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ASSIGNMENT:

MECHANICS OF SOLIDS II

ASSIGNMENT NO 4

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ID: 7968

SECTION: B

SUBMITTED TO: SIR ENGR: MUHMMAD SAQID.

Date:

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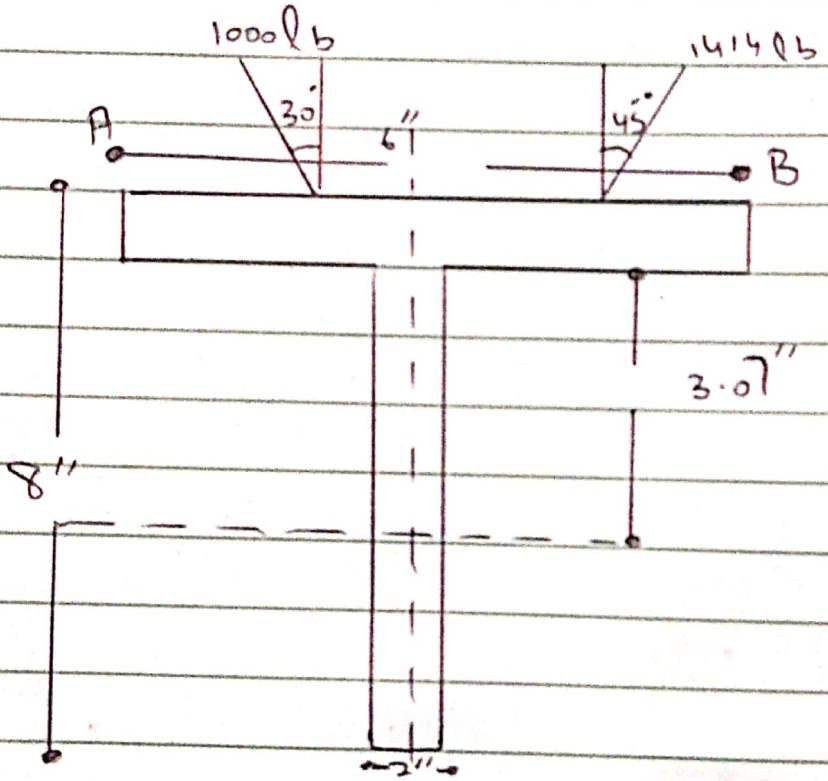
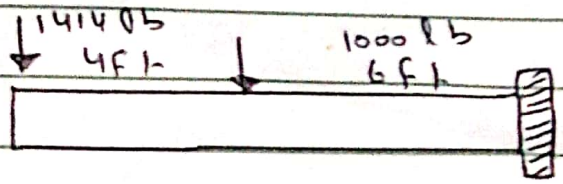
PROBLEM NO 2:

GIVEN:

L = 10'





TO FIND:

Inclination of neutral axis = ?

Max tension = ?

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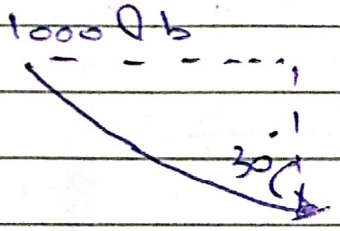
Max Compression = ?

SOLUTION:

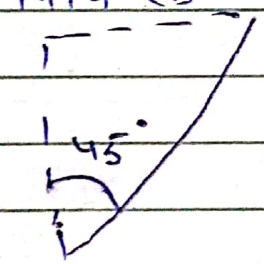
First we are finding moments.

First we are solving components.



$1000 \sin 30^\circ$

$1000 \cos 30^\circ$



$1414 \cos 45^\circ$

$1414 \sin 45^\circ$

As max is caused by vertical components of bad.

$$Mx = (1000 \cos 30^\circ)6 + (1414 \cos 45^\circ)12$$

$$Mx = 5196.5 + 11998.18$$

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$M_x = 17194.33$ lb/ft.

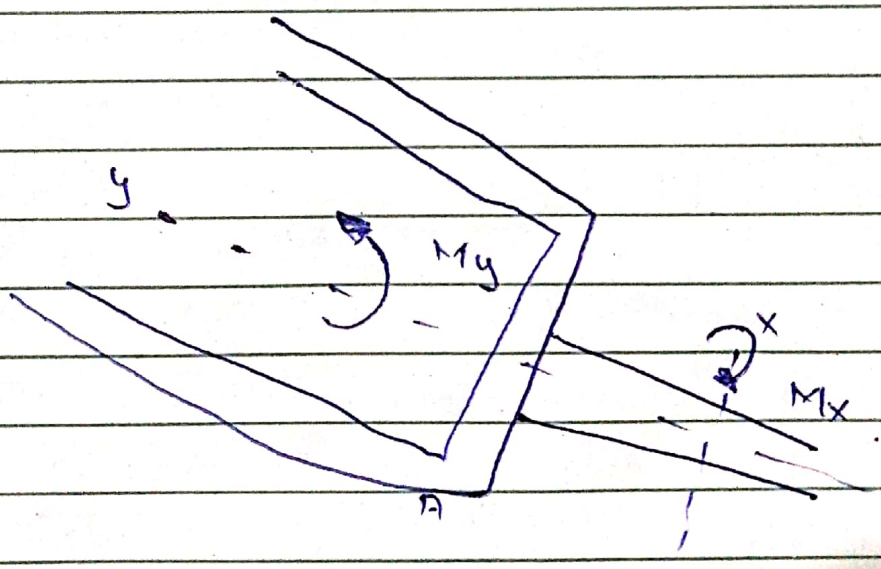
Now for M_y.

$M_y = (1000 \sin 30)\, 6 + (1414 \sin 45^\circ)\, 12$

$M_y = 3000 + 11998.18$

$M_y = 14998.18$ lb/ft.

M_y is in anticlock wise direction.



Finding stresses at extreme fibers.

$$\sigma_x = \frac{M_x y}{I_n}$$

$\sigma_x = 17194.33 \times 4.07 / 112.6\ in^4$

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$$\sigma_x = \frac{17194.33}{5.43 \times 10^{-3}} \times 0.3391$$

$$\sigma_x = 3.166 \ \frac{Mlb}{Ft^2} \times 0.333$$

$$\sigma_x = 1.0738 \ \frac{Mlb}{Ft^2}$$

$$\sigma_x = 1.0738 \ \frac{Mlb}{ft^2}$$

$$\sigma_y = \frac{14998.18 \times 3^{1/4}}{18.7 \ in^4}$$

$$\sigma_y = \frac{14998 \times 0.38}{9.018 \times 10^4 \ Ft^4}$$

$$\sigma_y = 16.624 \ \frac{Mlb}{Ft^2} \times 0.25$$

$$\sigma_y = 4.156 \ \frac{Mlb}{Ft^2}$$

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∴ Finding load at "A" and "B"

$$\sigma_A = \sigma_x + \sigma_y$$

$$\sigma_A = 1.0738 + 4.156$$

$$\sigma_n = 5.229 \ \frac{Mlb}{Ft^2}$$

$$\sigma_B = \sigma_x - \sigma_y$$

$$\sigma_B = 1.0738 - 4.15$$

$$\sigma_B = -3.08822 \ \frac{Mlb}{Ft^2}$$

Now finding a neutral axis.

$$\tan\alpha = \frac{I_x}{I_y} \cdot \frac{M_y}{M_x}$$

$$\tan\alpha = \frac{5.43 \times 10^{-3}}{9.018 \times 10^{-4}} \times \frac{1794.33}{14998.18}$$

$$\tan\alpha = 6.021 \times 1.146$$

$$\tan\alpha = 6.9026$$

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$\tan\alpha = 6.9026$

$\alpha = \tan^{-1}(6.9026)$

$\alpha = 81°.76°$

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