NAME ★ Muhammad Anwar.

ID ★ 16649

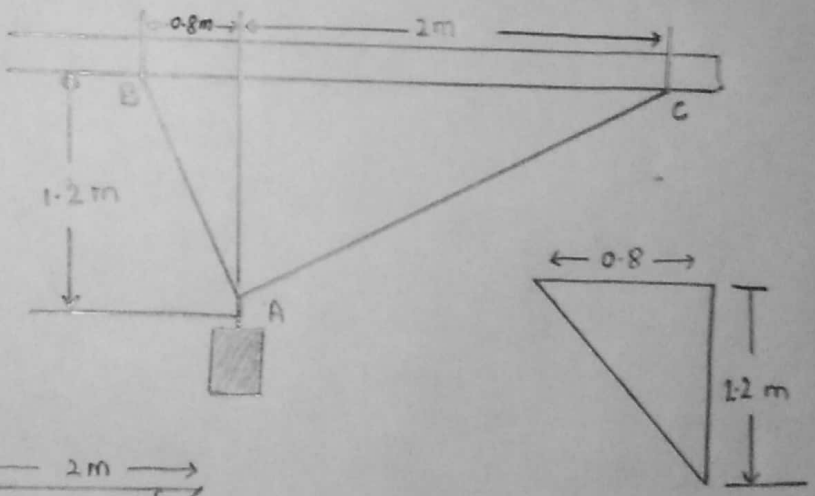
Submitted to ★ ENGR Muhammad Mojid Naeem

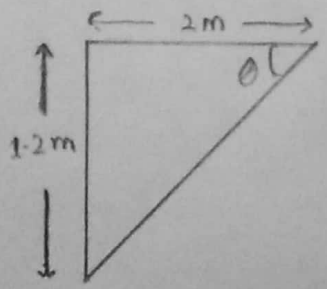
Subject. ★ Engineering Mechanics.

Semister ★ 2nd.

QUESTION. # 1

Part. (a) two high Strength flexible Steel cable AB and AC are fastened to the Ceiling of a Building through Corbon steel hooks at point B & C. These Cable are knocked together to a 3rd Cable at Point A which is holding a thick wall water tank weighting 400 pound and is full of 3000 litres of water Volume. What percentage of the whole weight is being held by Cable AB alone? What amount of tension must be there in both the cables to maintain the Static equilibrium of the System?





$$\tan\theta = \frac{P}{B} = \frac{1.2}{2}$$

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

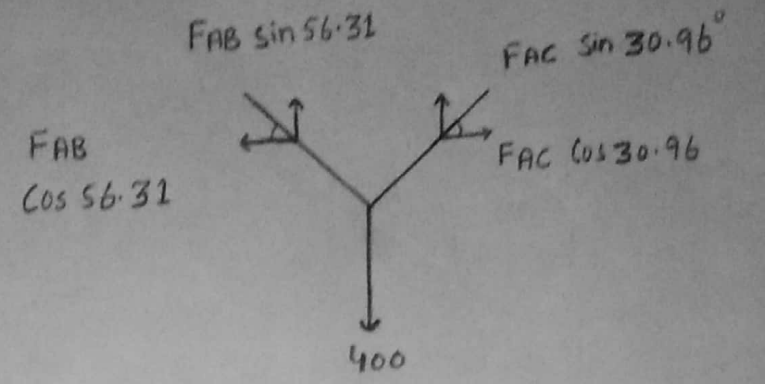
$$\theta = 30.96$$

$$\tan\theta = \frac{P}{B} = \frac{1.2}{0.8}$$

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

$$\theta = 56.31$$

(P.T.O)



$$\sum F_x = 0$$

$$-F_{AB}\cos 56.31 + F_{AC}\cos 30.96^\circ = 0$$

$$\sum F_y = 0 \quad \uparrow + \downarrow -$$

$$F_{AB}\sin 56.31 + F_{AC}\sin 30.96 - 400 = 0$$

$$F_{AB}\sin(56.31) + F_{AC}\sin(30.96) = 400$$

$F_{AB} = 343.40$ lb and

$F_{AC} = 222.13$ lb.

Result.

1. $343.40 + 222.13 = 505.5$ lb is total T.
2. $\frac{343.40}{505.5} \times 100 = 60.72\%$ of Total weight which is holded by (AB).

QUESTION # 1

Part. B

Weight increased by 15%

$= 400\ lb \times \frac{15}{100} = 60.$

Weight = 400 lb.

Volume of water increased by 35%.

$300 \times \frac{35}{100} = 1050$ liters.

Calculating effect on Results (a).

As $\Sigma F_x = 0$.

$-F_{AB} \cos 56.31 + F_{AC} \cos 30.96 = 0$ and

$\Sigma F_y = 0$

$F_{AB} \sin 56.31 + F_{AC} \sin 30.96 = 460$

Results:

$F_{AB} = 394.91\ lb$

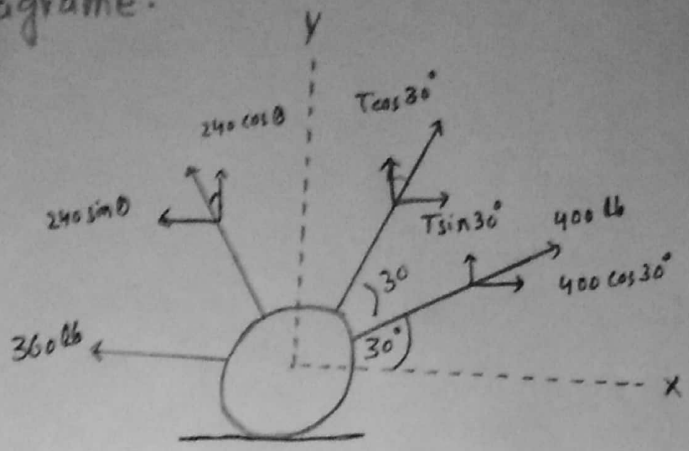
$F_{AC} = 255.452\ lb$

total = 649 lb.

$\frac{394}{649} \times 100 = 60\%$ of total weight. is holded by (AB) Cable alone.

the Same like first one.

Diagrame.



Calculation.

Component of 1	Component of 2
400 cos 30° and	240 cos θ and
400 sin 30°	240 sin θ.

Components of T.

T cos 30° and T sin 30°

$$\sum F_x = 0$$

$$\Rightarrow -240 \sin\theta - 360 + T \sin 30^\circ + 400 \cos 30^\circ = 0$$

$$\sum F_y = 600$$

$$\Rightarrow 240 \cos\theta + T \cos 30^\circ + 400 \sin 30^\circ = 600.$$

As $-240 \sin\theta + T \sin 30 = 13.599 \longrightarrow (i)$

$240 \cos\theta + T \cos 30^\circ = 400 \longrightarrow (ii)$

For θ Put eq (i) in eq (ii) we get.

(P.T.O)

$$-240 \sin\theta = 13.599 - T \sin 30$$

$$\sin\theta = \frac{T \sin 30 - 13.599}{240}$$

$$\theta = \sin^{-1}\left(\frac{T \sin 30 - 13.599}{240}\right)$$

$$\Rightarrow -360 - 240 \sin\theta + T \sin\theta 30 + 400 \cos 30^\circ = 0 \rightarrow (1)$$

$$240 \cos\theta + T \cos 30^\circ + 400 \sin 30^\circ = 600 \longrightarrow (2)$$

Solution of eq (1) & (2) are.

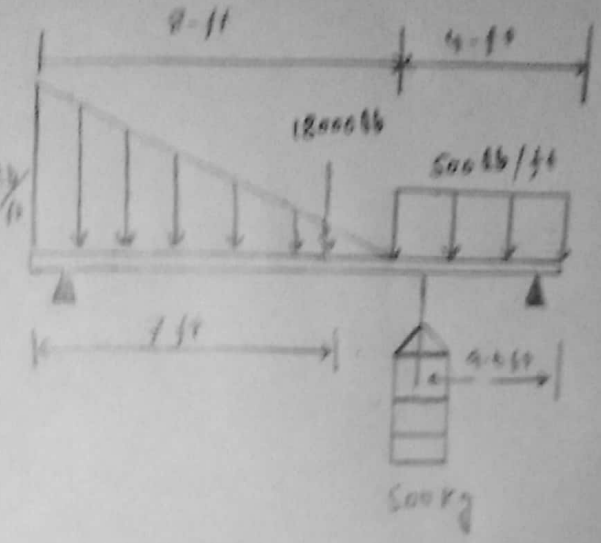
$\theta = 21.7$ and $T = 204$ lb.

Result

$T = 204$ lb

QUESTION # 3.

Diagrame.



Calculation.

Statical determinancy.

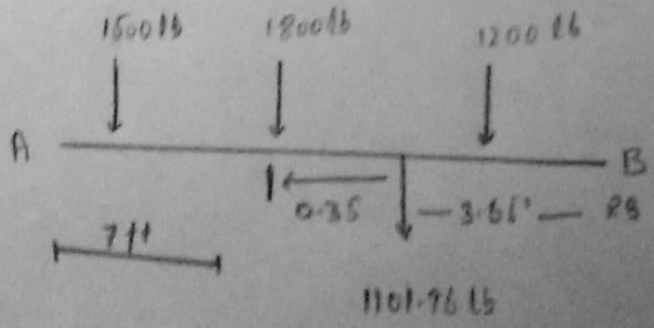
$Y = 3 \quad = 0$

$3 - 3(1) = 0$

$0 = 0$

Statically

Free body Diagrame.



(P.T.O).

The Sum of clock wise and anti-clock wise torque and forces are equal to zero.

As

$$\sum MA = 0.$$

$$1600 \times 2.67 + 1800 \times 7.5 + 1101.96 \times 8.35 + 1200 \times 10 - RB \times 12 = 0.$$

$$\Rightarrow 12\,RB = 160473.37$$

$$\Rightarrow \frac{12\,RB}{12} = \frac{160473.37}{12}$$

$$\boxed{RB = 13372.78\ lb}$$

$$\sum MA = 0$$

$$RA \times 12 - 1600 \times 9.33 - 18000 \times 4.5 - 1101.96 \times 3.65 - 1200 \times 2 = 0$$

$$\Rightarrow 12\,RA = 102350.154$$

$$\frac{12\,RA}{12} = \frac{102350.154}{12}$$

$$\Rightarrow \boxed{RA = 8529.18\ lb}$$ Ans

The END.