Name : Owais Khan

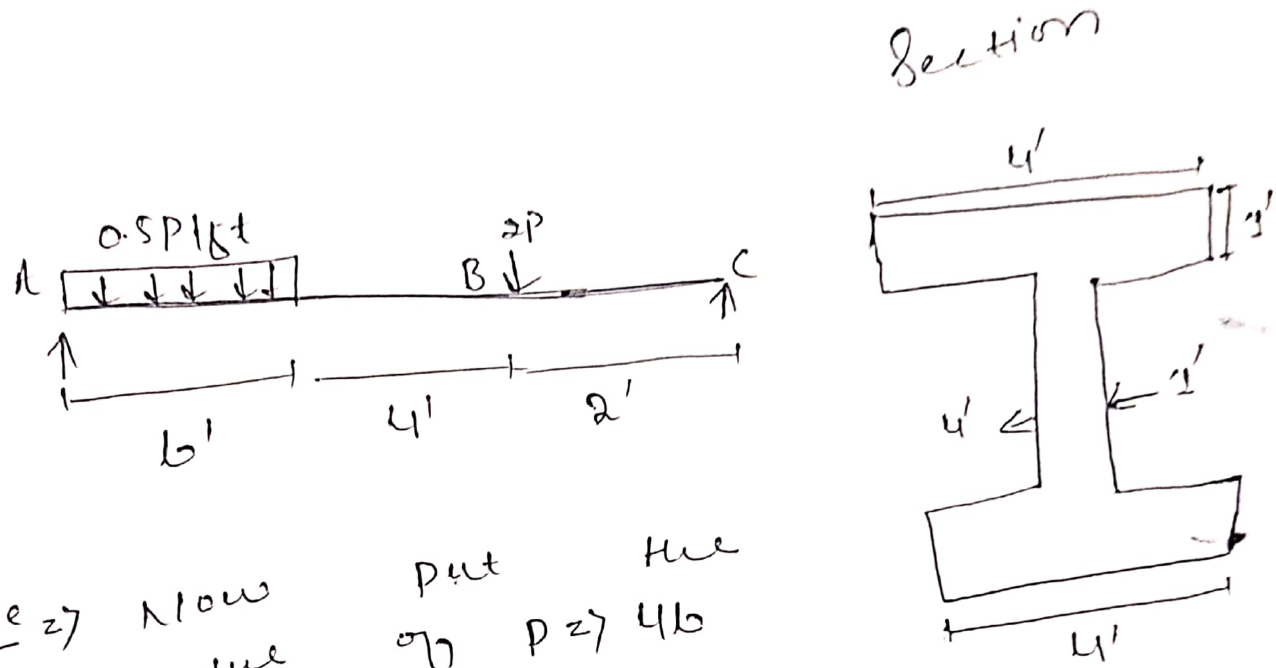
ID : 7946

Section : B

Subject : Mechanics of Solid II

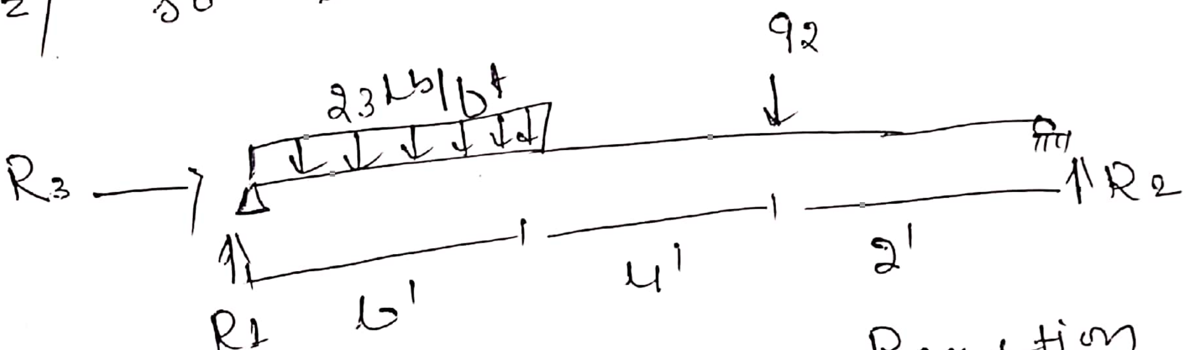
Department : BE (C)

Instructor : Engr. Muhammad Saqib



Note => Now put the value of P => 46

=> So we have



=> Find unknown Reaction at the support apply Equillibrium equation.

$\Sigma F_x => 0$

i-e

$R_3 => 0$

$R_1 + R_2 => (23 \times 6)^{lb} + 92\,lb$

$R_1 + R_2 => 138\,lb + 92$

$R_1 + R_2 => 230\,lb$

$\Sigma M_A => 0$ (->- +)

$(R_2 \times 12) - 10 \times 92 - (23 \times 6) \times 6/2 => 0$

$12 R_2 => 920 + 138 \times 3$

$12 R_2 => 3174$

$R_2 => \frac{3174}{12} => 264.5$

=>

$R_1 + R_2 => 230$

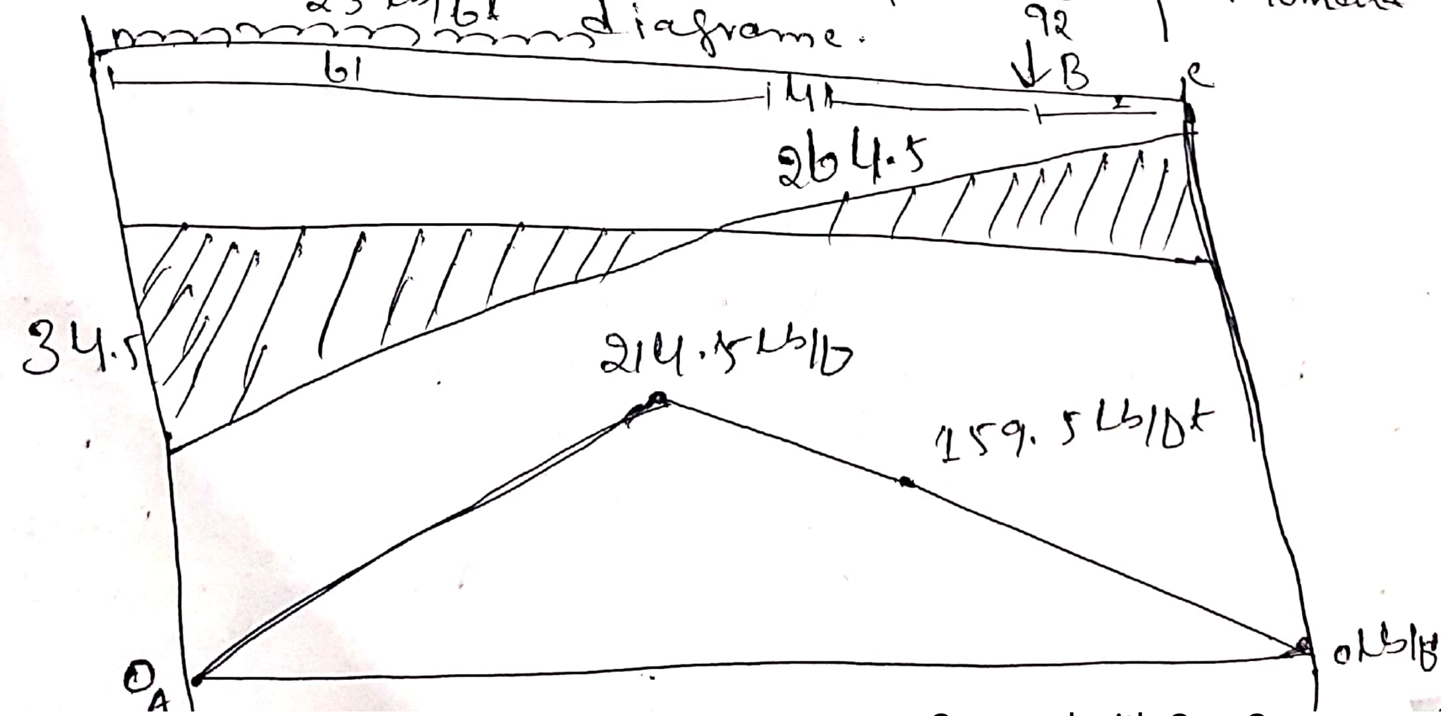
$R_1 => 230 - R_2$

putting the value of R_2.

$R_1 => 230 - 264.5$

$R_1 => -34.5$

Now Shear force & bending Moment diagrame.



Scanned with CamScanner

=> Shear force at 6ft From Left Support

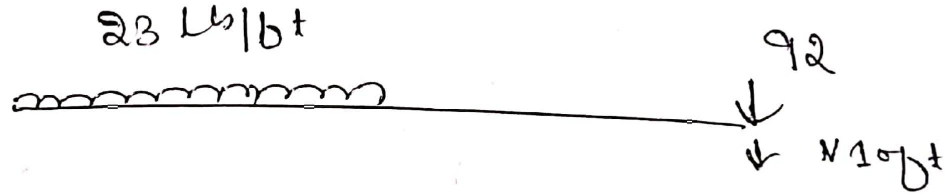
$\Sigma F_y \Rightarrow 0$ $\quad \uparrow + \downarrow -$

$$-34.5 - 23 \times 6 - N_{6ft} \Rightarrow 0$$

$$N_{6ft} \Rightarrow -172.5 \text{ Lb}$$

=> Now Shear force at 10ft

$\Sigma F_y \Rightarrow$ $\quad \uparrow + \downarrow -$

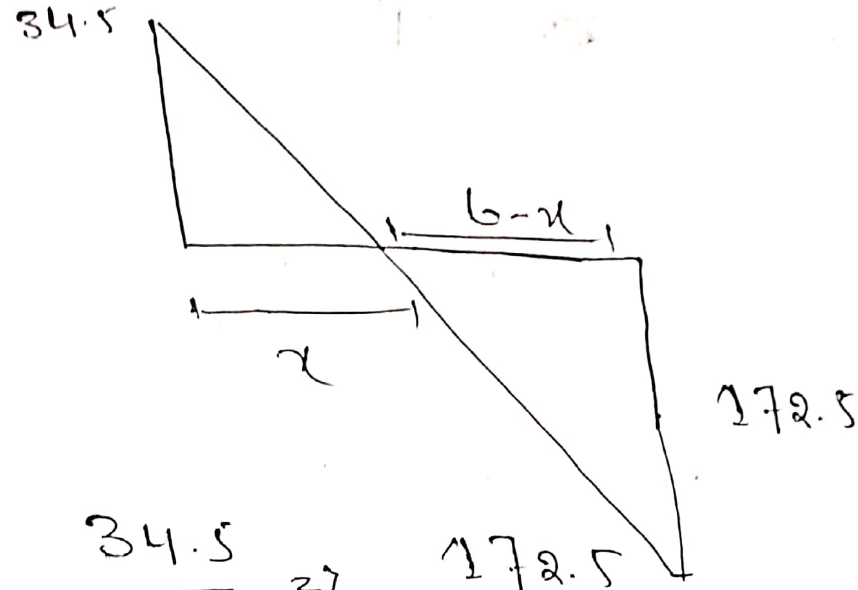


$$-34.5 - 23 \times 6 - 92 - V_{10ft} \Rightarrow 0$$

$$V_{10ft} \Rightarrow -264.5$$

=> Point of Maximum bending moments. As we know that the point where shear force is maximum so from point of zero shear corresponding point will have maximum bending moment.

From Shear force diagrame on page (3) we have



$$\frac{34.5}{x} \Rightarrow \frac{172.5}{6-x}$$

$$(6-x) * 34.5 \Rightarrow 172.5x$$

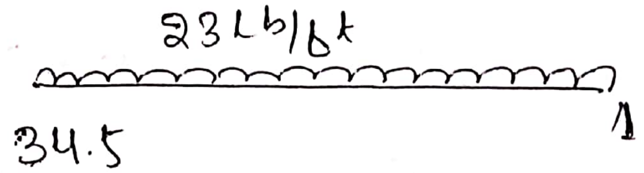
$$207 - 34.5x = 172.5x$$

$$207 \Rightarrow 172.5x + 34.5x$$

$$\frac{207}{207} \Rightarrow \frac{207x}{207}$$

$$x \Rightarrow 1$$

Now determine the value of Moment at 1

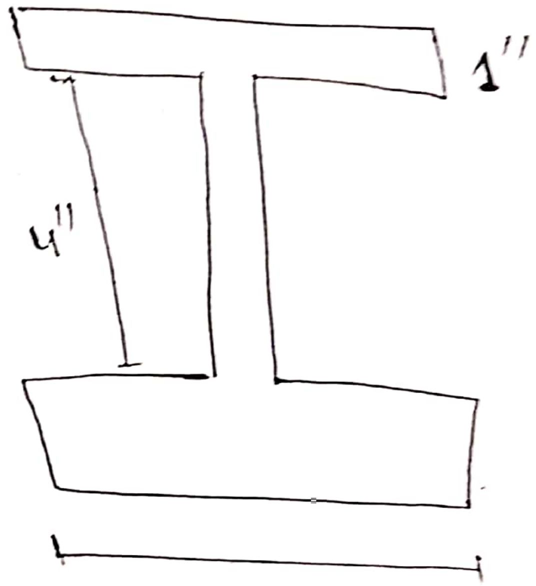


$M_1 - (-34.5 \times 1 + (23 \times 1)) \times (1/2) \Rightarrow 0$

$M_1 \Rightarrow -46$ Lb/ft

2) For Shear Stress we have $\tau \Rightarrow \frac{VQ}{Ib}$

So First we determine moment of inertia I for The given Section of beam.



As the given figure is symetric along both axis.

So $\bar{x} \Rightarrow 4/2 \Rightarrow 2$ in, $\bar{y} = 6/2 \Rightarrow 3''$

From i.e $(\bar{x}, \bar{y}) = (2, 3)$ center of growth

For exterme Left and bottom

Area of point (1) => 4×1 => $4 in^2$

Area of point (2) => 4×1 => $4 in^2$

Area of point (3) => 4×1 => $4 in^2$

=> Moment of inertia about X-axis (centroid) I_{xx}

=> Determine Distance b/w C.G of the whole Section & the corresponding parts.

Let G_1, G_2, G_3 be the center of gravity of point (1), (2) & (3) and k_1, k_2, k_3 be the distance $\bar{y}$ and y_1, y_2, y_3 respectively.

So

$k_1 \Rightarrow \bar{y} - y_1 \Rightarrow 3 - 0.5 \Rightarrow 2.5 in$

$k_2 \Rightarrow \bar{y} - y_2 \Rightarrow 3 - 3 \Rightarrow 0 in$

$k_3 \Rightarrow \bar{y} - y_3 \Rightarrow 3 - 0.5 \Rightarrow 2.5 in$

So

$$I_{xx} \Rightarrow \frac{b_1 h_1^3}{12} + a_1 k_1^2 + \frac{b_2 h_2^3}{12} + a_2 k_2^2 + \frac{b_3 h_3^3}{12} + a_3 k_3^2$$

$$I_{xx} \Rightarrow \frac{4(1)^3}{12} + 4(2.5)^2 + \frac{(1)(4)^3}{12} + a_2(0) + \frac{4(1)^3}{12} + 4(2.5)^2$$

$$I_{xx} \Rightarrow 4/12 + 25 + \frac{64}{12} + 4/12 + 25$$

$$I_{xx} \Rightarrow \frac{4 + 12(25) + 64 + 4 + 12(25)}{12}$$

$I_{xx} \Rightarrow 56\ in^4$

Now $$I_{yy} = \frac{b_1^3 h_1}{12} + \frac{b_2^3 h_2}{12} + \frac{b_3^3 h_3}{12}$$

$$I_{yy} \Rightarrow \frac{(4)^3(1)}{12} + \frac{(1)^3(4)}{12} + \frac{(4)^3(1)}{12}$$

$$I_{yy} \Rightarrow \frac{64}{12} + \frac{4}{12} + \frac{64}{12}$$

$$I_{yy} \Rightarrow \frac{64+4+64}{12}$$

$$\boxed{I_{yy} \Rightarrow 11\ in^4}$$