NAME: M. Hunais

ID: 7963

SECTION: B

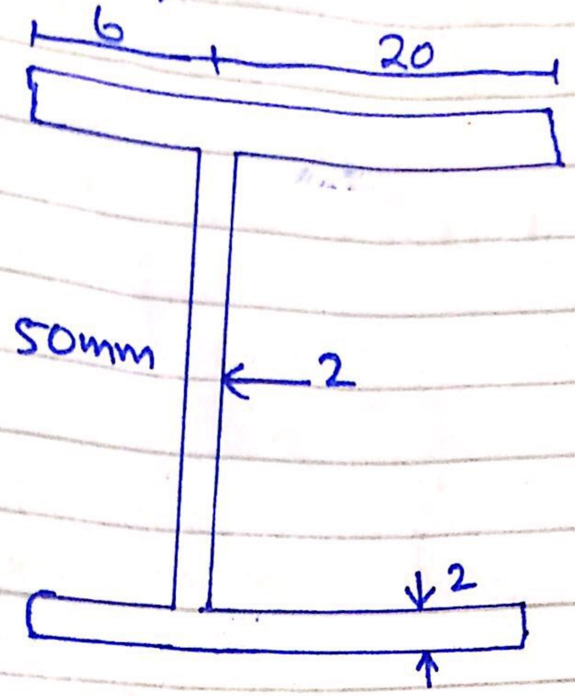
DEPARTMENT:- BE Civil

SUBMITTED TO: Sir Saqib

SUBJECT:- MOS - II

DATE: 23rd - June - 2020.

Ques # 01 a).



Required

Location of shear centre.

Solution:-

As we know:-

$$e = \frac{\delta_f h^2 b^2}{4I}$$

and

$$I = 2\left(\frac{bh^3}{12} + Ay^2\right) + \left[\frac{bh^3}{12} + Ay^2\right]$$

$$= 2\left[\frac{(26)(2)^3}{12} + (20\times2)(25)^2\right] + \left[\frac{2(50)^3}{12} + 0\right]$$

$$I = 50034.66 + 20833$$

$$I = 70867.99 \text{ mm}^4$$

$$e = \frac{2(50)^2(25)^2}{4(70867.99)} = 11.02 \text{ mm.}$$

So, shear centre.

$e = 11.02$ mm.

Question # 01 : b)

of ⇒ Determine the thickness the wall of a water tank constructed from steel plates .... 62.4 Lb/ft^3

⇒ Given Data:-

Height, $H = 26\,ft$

Dia, $D = 22\,ft$

(assumed):

tangential Stress, $\delta_t = 6000\,psi$

Specific weight of water tank = 62.4 Lb/ft^3

⇒ Required = ?

we have to find thickness = ?

The pressure develop by water = $P = \gamma h$.

$$\delta_t = \frac{PD}{2t}$$

$$\delta_t = \frac{PD}{2t} \Rightarrow \frac{\gamma h D}{2t}$$

$$2t \times \delta_t = \gamma h D$$

$$2t = \frac{\gamma h D}{\delta t}$$

$$t = \frac{\gamma h D}{\delta t \times 2}$$

$$t = \frac{\frac{(62.4)(26 \times 12)(22 \times 12)}{(12)^2}}{6000}$$

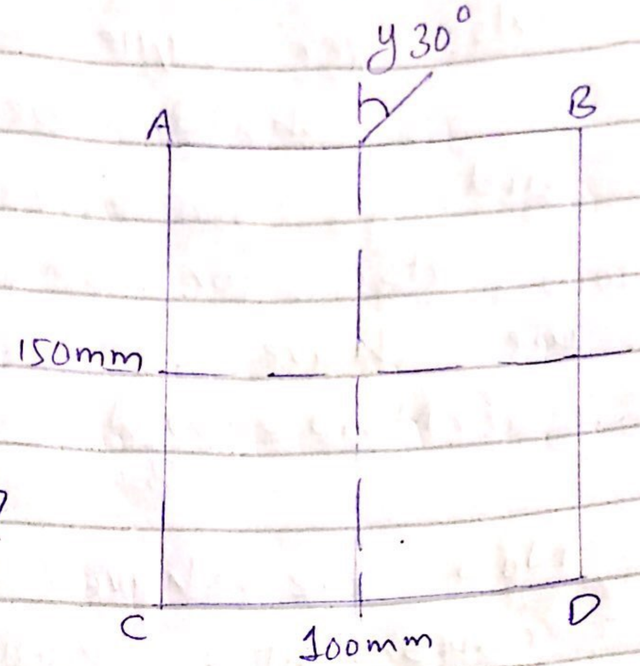
$$\boxed{t = 0.24 \text{ in.}}$$

QUES # 02 (a):-

Given Data:-

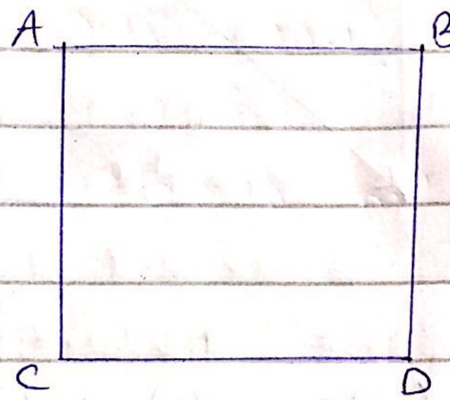
$W = 4KN$

$L = 3m$



Required => Maximum bending stress = ?

As we know the bending moment is maximum at extreme. So we would find stresses at A, B, C, D



As we know

$$\delta = \frac{M_x y}{I_x} + \frac{M_y x}{I_y}$$

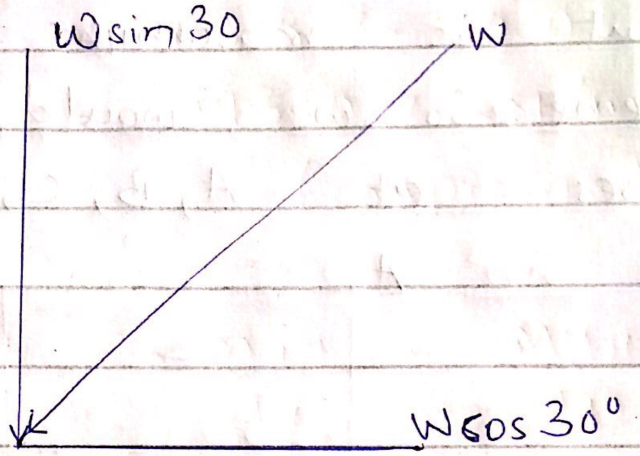
we have to find M_x & M_y

As per question the M_x & M_y should be found at the mid.

As for simply supported we have

$$M_{mid} = \frac{WL^2}{8} \quad \text{———} \quad (1)$$

Now we have to find the components of W in x & y directions.



So,

$$M_x = \frac{(W\cos 30) \times l^2}{8}$$

$$\boxed{M_x = 3.9 K.N}$$

Now,

$M_y = 2.25 KN$

⇒ M_x is causing compression at A & B tension at C & D

⇒ M_y is causing compression at B & D, tension at A & C.

Now, I_x & I_y.

$$I_x = \frac{bh^3}{12} = \frac{0.1 \times 0.15^3}{12}$$

$$I_x = 2.815 \times 10^{-5} m^4$$

$$I_y = \frac{hb^3}{12} = \frac{0.15 \times 0.1^3}{12}$$

$$I_y = 1.25 \times 10^{-5} m^4$$

Now, stresses at extreme fibers

$$\delta x = \frac{M_x y}{I_x} = \frac{3.9 \times 0.075}{2.815 \times 10^{-5}}$$

$$\delta x = 10390.7 \ KN/m^2$$

$$\delta y = \frac{2.25 \times 0.05}{1.25 \times 10^{-5}}$$

$$\delta y = 9000 \ KN/m^2$$

Now, (taking tension +↑)

Stresses at $A = \frac{M_x y}{I_x} + \frac{M_y x}{I_y}$

$= -1390.7 \ KN/m^2$. (compression).

At B, $= \frac{M_x y}{I_x} + \frac{M_y x}{I_y}$

$= -10390.7 - 9000$

$= -19390.7 \ KN/m^2$

(compression).

=> **Now,**

Stresses At $C = \frac{M_x y}{I_x} + \frac{M_y x}{I_y}$

$= 10390.7 + 9000$

$= 19390.7 \ KN/m^2$

(tension).

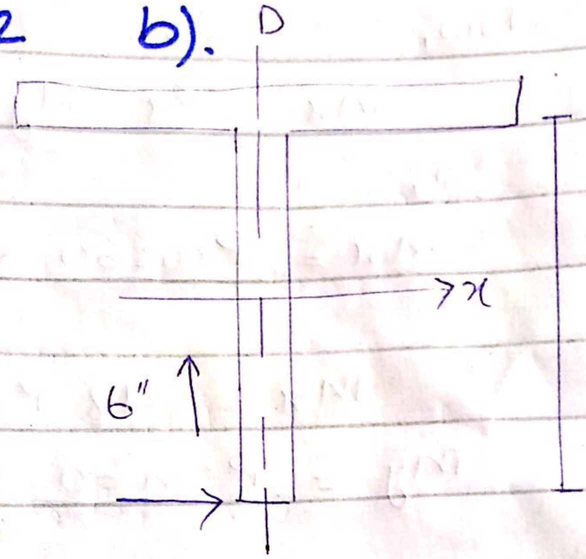
Stresses At $D = \frac{M_x y}{I_x} + \frac{M_y x}{I_y}$

$= 1390.7 \ KN/m^2$

(tension)

So, the maximum stresses are on B & C.
B is under compression of 19390.7 KN/m^2 & C is under tension of the same value.

Ques # 02 b).



Given Data:-

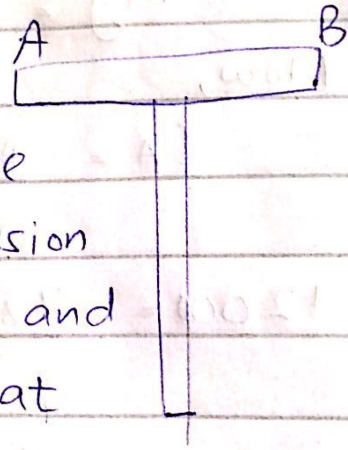
$L = 16 ft$

$I_x = 112.6 \, in^4$

$I_y = 18.7 \, in^4$

$\delta_c = 12000 \, psi$

$\delta_t = 5000 \, Psi$



By looking Figure we can Judge that maximum compression would accure on d and maximum tension c at B. There will tension as well as compression which will reduce that effect of each other

So, we will calculate stress at A and C.

So,

$$\delta A = \frac{M_x y}{I_x} + \frac{M_y x}{I_y} \longrightarrow \text{(compression)}$$

$$\delta c = \frac{M_x y}{I_x} + \frac{M_y x}{I_y} \longrightarrow \text{(Tension)}.$$

Now,

M_x & M_y.

So,

$$M_x = \frac{P\cos 60 \times (16 \times 12)}{4}.$$

$$M_x = 48\ P\cos 60.$$

$$M_y = \frac{P\sin 60\ (16 \times 12)}{4}.$$

$$M_y = 48\ P\sin 60.$$

Now,

$$\delta A = \frac{M_x y}{I_x} + \frac{M_y x}{I_y}$$

$$12000 = \frac{48\ P\cos 60^\circ \times 3.07}{112.6} + \frac{48\ P\sin 60 \times 3}{18.7}$$

solving equation

$P = 1638.6$ lb.

Now,

$$\delta_c = \frac{M_x y}{I_x} + \frac{M_y x}{I_y}.$$

$$\cancel{\delta_c}\ 5000 = \frac{48 P\cos 60 \times 5.93}{112.6} + \frac{48 P\sin 60 \times 0.5}{18.7}$$

Solving equation.

$P = 2104.9$ lb.

So, the maximum Load (P) applied should 1638.6 lb.