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Section - A

Semester 2nd

Civil Engineering Department

Paper: Engineering Mechanics

Qno1 (Ans)

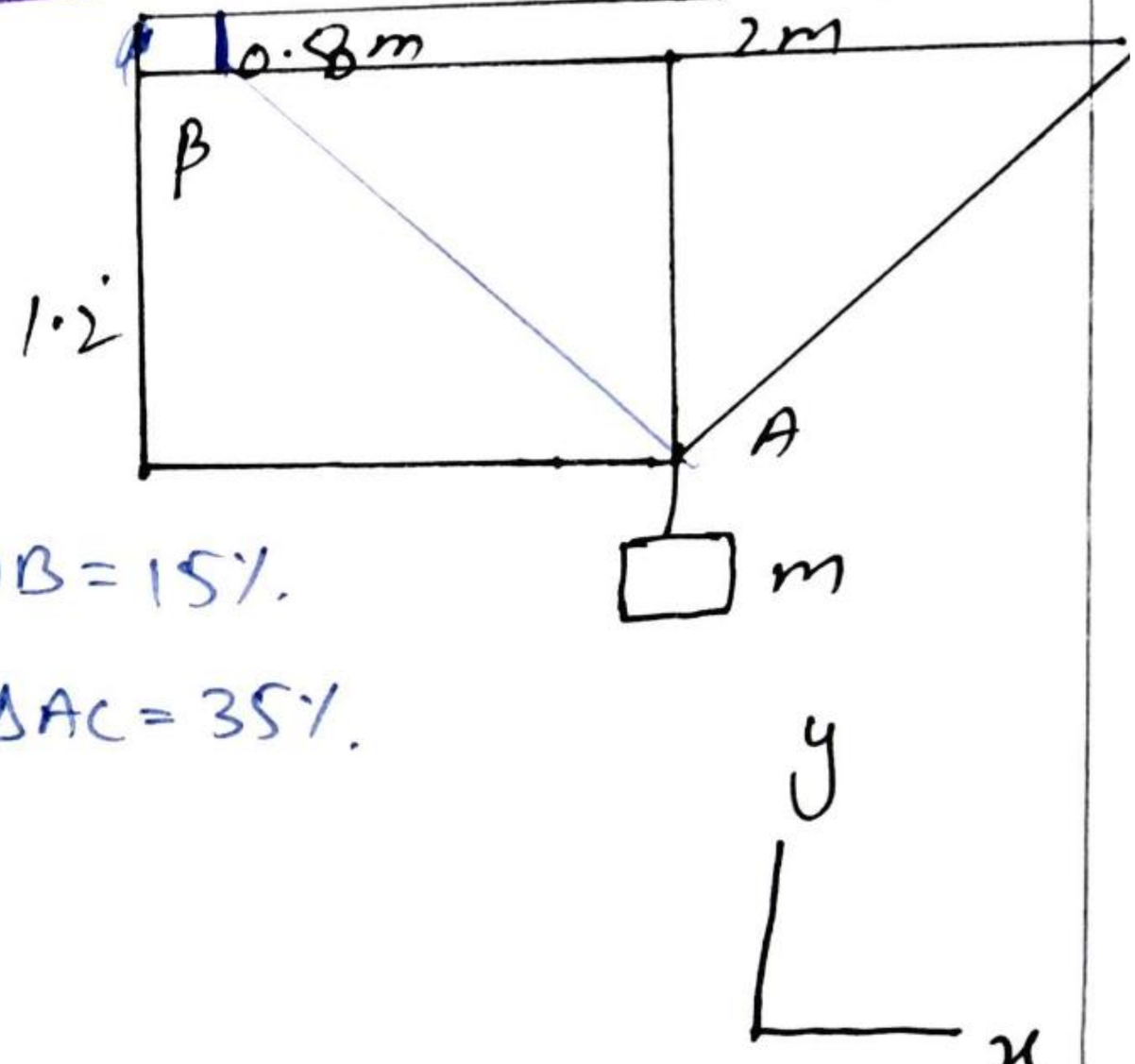
Part (A)

Given data

m = 400lbs

Increase of Volume => ΔAB = 15%.

Increase of Volume => ΔAC = 35%.



Required

AB =

BC =

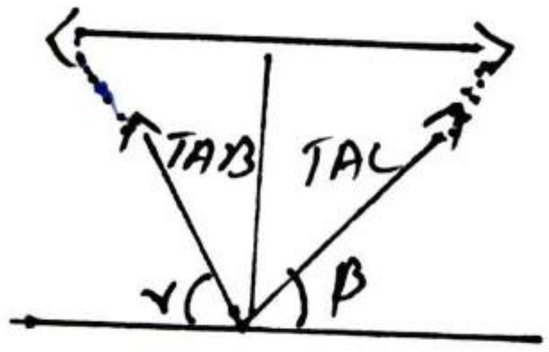
Solution:

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

$\theta = 56.3^{\circ}$

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

$\beta = 31.0^{\circ}$



We know that

$m = 400lbs = \frac{400}{2.204} = 181.48kg$

$T_{AB} = T_{AB}\,\Delta_{AB} = 0.15 \times (181.48)(9.81)[-(0356.3j + \sin 563i)$

$= 267.047\ \{-0.55i + 0831i\}$

$(T_{AB} = -146.87i + 2212N)$

$$TAC = TAC\ \Delta AC = 0.35(181.48) + (9.81)\{-(0331\hat{i} + \sin 31\hat{i})\}$$

$$TAC = (623.11)\{0 - 0.857\hat{i} + 0.515\hat{i})$$

$$TAC = -534\hat{i} + 320\hat{i}\ N$$

$$TAB = -146\hat{i} + 221\hat{i}\ N$$

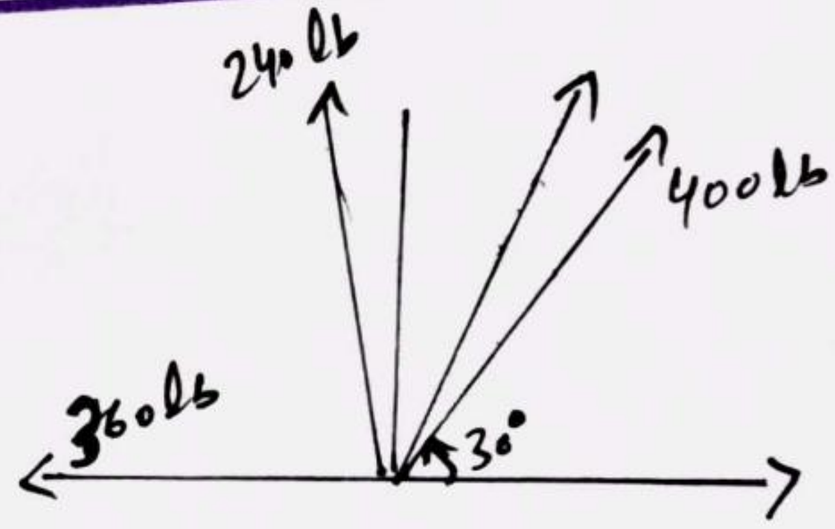
$$TAC = -534\hat{i} + 320\hat{i}\ N$$

Part B: if the water tank increases then weight is their Stabily is not double.

Q2 Ans

Given data

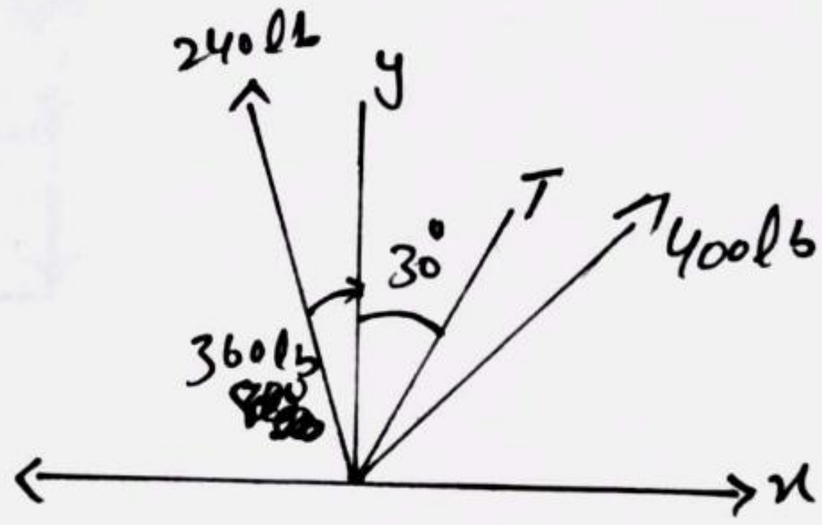
5 feet of Bold = 600lb



Required

$T = ?$

$Q = ?$



Solution

$$\Sigma f_x = 0 = -360 - 240\sin Q + T\sin 30 + 400\cos 30 = 0$$

$$\Sigma f_y = 0 = 240\cos Q + T\cos 30° + 400\sin 30 = 600$$

Numerical Solution of equation (1) and Eq(2)

$Q = 21.7°$, $T = 204$ lb Ans

Note: We could eliminate T between Equation 1 & 2 the resulting equation Transcedental.

Q3 Ans =

Given data

Required

Ay = ?

By = ?

Solution

=> UDL = Convert To point load

=> 300x4 = 1200 lb

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

=> UVL = $\frac{1}{2} \times 400 \times 8 = 1600$ lb

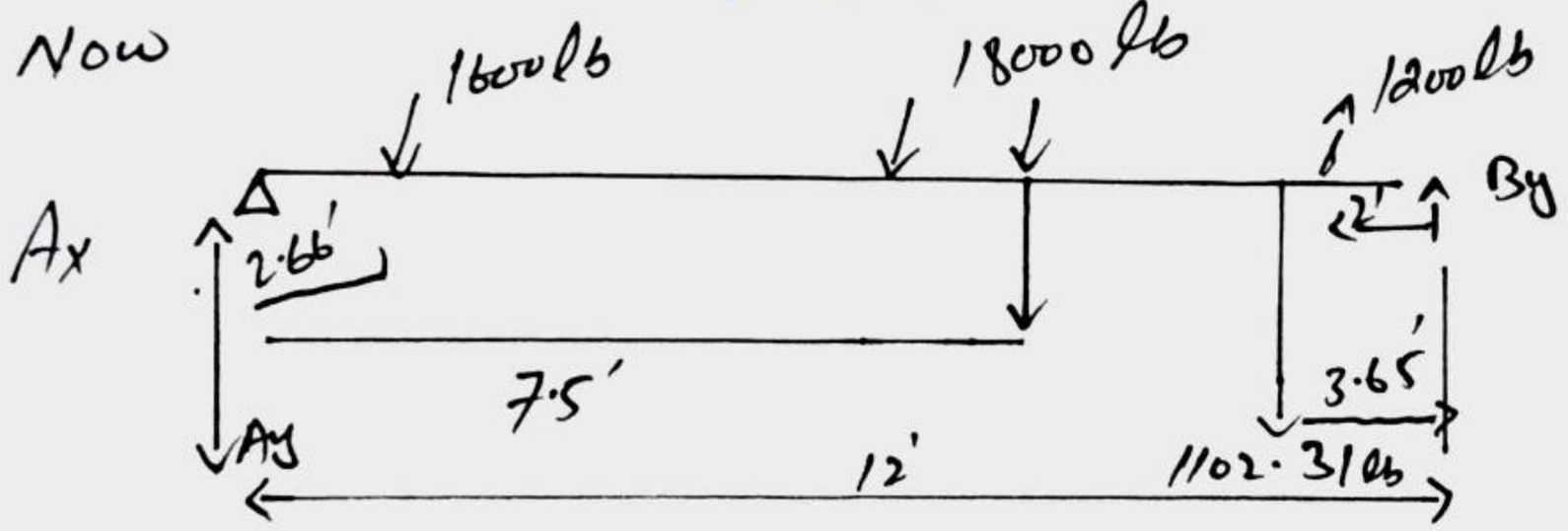
at distance = $\frac{1}{3} \times 8 = 2.66'$ from A

=> One load in kg

Convert to lb

=> 500 x 2.204 = 1102.31 lb

Now



$\sum Ax = 0$

$Ax = 0$

$\sum mA = 1600 \times 2.66 - 18000 \times 7.5 - 1200 \times 10 - 1102.31 \times 8.35 + 1 + 12$

$= -4256 - 135000 - 12000 - 9204.28 + By * 12$

$= -160460.12 + By \times 12$

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

$By = 13371.69$ lb

$Ay = \{$ Total load $- By$

$Ay = 1200 + 1102.31 + 18000 + 1600 - 13371.69$

$Ay = 8530.31$ lb $\Longrightarrow$ $Ay = 8530.31$, $By = 13371.69$ Ans