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Section: A

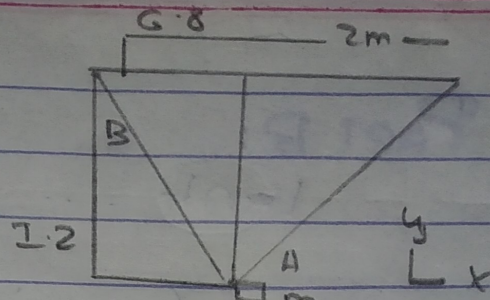
Dept: Civil Engineering

Paper: Mid term

Semester: 2nd

QUESTION: 1

GIVEN DATA:



$$m = 400 \text{ lbs}$$

$$\Delta DAB = 15^\circ$$

$$AC = 35^\circ$$

REQUIRED:

$$AB = ? \quad BC = ?$$

SOLUTION:

$$\theta = \tan^{-1} \left(\frac{1.2}{0.8} \right)$$
$$\theta = 56.3$$

$$\beta = \tan^{-1} \left(\frac{1.2}{2} \right)$$

$$\beta = 31.6$$

We know that

$$m = 400 \text{ lbs}$$

$$\Rightarrow \frac{400}{2.204} = 181.48 \text{ kg}$$

$$T_{AB} \cos DAB = 0.15 \times (181.48)$$

$$(9.81) [-0.356 - 3i + 5 \sin 56.3i]$$

$$T_{AB} = 267.047 \{ 0.55i + 0.83i \}$$

$$T_{AB} = (-146.87i + 221i \text{ N})$$

PART B: If the water tank

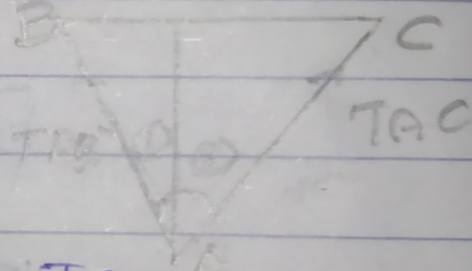
$$w = \left(400 + 400 \times \frac{15}{100} \right) +$$

$$6569 + 6569 \times \frac{35}{100}$$

$$= 400 + 60 + 65 + 2299$$

$$= 9328.15 \text{ lb}$$

$$\{ F_x = 0$$



$$TAB = 1.54 TAC$$

$$(1.8) TAC = 9328$$

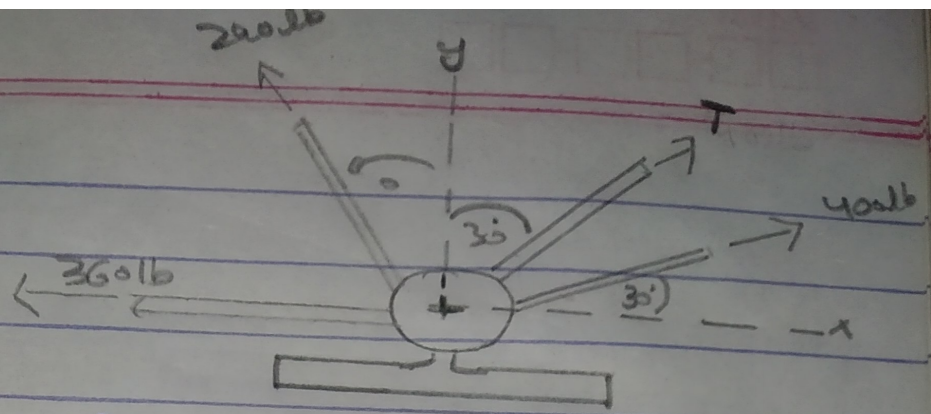
$$TAC = 5182.22$$

$$TAB = 1.54 \times 5182$$

$$TAB = 7980.6 \text{ lb}$$

QUESTION: 2

GIVEN:



REQUIRED: Stress of bolt = 600 lb

Solution:

$$\begin{cases} F_x = 0 \\ -360 - 240 \sin \phi + T \sin 30^\circ + 400 \cos 30^\circ = 0 \end{cases}$$

$$\begin{cases} F_y = 0 \\ 240 \cos \phi + T \cos 30^\circ + 400 \sin 30^\circ = 600 \end{cases}$$

Numerical solution of equation (1) & (2)

$$\phi = 21.7^\circ$$

$$T = 204 \text{ lb}$$

NOTE:

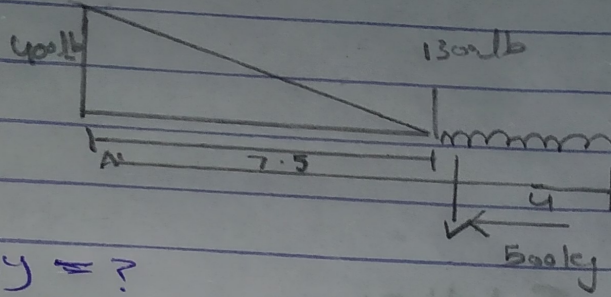
We could eliminate T between equation 1 & 2 and resulting equation transcendental.

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Question: 3

GIVEN

REQUIRE:



$A_y = ?$

$B_y = ?$

Solution:

Convert load

$\Rightarrow 300 \times 4 = 1200 \text{ lb}$

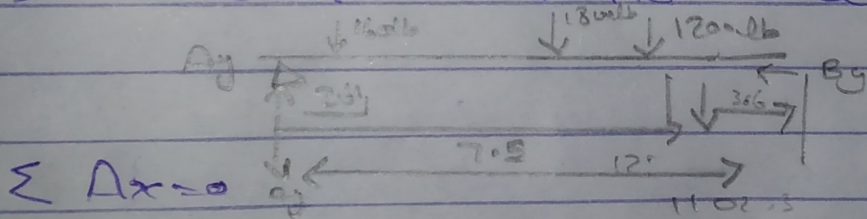
at point $= \frac{1}{2} \times 4 = 2$ from B

$\Rightarrow UUL = \frac{1}{2} \times 400 \times 8 = 1600 \text{ lb}$

at distance $= \frac{1}{3} \times 8 = 2.66$ from A

\Rightarrow one load in kg convert in to lb

$= 500 \times 2.204 = 1102.31 \text{ lb}$



$\Sigma Ax = 0$

$Ax = 0$

$\Sigma MA = -1600 \times 2.66 - 1800 \times 7.5 - 1200 \times 12 + By \times 12$

$= -4256 - 13500 - 1200 - 9204 + By \times 12$

$By = \frac{16046.12}{12}$

$By = 13371.69 \text{ lb}$