Section #
B

ID #
7964

Paper #
MOS-II

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Submitted To #
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Question 1 :- (1)

Part B

Given :-

$\delta^t = 6000$ Psi

height $= 26$ Psi

$\gamma = 62.41 \, lb/ft^3$

Required

$T = ?$

Sol :-

we know that

$P = \gamma h$

$$\delta^t = \frac{PD}{2t}$$

$$t = \frac{PD}{2\delta^t}$$

$$t = \frac{62.41 \times 26 \times 22}{2 \times 6000}$$

$t = 2.974$ ft

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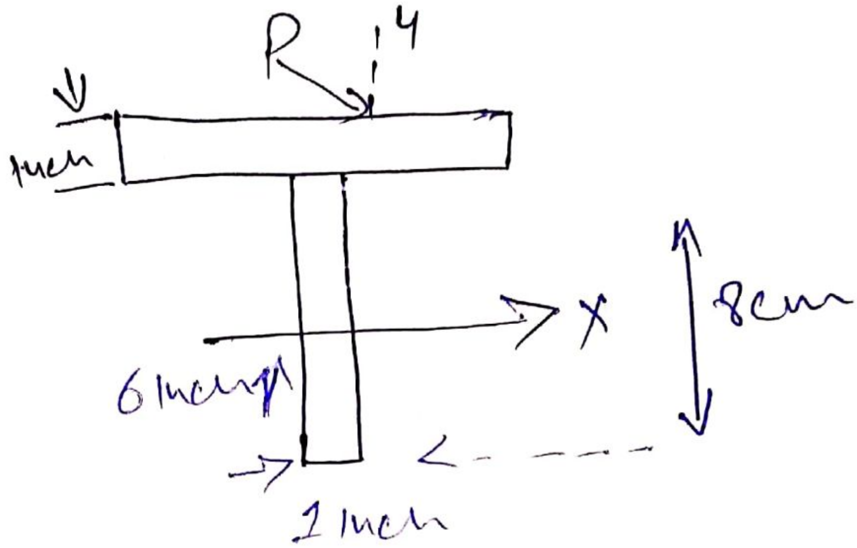
(2)

Question 2 :- Part B

Given :-



$L = 16$ ft

$I_x = 112.6$ inch^4

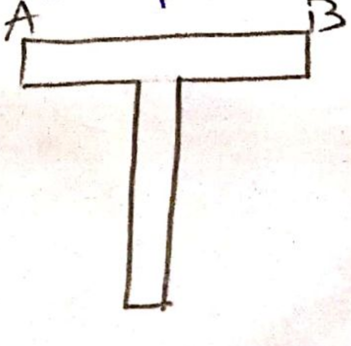
$I_y = 18.7$ in^4

$\delta_c = 12000$ psi

$\delta_c = 5000$ psi

Sol :-

By looking figur we can Judge that maximum compression would accure on



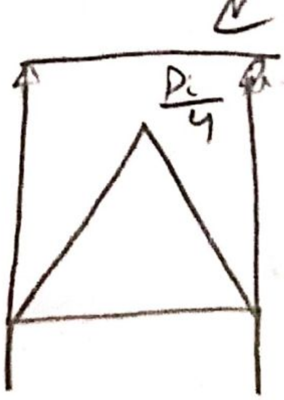
A & maximum tension C at B there will tension as well as compression which will reduce that effects of each other So we will calculate stress at A & C

So

$$\sigma_A = \frac{M_x y}{I_x} + \frac{M_y x}{I_y} \text{ (comp)}$$

$$\sigma_C = \frac{M_x y}{I_x} + \frac{M_y x}{I_y} \text{ (Tension)}$$

Now M_x & M_y



So

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

$$\boxed{M_x = 48P\cos 60}$$

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

$$\boxed{M_y = 48P\sin 60}$$

Now

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

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

Solving the equation

Now

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

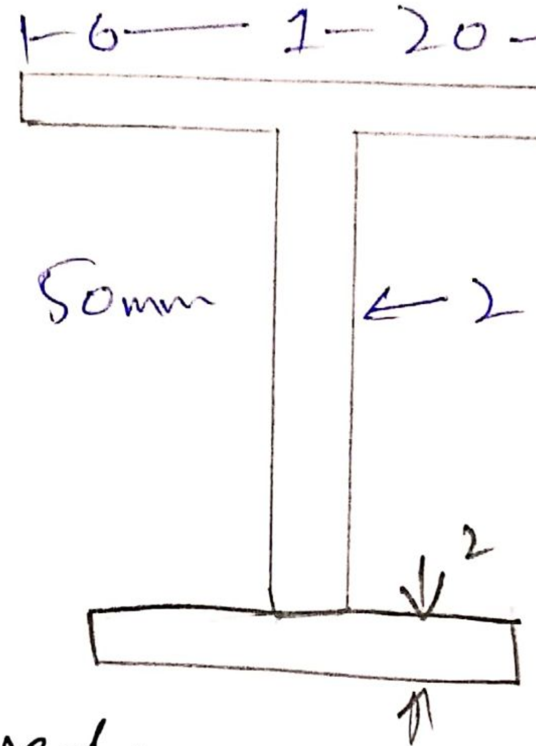
$$5000 = \frac{48P\cos 60}{112.6} \times (5.93) + \frac{48P\sin 60 \times 0.5}{18.7}$$

So $P = 2104.8$ lb

Max Load P is 1638.6 Lb

Question ~~07~~ :-

Part A



Required:

Location of Shear Centre

Sol:

we know that

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

&

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

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

$I = 50034.66 + 20833$

$I = 70867.99 \, mm^4$

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

So
Shear Centre is

$\boxed{e = 11.02 \, mm}$

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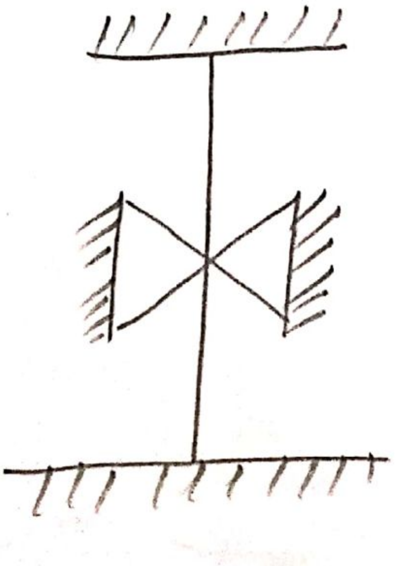
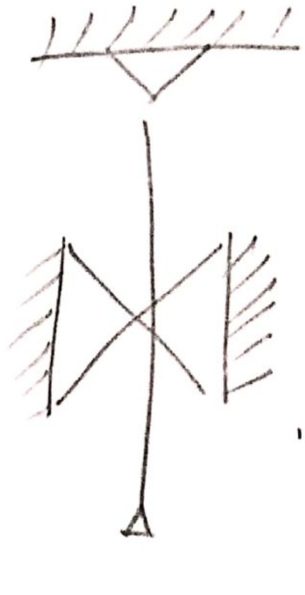
Question 3 :-

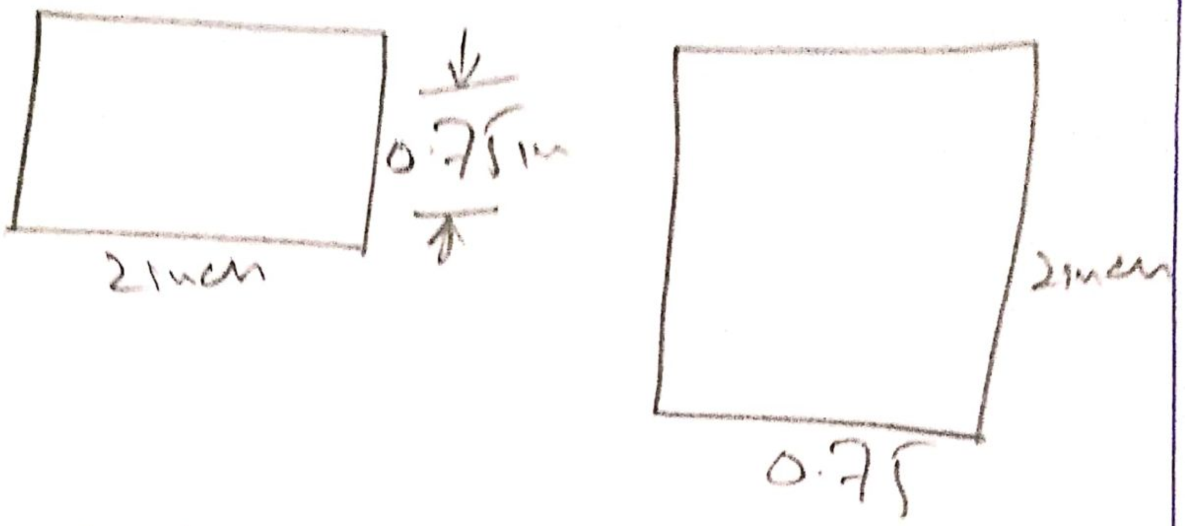
$L = 10\,ft$

Sol :-

According to the given data as Conduction is not Supports it which direction the column will buckle so we will Analyse both case







For Case 1 :-

$$P_{cr} = \frac{\cancel{k}\, n\pi^2 E I}{L_e^2}$$

Here for Case 1

$n = 2 \quad E = 10.3 \times 10^6$ psi

$$I = \frac{0.75 \times 2^3}{12} = 0.5 \text{ inch}^4$$

$$L_e = 0.5L = 0.5 \times 16 \times 2$$

$$= 96 \text{ ft}$$

$$P_{cr} = \frac{2 \times 3.14^2 \times 10.3 \times 10^6 \times 0.5}{96^2}$$

$P_{cr} = 11019.3$ lbs $= 11.61$ kip

For Case 2 :-

$n = 2 \quad E = 10.3 \times 10^6$ psi

$I = \dfrac{2 \times 0.75^3}{12} = 0.0703 \text{ in}^4$

i.e $= L = 16 \times 12 = 192$

$P_{cr} = \dfrac{2 \times 3.14^2 \times 10.3 \times 10^6 \times 0.0703}{192^2}$

$P_{cr} = 387.8$ lbs

$= 0.387$ kps

So

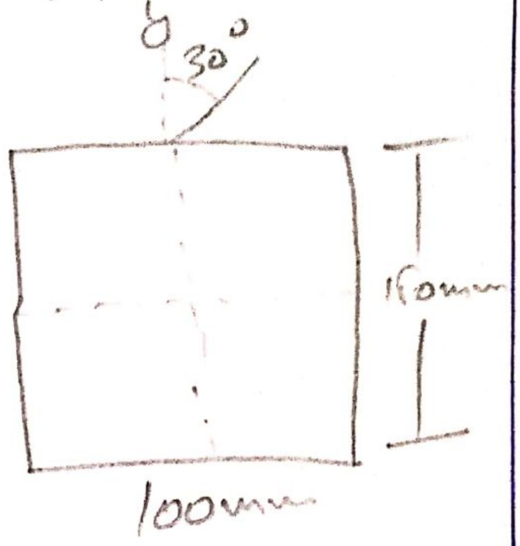
Safe load

$= \dfrac{0.387}{2}$

$\boxed{= 0.2 \text{ kps}}$

Question 02

Part A



Given Data:

$w = 4 kN/m$

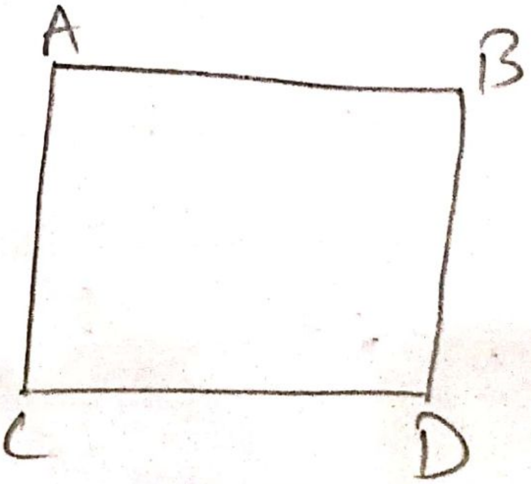
$L = 3m$

Required:

Maximum bending stress = ?

Solution:

As the bending moment is maximum at extrems so we would find stress at A, B, C & D (as)



we know that

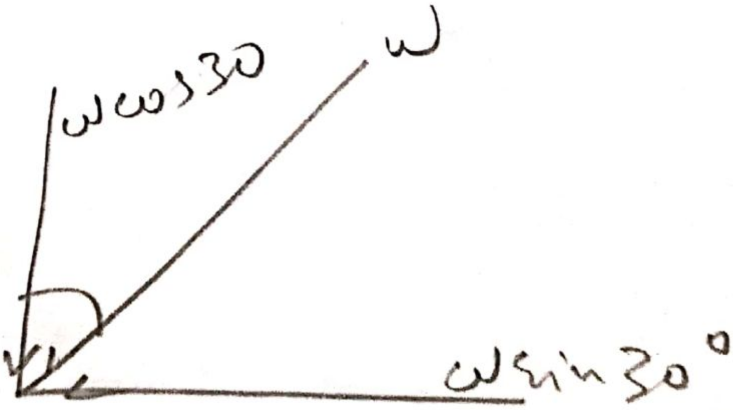
$$\sigma = \frac{M_x y}{I_x} + \frac{M_y x}{I_y}$$

The Max & My should be find at the mid

As simply supported we have

$$M_{id} = \frac{wl^2}{8} \longrightarrow$$

Now we have to find the component of w in x & y direction.



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

$$M_x = \frac{(4 \times \cos 30) \times 3^2}{(12)}$$

$$M_x = 3.8 \text{ KN}$$

Now

$$M_y = \frac{(4 \times \sin 30) 3^2}{8}$$

$$M_y = 2.25 \text{ KN}$$

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

M_y is causing compression at B & D Tension at A & C

I_x & I_y

$$I_x = \frac{bh^3}{12} = \frac{0.1 \times 0.15^3}{12} = 2.815 \times 10^{-5} m^4$$

$$I_y = \frac{hb^3}{12} = \frac{0.15 \times 0.13}{13} = 1.25 \times 10^{-5} m^4$$

Now stress at extreme

$$\sigma_x = \frac{M_x y}{I_x} = \frac{3.8 \times 0.075}{2.815 \times 10^{-5}}$$

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$\sigma_x = 10380.7 \ kN/m^2$

$\sigma_y = \dfrac{2.25 \times 0.05}{1.25 \times 10^{-5}}$

$\sigma = 9000 \ kN/m^2$

Now Tangential tension + n

Stress at $A = \dfrac{M_x y}{I_x} + \dfrac{M_y x}{I_y}$

$\Rightarrow -10380.7 + 9000$

$\Rightarrow -138.7 \ kN/m^2$ (comp)

at B

$\dfrac{M_x y}{I_x} + \dfrac{M_y x}{I_y}$

$\Rightarrow 1038.7 - 9000$

& δ at $b = -18380.7 \ kN/m^2$

Now
stress at C

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

$= 10380.7 + 8000$

$= 18380.7$ KN/m (Tension)

Stress at D

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

$\Rightarrow 10380.7 - 8000$

$\Rightarrow 1380.7$ KN (Tension)

So maximum stress are on B & C

B is under compression of 18370.7 KN/m² & C is under Tension of the same value.