IQRA NATIONAL UNIVERSITY

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SECTION: A

Dept: BE(C)

Semester: 2nd

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Subject: Engineering Mechanics.

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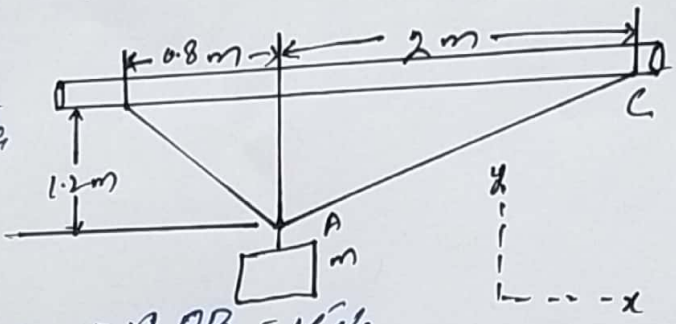
Q1 two high stregth flexible steel cables AB and AC are fastend ?

A



Ans/ Given data

A m = 400 lbs

increase of volume => V AB = 15%

increase of volume = V AC = 35%

Required

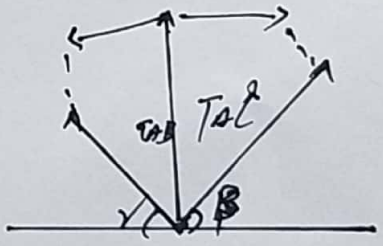
AB = ?

BC = ?

Solution

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

$\gamma = 56.3^\circ$



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

$\beta = 31.0^\circ$

we know that

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

$T_{AB} = T_{AB} \text{ of } AB = 0.15 \times (181.48)(9.81)$

$[-\cos 56.3 i + \sin 56.3 j]$

$= 267.047\{-0.55\hat{i} + 0.831\hat{j}\}$

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

$T_{AL} = T_{AL}\,\hat{n}_{AL} = 0.35(181.48)(9.81)$

$\{-\cos 31\hat{i} + \sin 31\hat{j}\}$

$T_{AL} = (623.11)\{-0.857\hat{i} + 0.515\hat{j}\}$

$T_{AL} = -534\hat{i} + 320\hat{j}\,N$

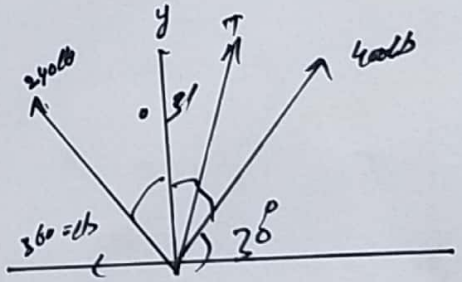
$T_{AB} = -146\hat{i} + 221\hat{j}\,N$

$T_{AC} = -534\hat{i} + 320\hat{j}\,N$

Q2 Question (2)

Give data

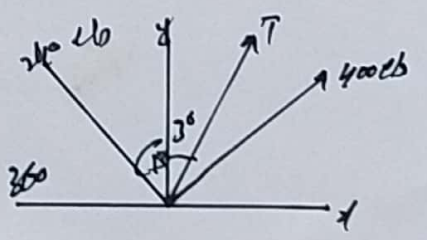
Load = 600 lb



Required

$T = ?$

$\theta = ?$



Sol:- $\Sigma F_x = 0 = -360 - 240\sin\theta + T\sin 30 + 400\cos 30 = 0$

$\Sigma F_y = 0 = 240\cos\theta + T\cos 30^\circ + 400\sin 30 = 680$

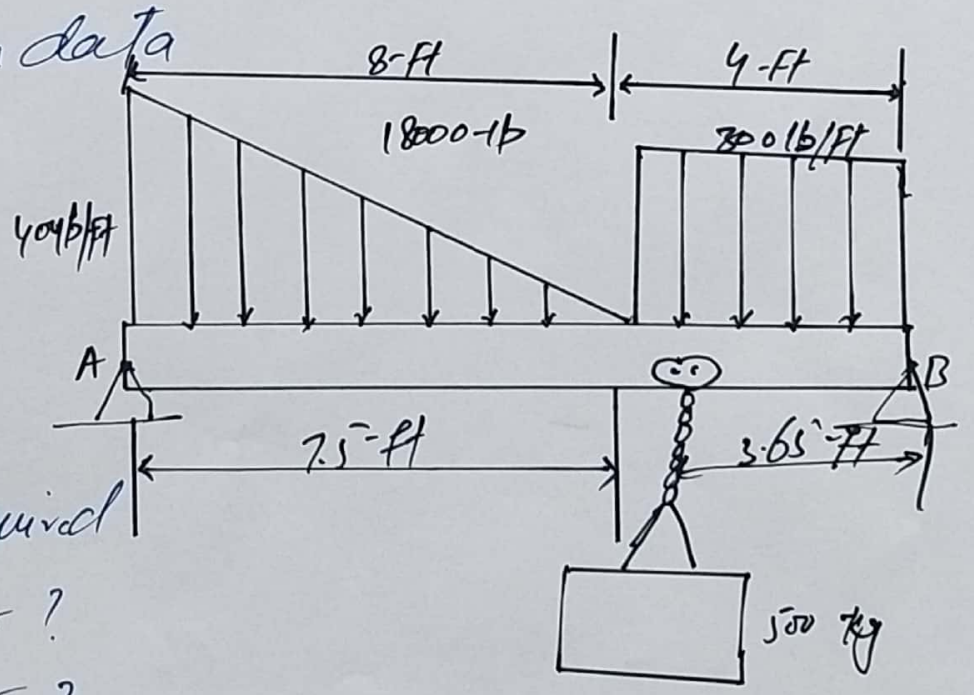
Numerical solution of equation ① & ②

$\theta = 21.7^\circ \quad T = 204$ lb Ans

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

Question = 3

Given data



Required

Ay = ?

By = ?

Solution.

⇒ UDL = Convert to point load.

⇒ 300 × 4 = 1200 lb

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

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

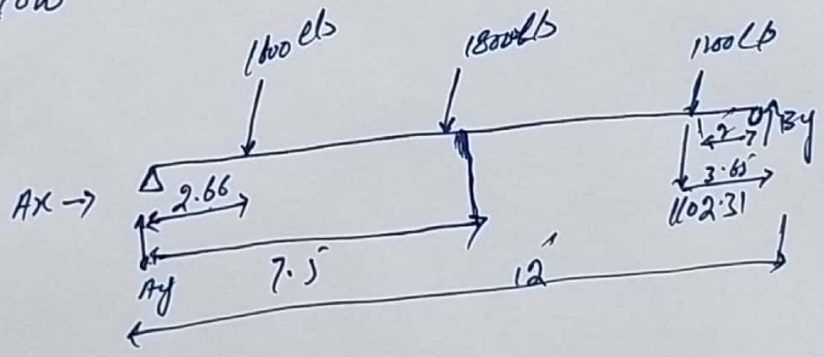
at distance = $\frac{1}{3} \times 8 = 2.66$ from A.

⇒ one load in kg

Convert to lb

$= 500 \times 2.204 = 1102.31$ lb

Now



$\Sigma Ax = 0$

$Ax = 0$

$\Sigma MA = -1600 \times 2.66 - 18000 \times 7.5 - 1200 \times 10 - 1102.31 \times 8.33 + By \times 12$

$= -4256 - 135000 - 12000 - 9204.28 + By \times 12$

$= -160460.12 + By \times 12$

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

$$By = 13371.69 \text{ lb}$$

$Ay = \Sigma$ Total Load - By

$$Ay = 1200 + 1602.31 + 18000 + 1600 - 13371.69$$

$$Ay = 8530.31 \text{ lb}$$

$Ay = 8530.31$, $By = 13371.69$ Ans