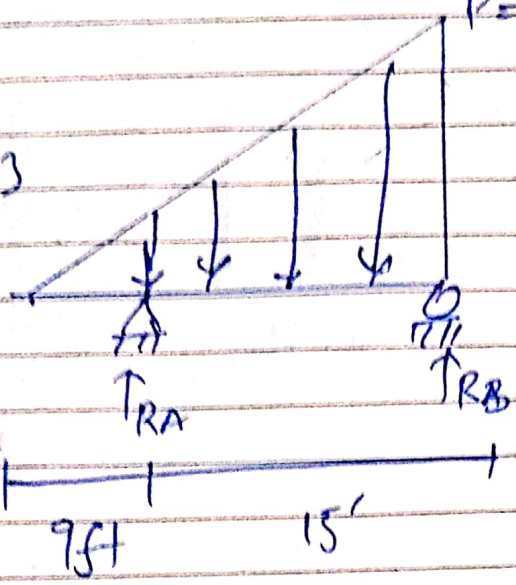
Submitted To Engr. Saqib Khan

Date 26/09/2020

Summer Semester 6th

Date

Q13-



Sol:-

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

$$R_A + R_B - \frac{1}{2}(63)(24) = 0$$

$$R_A + R_B = 756 \rightarrow (1)$$

$$\Sigma M_A = 0 \quad (\circlearrowleft +)$$

$$-(R_B \times 15) + \left(\frac{1}{2} \times 63 \times 15\right)\left(\frac{2}{5} \times 15\right) = 0$$

$$-15R_B + 4725 = 0$$

$$15R_B = 4725$$

$$\boxed{R_B = 315 \text{ lb}}$$

put the value in eq (1)

$$R_A + 315 = 756$$

$$R_A = 756 - 315$$

$$\boxed{R_A = 441 \text{ lb}}$$

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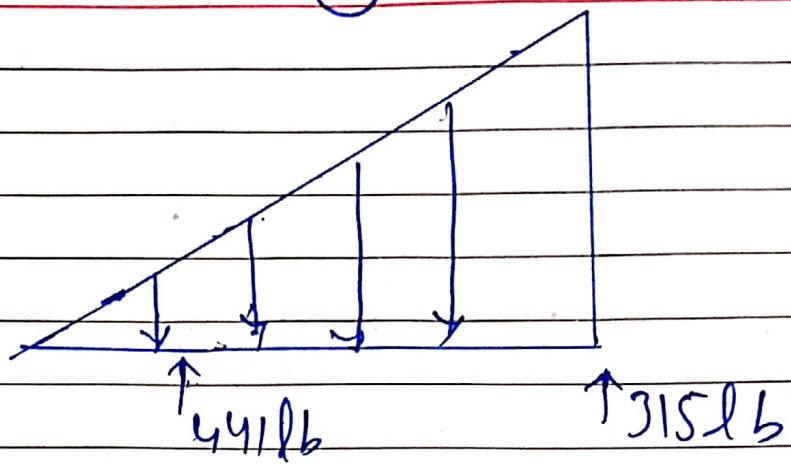
(2)



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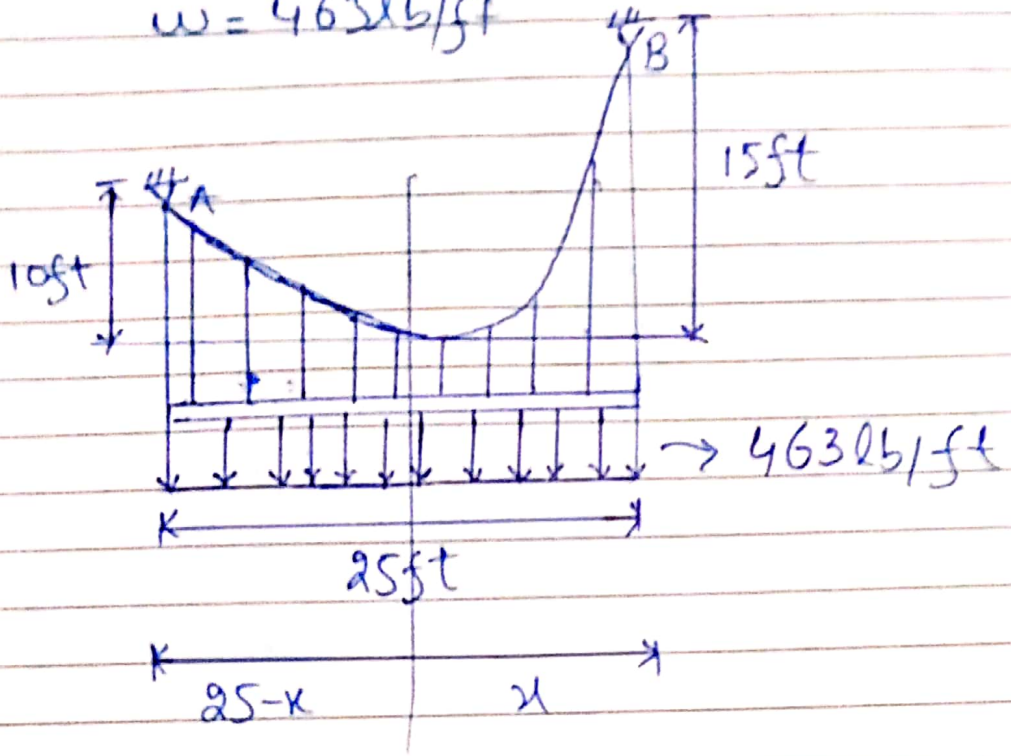
Q28 $w = 463 lb/ft$



$$F_{H_{\text{total}}} = \frac{wL^2}{2h}$$

$$F_{HL} = \frac{wL^2}{2h} \Rightarrow F_{HL} = \frac{463(25-x)^2}{2(10)} \rightarrow (1)$$

$$F_{HR} = \frac{wL^2}{2h} \Rightarrow F_{HR} = \frac{463(x)^2}{2(15)} \rightarrow (2)$$

Compare eq (1) and (2)

$$\frac{463(25-x)^2}{2(10)} = \frac{463(x)^2}{2(15)}$$

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

(4)

$$\sqrt{(25-x)^2} = \sqrt{x^2(10/15)}$$

$$25 - x = x(0.8165)$$

$$x = \frac{25}{1.08165}$$

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

$$F_H = \frac{W}{2y} x^2 = \frac{463}{2(15)} (13.76)^2$$

$$F_H = 2922 \text{ lb}$$

At B:

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

$$y_B = \frac{463}{2(2922)} x^2$$

$$\tan\theta = \frac{Wx}{F_H}$$

$$\theta = \tan^{-1}\left(\frac{463}{2922}\right)(13.76)$$

$$\boxed{\theta_B = 65.36^\circ}$$

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

$$T_B = \frac{2922}{\cos 65.36^\circ} = 7008\ lb$$

$$\boxed{T_B = 7\ kip}$$

AT part A:

$$\tan\theta = \frac{wx}{F_H}$$

$x = 25 - x = 25 - 13.76$

$x = 11.24\ ft$

$$\theta = \tan^{-1}\frac{463(11.24)}{2922}$$

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

$$T_A = F_H / \cos\theta_A$$

$$T_A = \frac{2922}{\cos 60.68^\circ} = 5967.1\ lb$$

$$\boxed{T_A = 5.96\ K}$$

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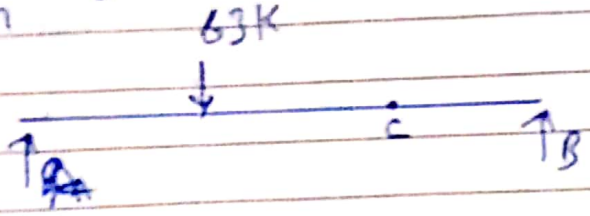
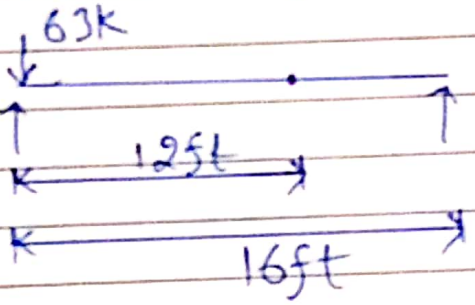
Q3) Shear force influence line for Beam



∵ Shear force changes with every different position.

$x = 0$, $V_c = ?$



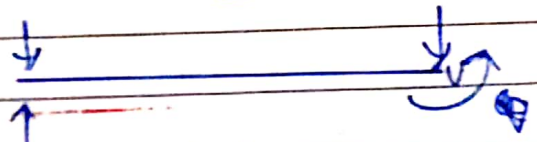
$\overset{+}{\circlearrowright} \Sigma M_B = 0$

$63 \times 16 - R_A(16) = 0$

$1008 = 16 R_A$

$R_A = \frac{1008}{16}$

$\boxed{R_A = 63K}$



$R_A = 63K$

$\Sigma F_y = 0$

$63 - 63 - V_c = 0$

$\boxed{V_c = 0}$

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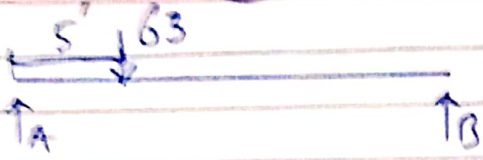
$x = 5$

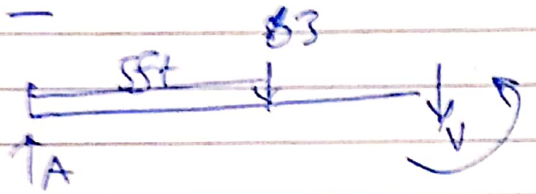


$\circlearrowleft \Sigma M_B = 0$

$-R_A(16) + 63(11) = 0$

$16R_A = 693$

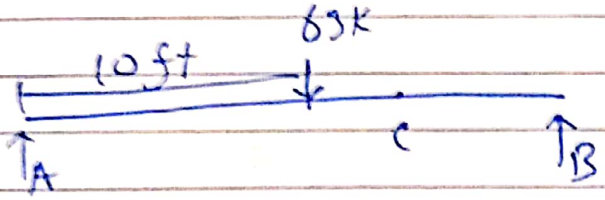
$\boxed{R_A = 43.31\,K}$



$43.31 - 63 - V_C = 0$

$\boxed{V_C = -19.69}$

$x = 10$



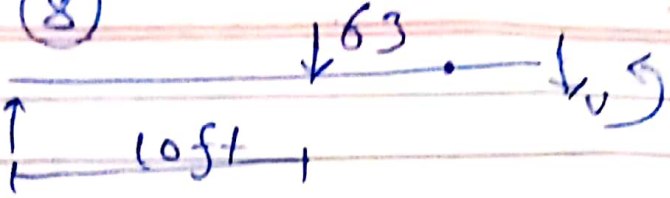
$\circlearrowleft \Sigma M_B = 0 \quad V_C = ?$

$-R_A(16) + 63(6) = 0$

$16R_A = 378$

$\boxed{R_A = 23.625\,K}$

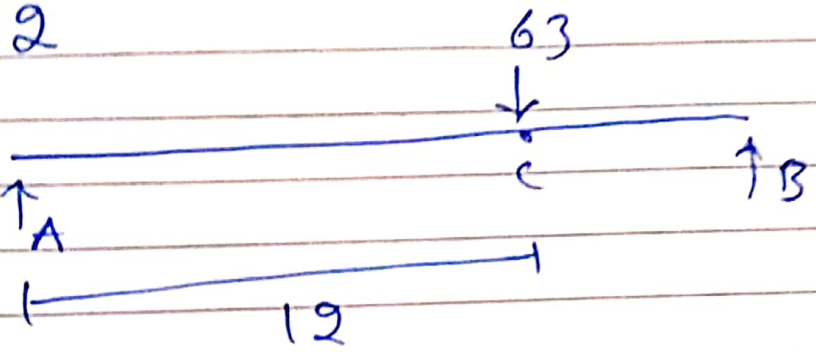
(8)



$23.625 - 63 - V_c = 0$

$$\boxed{V_c = -39.375}$$

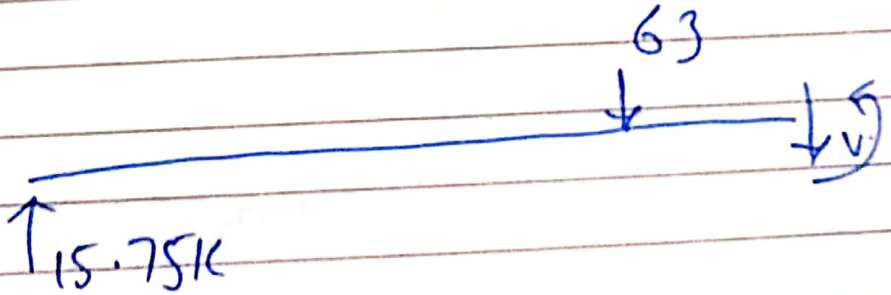
$x = 12$



$63(4) - R_A(16) = 0$

$252 = 16R_A$

$$\boxed{R_A = 15.75K}$$



$15.75K - 63 - V_c = 0$

$$\boxed{V_c = -47.25}$$

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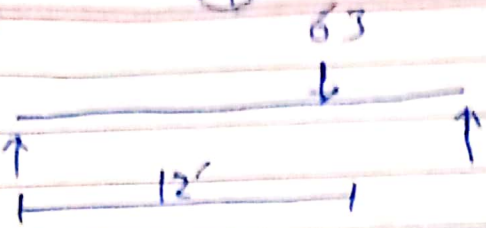
$x = 12'$



$$-R_A(16) + 63(12) = 0$$

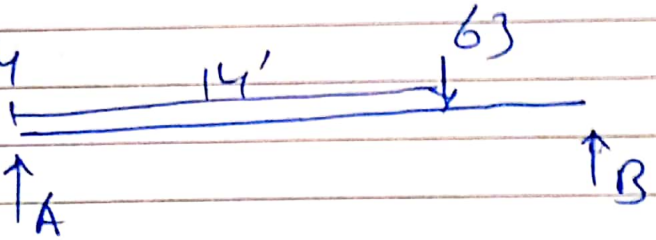
$$16R_A = 252$$

$$\boxed{R_A = 15.75\ K}$$

$$15.75 - V_C = 0$$

$$\boxed{V_C = 15.75}$$

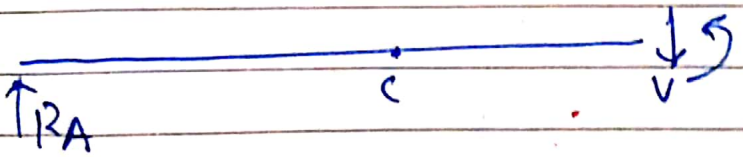
$x = 14$



$$-R_A(16) + 63(2) = 0$$

$$16R_A = 126$$

$$\boxed{R_A = 7.875\ K}$$



$$7.875 - V_C = 0$$

$$\boxed{V_C = 7.875}$$

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$x = 16'$

$$-R_A \times 16 + 6J(0) = 0$$

$$16R_A = 0$$

$$\boxed{R_A = 0}$$

$$0 - V_C = 0$$

$$\boxed{V_C = 0}$$

x	V_C
0	0
5	−19.69
10	−39.375
12⁻	−47.25
12⁺	15.75
14	7.875
16	0

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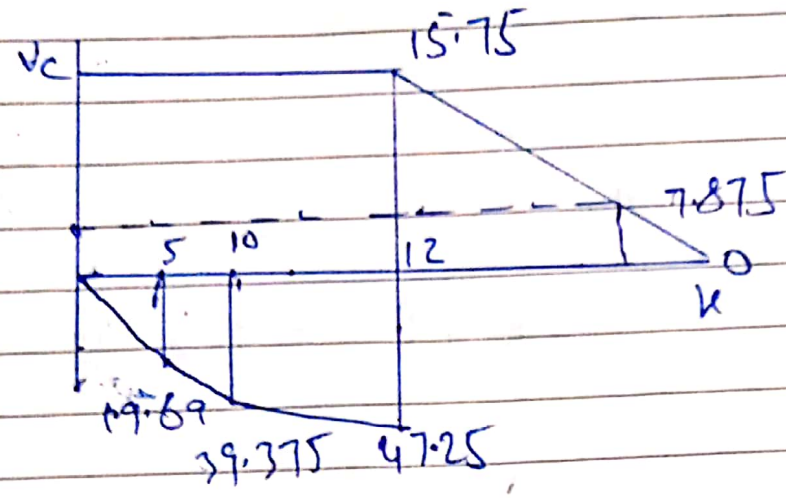

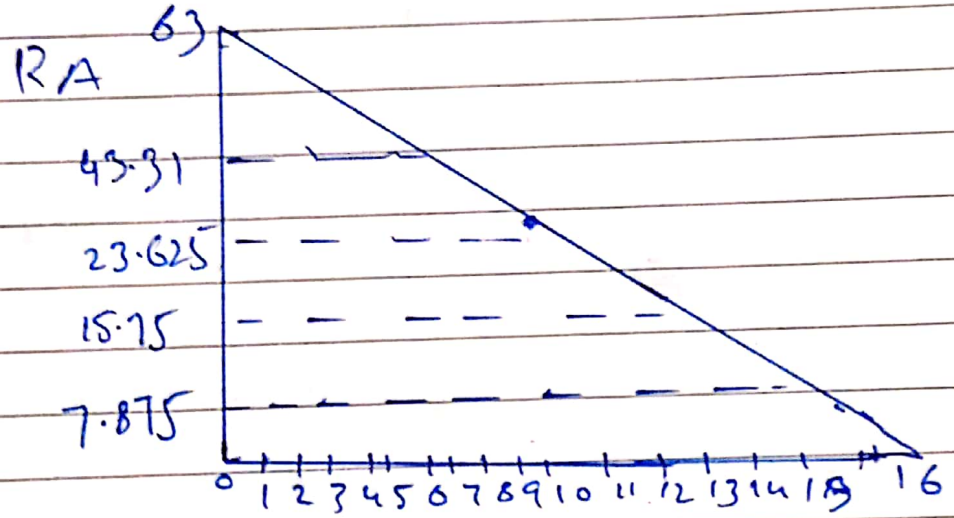

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