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Section "B"

Fourth semester

Subject : MOS II

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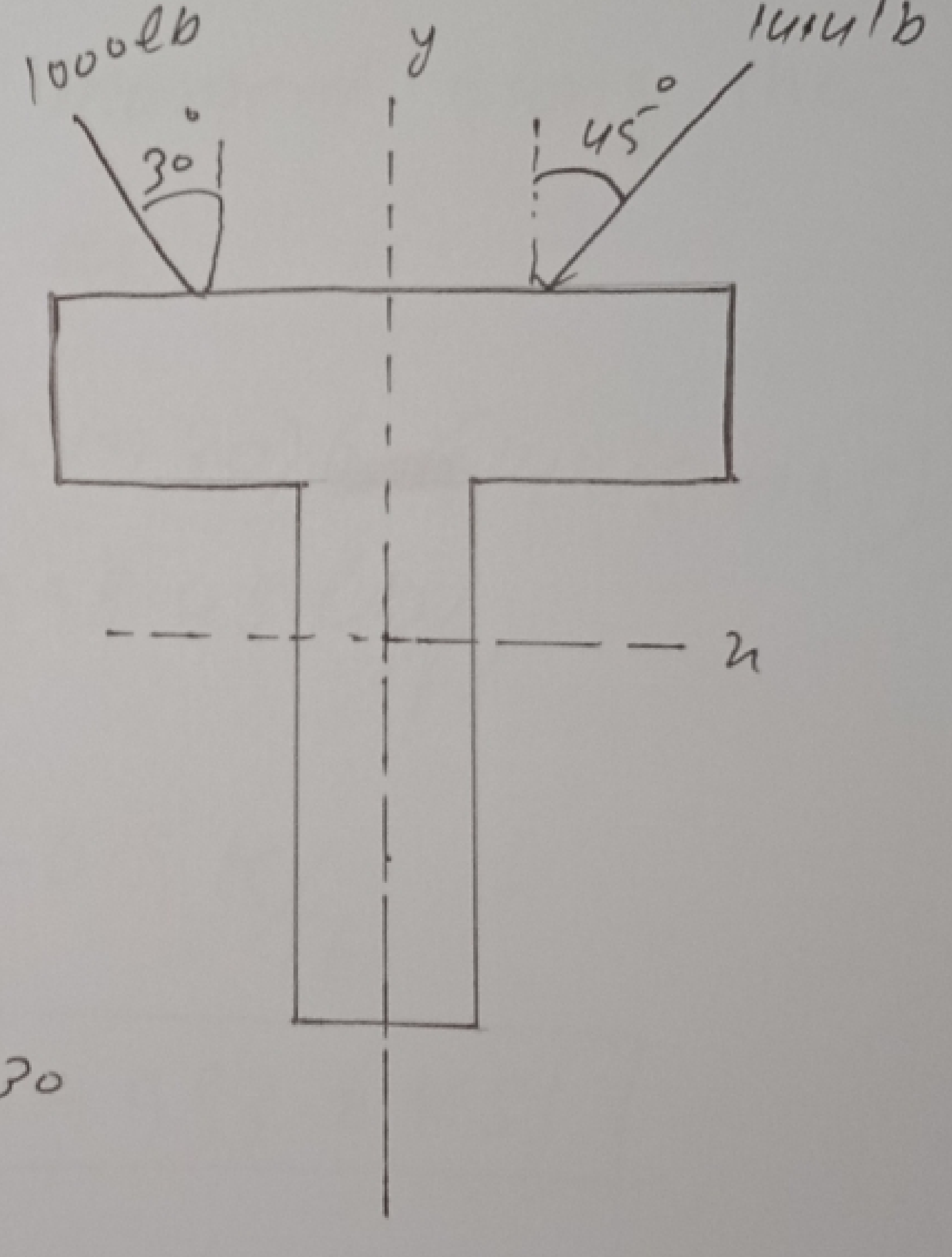
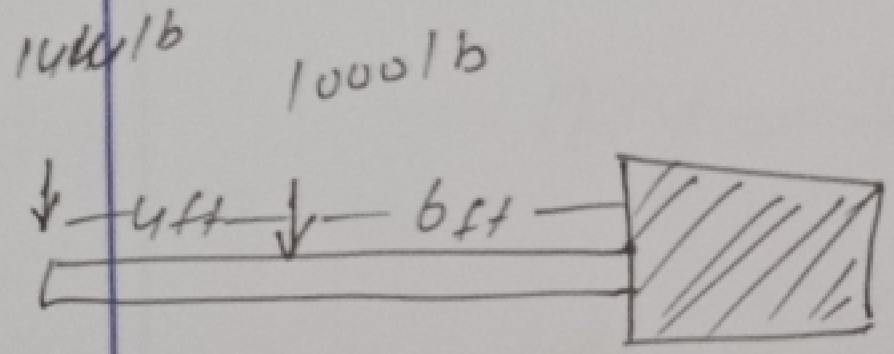
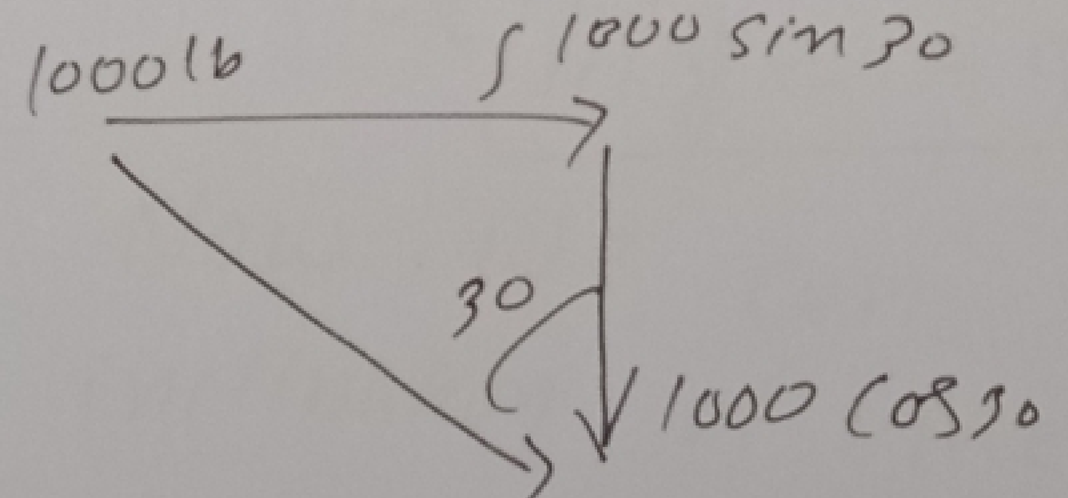
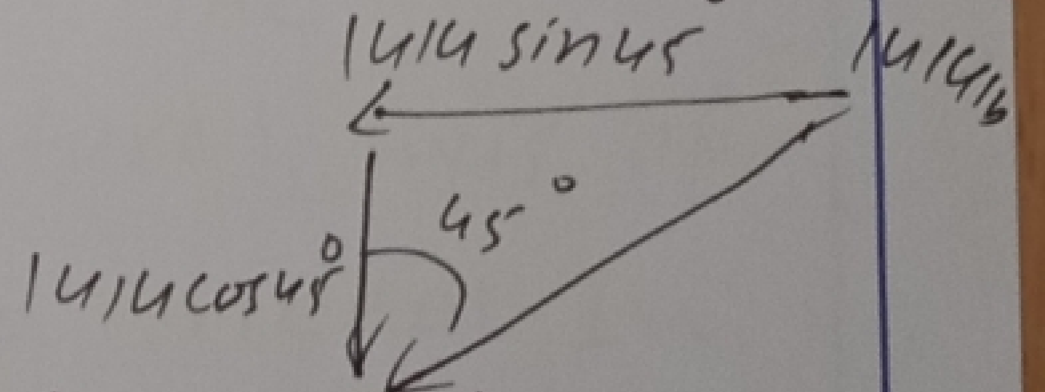
Problem No # 1336. A Cantilever beam 10 ft long with the same T section in problem 1335 Carries two Concentrated Loads applied as shown in figure. Compute the inclination of the Natural axis as the wall and the maximum compressive and tensile stresses.





Solution :-





First of All find moment along "Mx" and "My" as well

$Mx\ (1000\cos 30)6 + (1414\cos 45)10$

$Mx = 15194.64\ lb/ft$

OR

$Mx = 15.1\ K/ft$

or

$\boxed{Mx = 2174.4\ ksi}$

Now we find moment along the y-direction as.

$My = (1000\sin 30)6 - (1414\sin 45)10$

$My = -6998.48\ lb/ft$

OR $My = -6.9\ K/ft$

OR $\boxed{My = -993.6\ ksi}$

Now we can find the inclination of the Natural axis of The wall. For This we need In Moment of Inertia along the u) and also Iy (moment of inertia along

The y-direction. And Also needed of My and My which as already we have find in the previons page. as well.

→ So we have formula for the Neutral axis that as.

$$\tan\delta = \frac{I_x}{I_y} \cdot \frac{M_y}{M_x} \quad \text{———} \quad (A)$$

here $I_x = 112.6 \ in^4$

$I_y = 18.4 \ in^4$

$M_y = 993.6 \ psi$

$M_x = 2174.4 \ psi$

So putting these values in eq (A) we get

$$\tan\delta = \frac{112.6 \ in^4}{18.7 in^4} \times \frac{993.6 \ psi}{2174.4 \ psi}$$

$$\tan\delta = 6.0213 \times 0.456$$

$$\delta = \tan^{-1}(6.0213 \times 0.456)$$

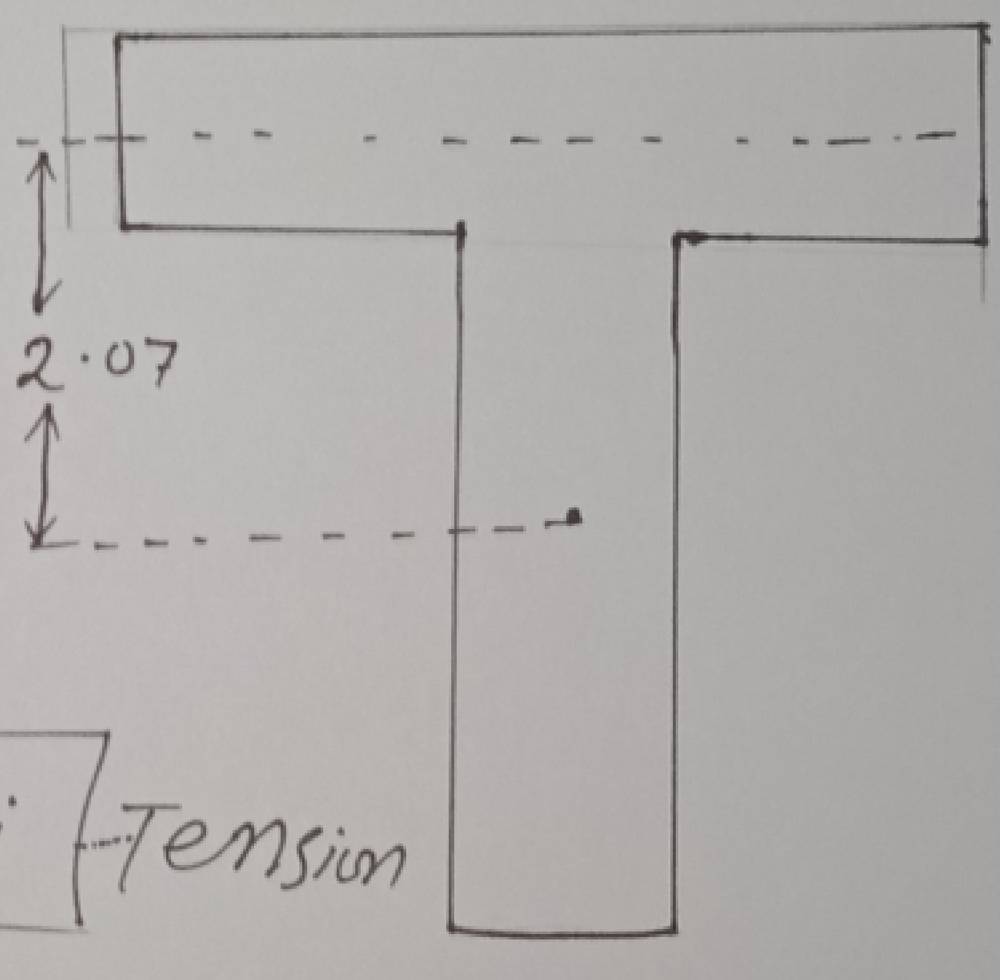
(4)

Hance The inclination of the Nutral Axis as.

$$\boxed{\delta = 70^\circ}$$

Now we find the compressive and Tensile stresses.

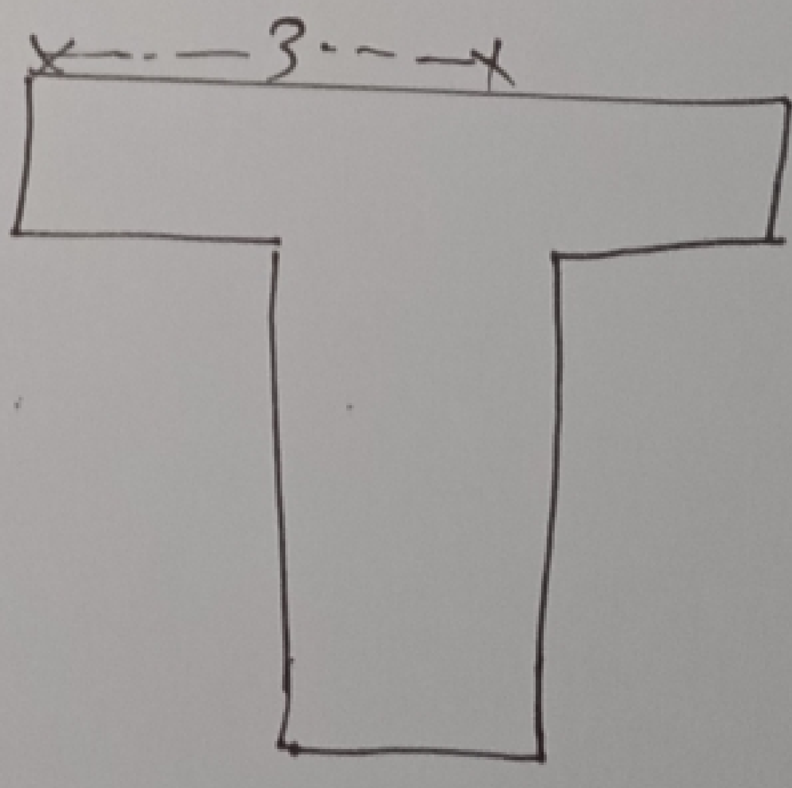
$$\sigma_x = \frac{M_x Y}{I_x}$$



So $\sigma_x = \frac{(2174.4)(2.07)}{112.6}$

$\boxed{\sigma_x = 39.9\ ksi}$ Tension

$$\sigma_y = \frac{M_y x}{I_y}$$

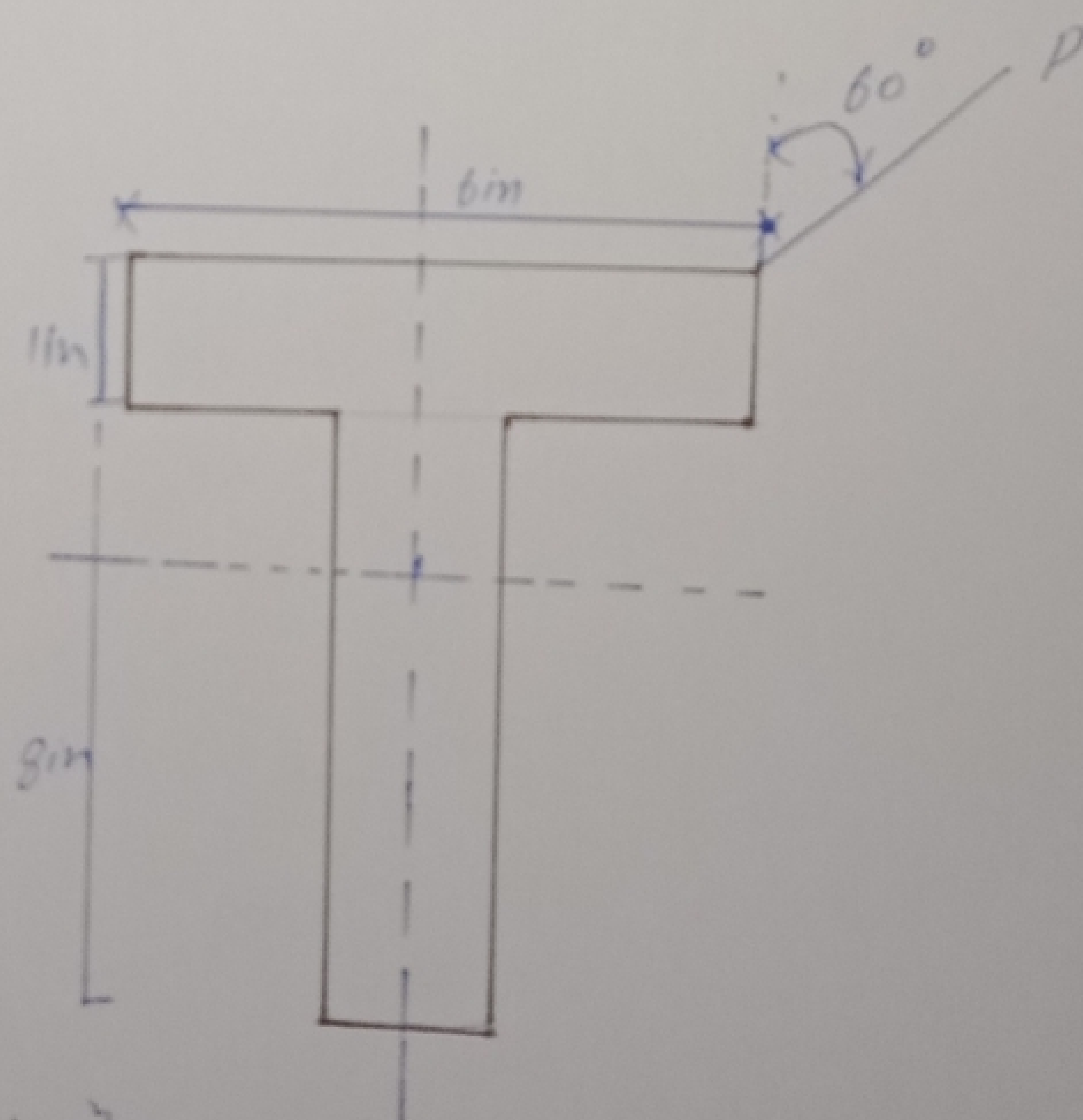


$$\sigma_y = -\frac{993.6 \times 3}{18.7}$$

$\boxed{\sigma_y = -159.4\ ksi}$ Compressive

Problem No # 1335:-7

The T-section shown in figure is The cross-section of a simply Supposed beam 16ft long that carries a central concentrated load inclined at 60° to the y-axis the centroidal x-axis is 3.07in. below The Top the section $I_x = 112.6\ in^4$ and $I_y = 18.7\ in^4$. If $\sigma_c \le 12000$ psi and $\sigma_t \le 5000$ psi. What is the maximum load that will not overstress. The beam?



Solution.

Given Data :->

$\Rightarrow$ length of the Beam = 6ft = 6×12 = 72 in

$\Rightarrow$ centroidal distance from.

The Top — $x = 3.07$ in

$\Rightarrow I_x = 112.6 \, in^4$

$\Rightarrow I_y = 18.7 \, in^4$

$\Rightarrow \sigma_c \leq 12000$ psi

$\Rightarrow \sigma_t \leq 5000$ psi

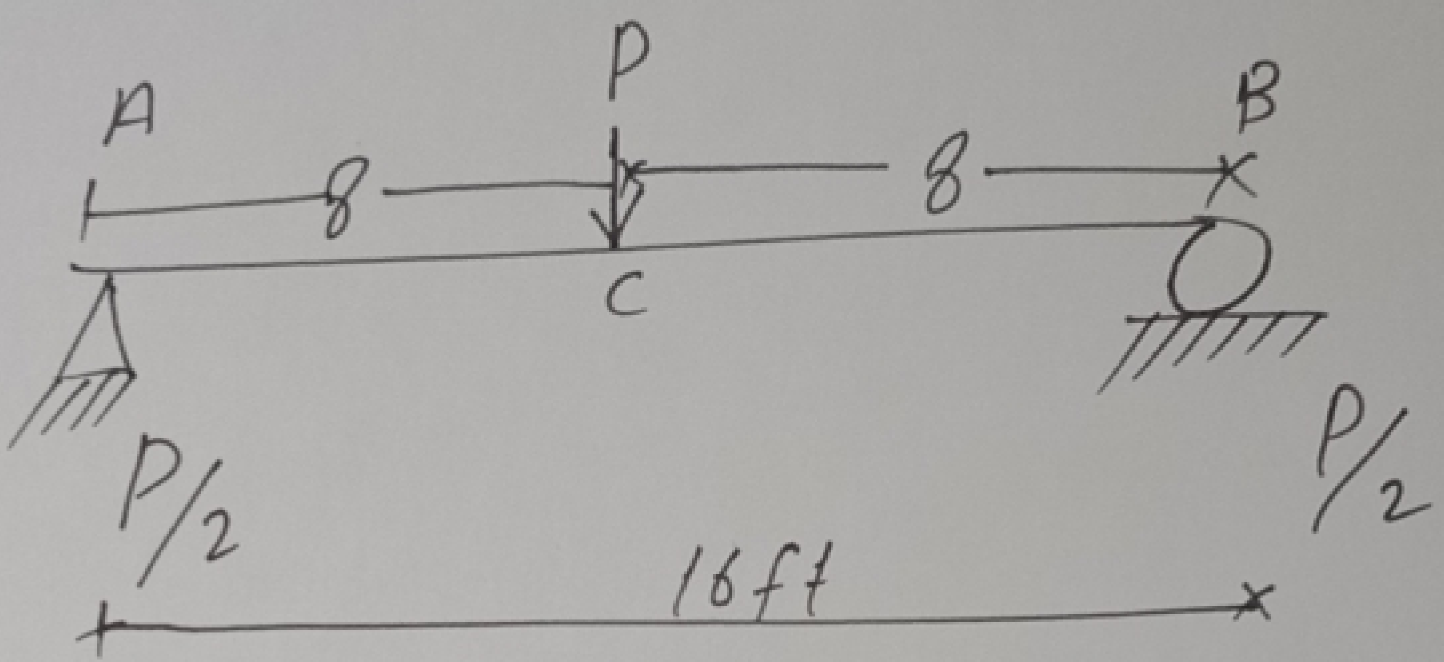
$\Rightarrow$ Load inclined to y-axis at 60°

Required $P = ?$

At the given Question a statement that Load "carries a central concentrated load" mean The load. Act on center of the Beam.

meam at the 6ft from support

Simply Supported Beam



Load Act on Centre

let suppose we find M at a point of the load. so moment along the x-axis at a point.

$$M_{Ax} = -(P\sin 60^\circ \times (8*12)) + \frac{P}{2} * (16*12)$$

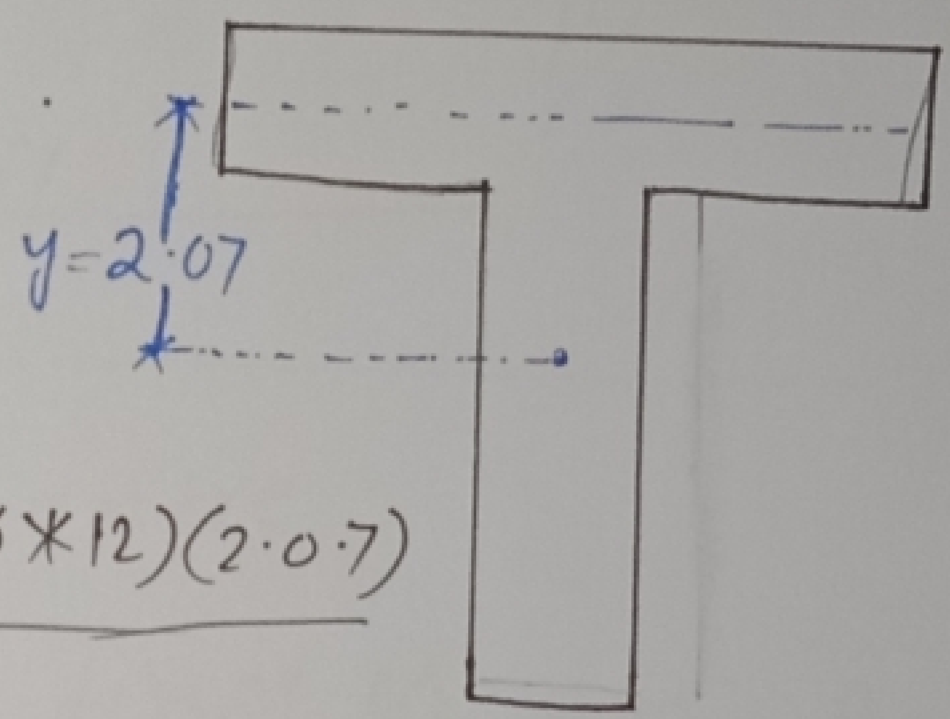
& $$M_{Ay} = -(P_c \cos 60)(8*12) + \frac{P}{2}(16*12)$$

$$\sigma_x = \frac{M_x\, y}{I_x}$$

$$\sigma_x = \frac{M \times y}{I_x}$$

$$\sigma_x = \frac{P(-(\sin 60)(8 \times 12) + \frac{1}{2}(16 \times 12)(2.07))}{112.6}$$

$\sigma_x \Rightarrow$ Tension.



$$5000 = \frac{P(-\sin 60)(8 \times 12) + \frac{1}{2}(16 \times 12)(2.07)}{112.6}$$

$$P = \frac{5000 \times 112.6}{((0.5)(16 \times 12)(2.07)) - (\sin 60)(8 \times 12)}$$

$$\boxed{P = 4870 \text{ lb}}$$

Now we find $\sigma_y = ?$
For the P. as
we consider $\sigma_y = 12000$ compression
and $\sigma_x = 5000$ Tension.

$$\sigma_y = \frac{M_y x}{I_y}$$

$$12000 = \frac{P(-\cos 60)(8*12)) + \frac{1}{2}(16*12)[(3)]}{18.7}$$

$$P = \frac{12000 * 18.7}{(0.5)(16*12)(3) - (\cos 60)(8*12)}$$

$$\boxed{P = 935 \text{ lb}}$$