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Subject : Engineering Mechanics

Department : Civil Engineering

Section : A

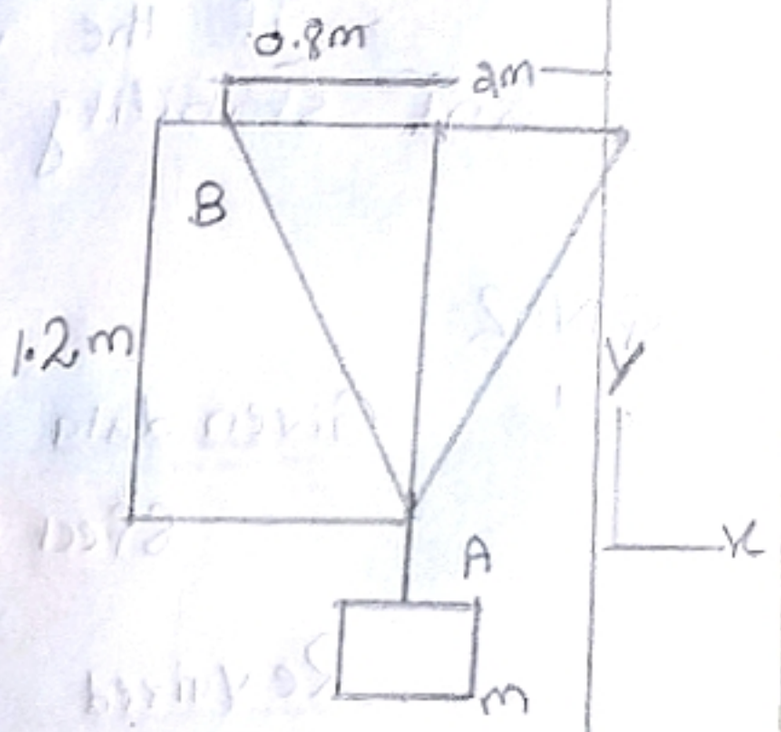
Part A

Given data:

m = 400 lbs

increase of volume => ΔAB 15%

increase of volume => ΔAC 35%



Required:

AB = ?

BC = ?

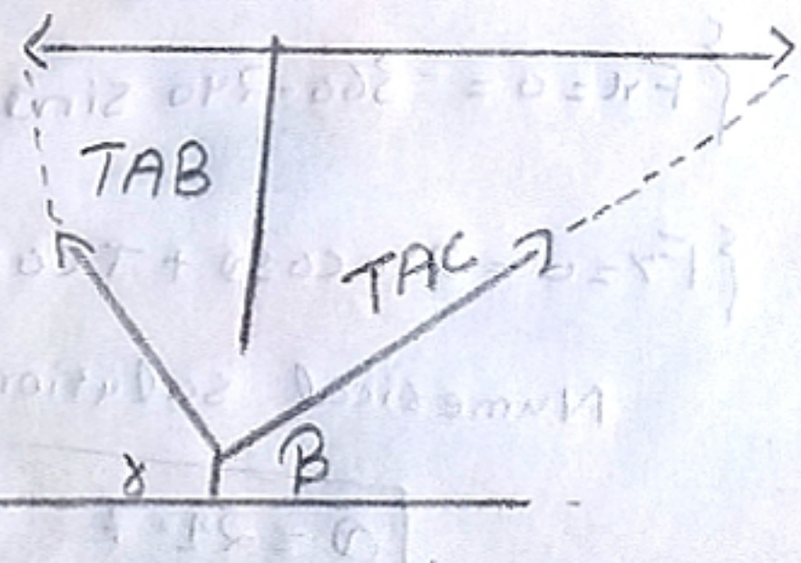
Solution:

$\delta = Tan^{-1}\left(\frac{1.2}{0.8}\right)$

$\delta = 56.3^{\circ}$

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

$\beta = 31.6^{\circ}$



As we Know that

m = 400 lbs => 400/2.204 = 181.48 kg

$T_{AB} = T_{AB}\ \Delta AB = 0.15 \times (181.48)(9.81)\ [-\cos 56.3 + \sin 56.3]$

$267.047\ \{-0.55i + 0.831i\}$

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

$$TAC = TAC\,\Delta AC = 0.35\,(181.48)\times(9.8)\,\{-(0.331i + \sin 31.6i\}$$

$$TAC = (623.11)\,\{-0.857i + 0.515i\}$$

$$TAC = -534i + 320iN$$

$$TAC = -146i + 221iN$$

$$TAB = -534i + 320iN$$

Part B:

if the water tank increase than weight and stability is not double.

QNo2:

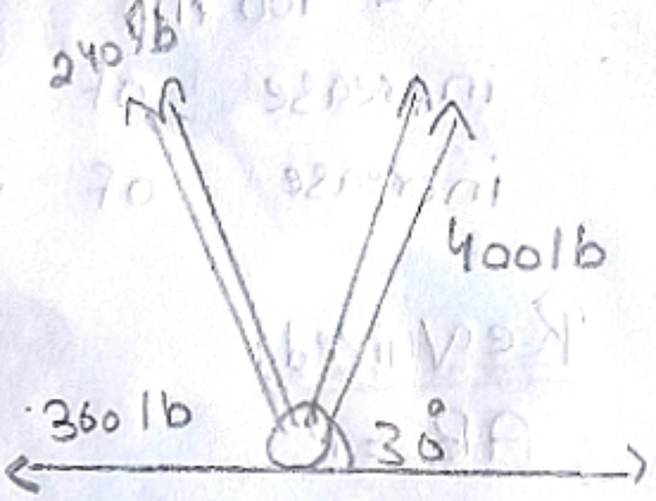
Given data

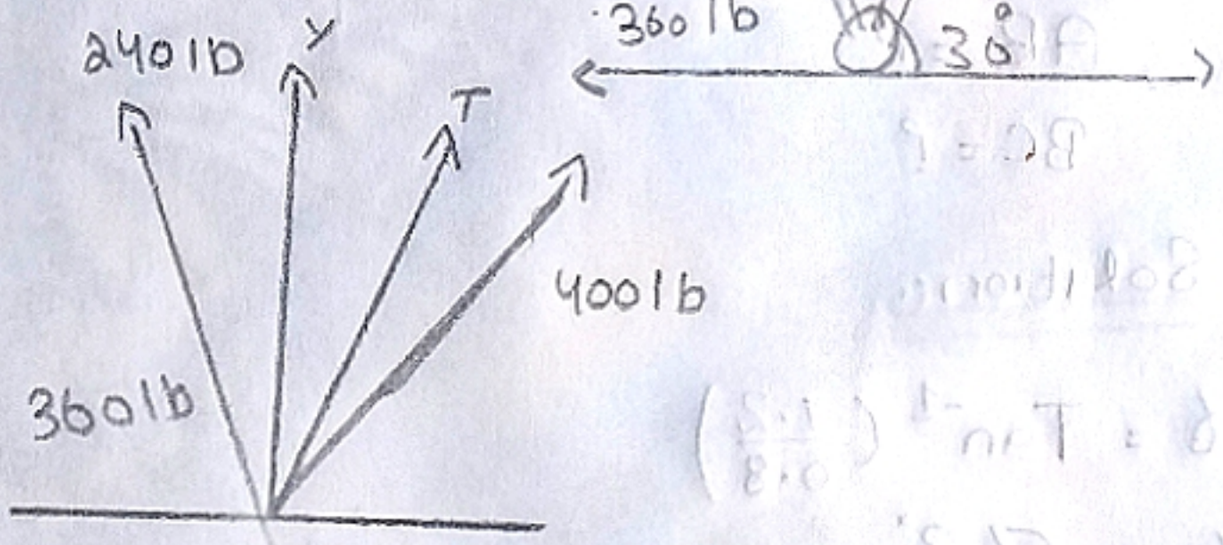
Effect of bold = 600lbs

Required

T = ?

Θ = ?





Solution

$$\{F_x = 0 = -360 - 240\sin\Theta + T\sin 30^\circ + 400\,(\cos 30^\circ = 0$$

$$\{F_y = 0 = 240\cos\Theta + T\cos 30^\circ + 400\,(\sin 30^\circ = 600$$

Numerical solution of Equation (1) and (2)

$\Theta = 21.7 \quad T = 2041b$ Ans

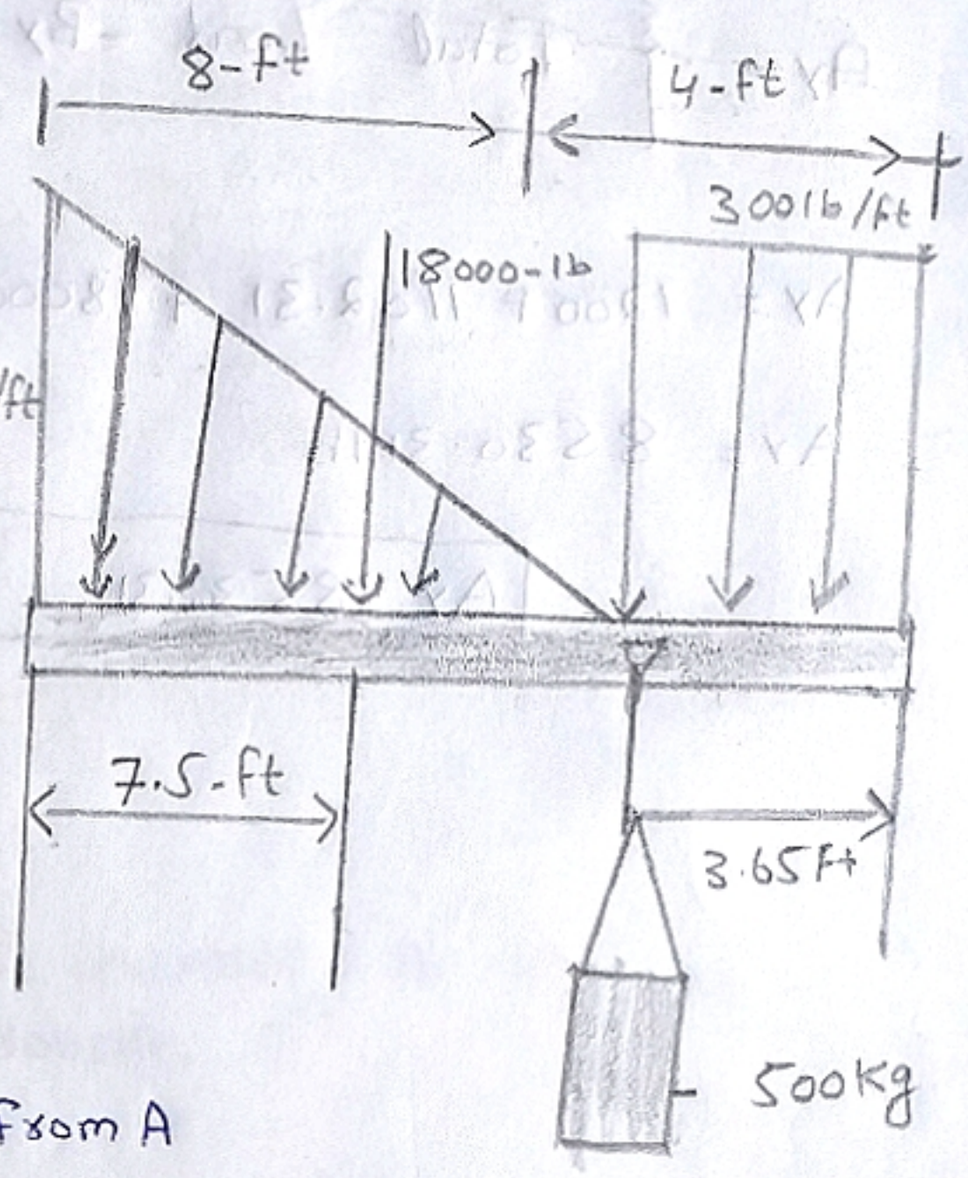
Note: we could eliminate T between Equation 1 and 2 the resulting equation Transcendental.

Given data

Required

Ay = ?

By = ?



Solution:-

UDL = Convert to Point load

=> 300x4 = 1200 lb

at Point = 1/2 x4 = 2 fromB

=> UVL = 1/2 x400x8 = 1600 lb

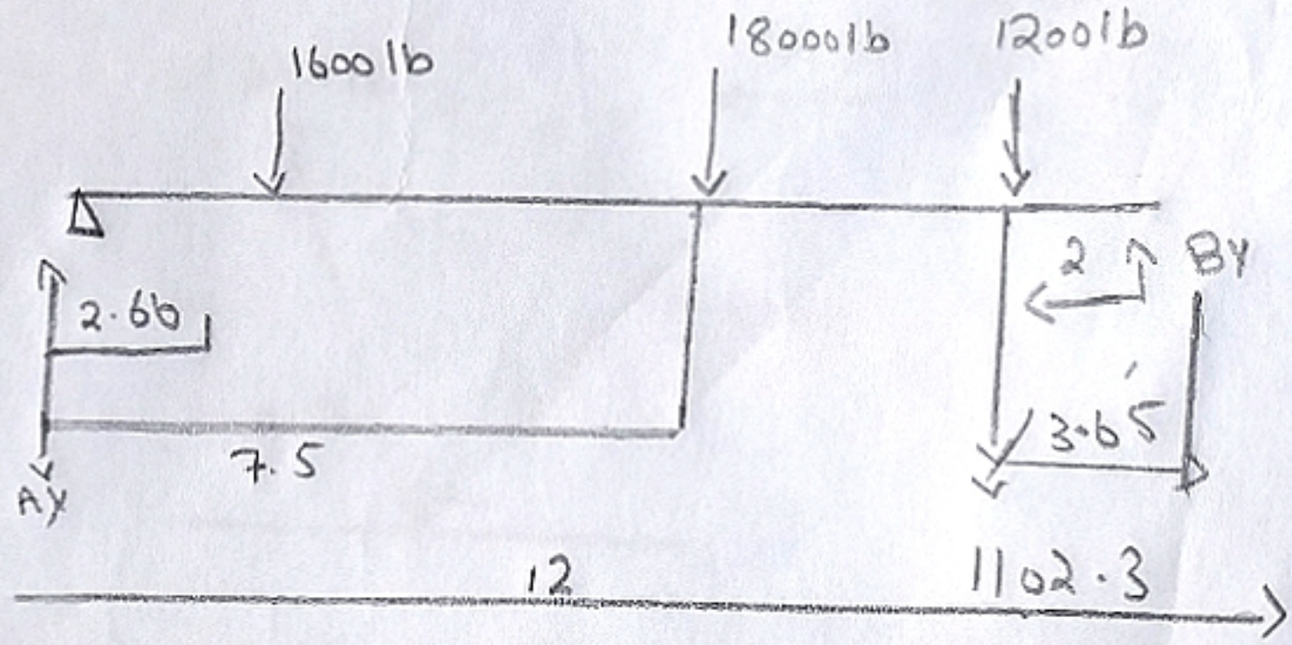
at distance = 1/3 X8 = 2.66 from A

=> one load in kg

convert to lb

= 500x2.204 = 1102.31lb

NOW



$\sum mA = -1600 \times 2.66 - 18000 \times 7.5 - 1200 \times 10 - 1102.3 \times 8.35 + 12$

$= -160460.12 + By \times 12$

$By = \frac{160460.12}{12}$

$By = 13371.69$

$A_y = \{$ Total Load $- B_y$

$A_y = 1200 + 1102.31 + 18000 + 1600 - 1337.69$

$A_y = 8530.31$ lb

$\boxed{A_y = 8530.31, \quad B_y = 1337.69}$ Ans