

Date: _____

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I.D.:- 16068

Section:- A

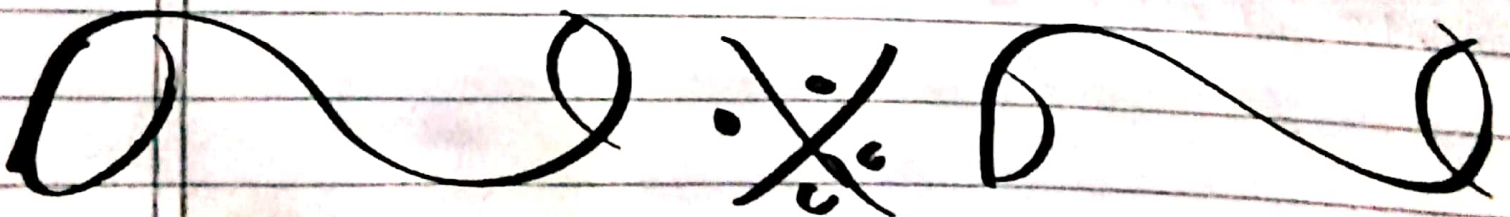
Subject :- Engineering
Mechanics.

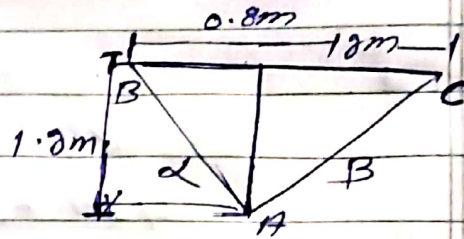
Reg. No :- 091-19-116068.

Department:- BS-(Civil).

Submitted to :- Sir

Majid Naeem.



QUESTION NO 1:-ANSWER NO 1:-GIVEN DATA:-

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

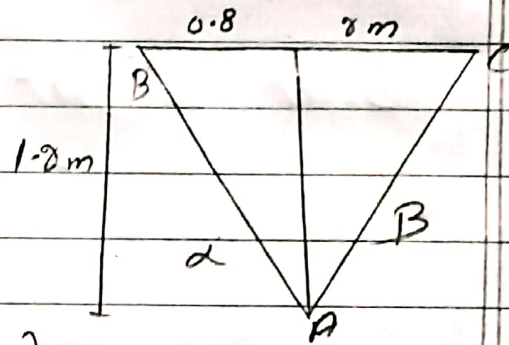
increase of volume $\Rightarrow \eta_{AB} = 15\%$

increase of volume = $\eta_{AC} = 35\%$

Required:-

$$AB = ?$$

$$AC = ?$$

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:

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

PART a:-

$$T_{AB} = T_{AB} \eta_{AB} = 0.15 \times (181.48)(9.8) \left[\cos 56.3^\circ + \sin 56.3^\circ \right]$$

$$= 867.047 \{ -0.55i + 0.831j \}$$

$$T_{AB} = -146.87i + 221j \text{ N.}$$

Now T_{AC} :-

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

$$T_{AB} = -148i + 899j \text{ N.}$$

~~Part b~~

PART b:-

increase weight by 15%

$$400 + 60 = 460 \text{ lb}$$

increase volume by 35%

$$3000 + 1050 = 4050 \text{ or } 8988.7 \text{ lb.}$$

$$\text{Total weight} = 8988.7 + 460$$

$$= 9388.7 \text{ or } 4258.7 \text{ kg.}$$

Now Find Tention in AB.

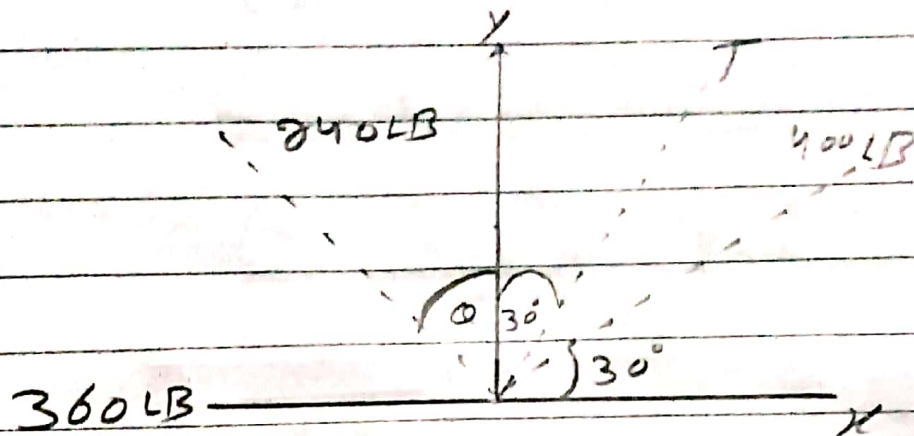
$$T_{AB} = T_{AB} \cos AC = 0.555 (4258.7) (9.8) \\ \left[\cos 35^\circ + \sin 31^\circ \right]$$

$$= 19874i + 11949j \text{ N.}$$

QUESTION NO 2.

ANSWER NO 2.

As we know that force on x-axis is $\sum F_x = 0$.



Solution:-

As we know that force on x-axis is

$$\sum F_x = 0.$$

$$T \sin 30^\circ + 400 \cos 30^\circ - 360 - 240 \sin \theta = 0 \quad \text{--- (i)}$$

$$\sum F_y = 600.$$

$$T \cos 30^\circ + 400 \sin 30^\circ + 240 \cos \theta = 600 \quad \text{--- (ii)}$$

Numerical Solution of Eq (i) & (ii)

$$\theta = 21.7^\circ, \quad T = 204 \text{ lb}$$

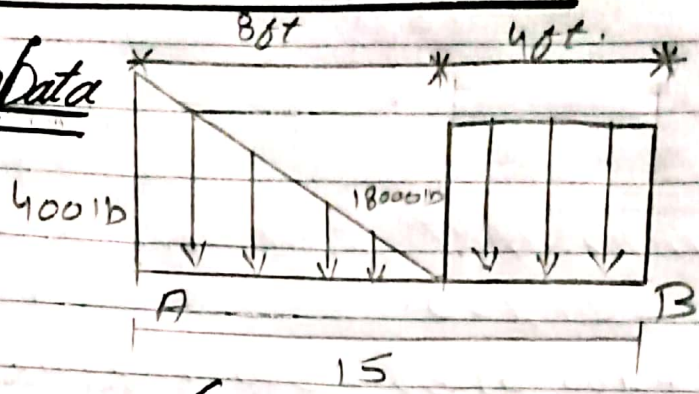
ANSWER:-

$$\left\{ \theta = 21.7^\circ, \quad T = 204 \text{ lb} \right\}.$$

QUESTION No 3.

ANSWER NO 3.

Given data



Required:-

$A_y = ?$
 $B_y = ?$

Solution:-

$400 \text{ lb/ft} \times 8 \text{ ft} = 3200 \text{ lb}$
 $300 \text{ lb/ft} \times 4 \text{ ft} = 1200 \text{ lb}$

$\Rightarrow 500 \text{ kg} = 1102.31 \text{ lb}$

From $\sum F_x = 0$ $A_x = 0$

$\sum M_A = 0$

$3200 - 1800(7.5) - 1200(12) - 1102.31(15)$
 $+ B_y(15) = 0$

$B_y = 14348.3143 / 15$

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$$B_y = 11952$$

$$\underline{\underline{\Sigma F_y = 0}}$$

$$A_y - 3000 - 1800 - 1800 - 1102 \cdot 31 + 11952 = 0$$

$$A_y = 11550.31$$

ANSWER:-

$$\{ B_y = 11952 \cdot A_y = 11550.31 \}$$