AFAQ HUSSAIN ID; 16269
2nd semester Sec B · CED

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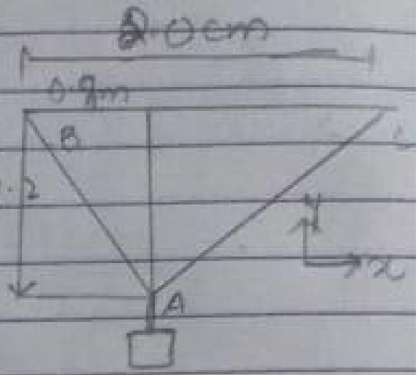
(1)

Engineering Mechanics :-

Q(1)
PART -(A)

Given Data :-



m = 400 lbs
v = 3000 litres
increase of volume
$\angle AB$ = 15%
increase of volume = $\angle AC$ = 35%

Required :-

Amount of tension is present if body at statically equilibra.

AB = ?
BC = ?

Solution :-

First all finding angle "θ" of wires.

$$\alpha = \tan^{-1}\left(\frac{\text{opposite side}}{\text{Adjacent side}}\right)$$

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

$$\alpha = 56.3^\circ$$

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(2)

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

$\beta = 30.9^{\circ}$

As we know that the body statically at equilibrium

(1) $T_{AB} = T_{AB}\lambda_{AB}$

First of All change weight from pounds to kilogram.

$m = 400\,lbs = 400/2.204 = 181.48\,kg$

$T_{AB} = T_{AB}\lambda_{AB}$

$\%\,(\text{weight})(-\cos\theta\hat{i} + \sin\theta\hat{j})$

$0.15\,(181.48\,kg)(9.81)[-\cos 56.3\hat{i} + \sin 56.3\hat{j}]$

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

$= -146i + 221j$

(2)

$T_{AC} = T_{AC}\lambda_{AC}$

$\%\,(\text{weight})(g)(-\cos\theta\hat{i} + \sin\theta\hat{j})$

$0.35\,(181.48)(9.81)(-\cos 56.3\hat{i} + \sin 56.3\hat{j})$

$= 623.117\,(-0.55\hat{i} + 0.83\hat{j})$

$\Rightarrow -534i + 320j$

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

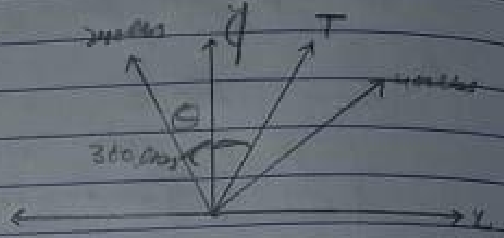
$T_{AC} = -534\hat{i} + 320\hat{j}\,N$

PART (B) "If the water tank increase than weight 10% while stability is not Doubt

Q2:- (3)

Given Data :-

E_N at yaxis = 600 lbs



REQUIRED :-

$T = ?$

$\theta = ?$

Solution :-

We know that

(1) $\Sigma F_x = 0$

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

(2) $\Sigma F_y = 0$

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

(1) $-240 \sin\theta + T \sin 30 + 400 \cos\theta = 360$

$-240 \sin\theta + (0.5)T + 346.4 = 360$

$-240 \sin\theta + (0.5)T = 360 - 346.4$

$-240 \sin\theta + 0.5T = + 3.6$ — (i)

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

$240\cos\theta + (0.866)T + 400(0.5) = 600$

$240\cos\theta + (0.866)T + 200 = 600$

$240\cos\theta + (0.866)T = 600 - 200$

$240\cos\theta + (0.866)T = 400$ — (ii)

$-240\sin\theta + (0.5)T = 13.6$ — (i)

$240\cos\theta + (0.866)T = 400$ — (ii)

From solution of eq (i) & (ii) we get "θ"

$\theta = 21.7^\circ$

put θ value in eq (i)

$-240\sin(21.7) + (0.5)T = 13.6$

$-88.7 + (0.5)T = 13.6$

$(0.5)T = 13.6 + 88.7$

$\frac{(0.5)T}{0.5} = \frac{102.3}{0.5}$

$T = 102.3/0.5$

$T = 204.6$

So $\boxed{\theta = 21.7^\circ \quad T = 204.6}$

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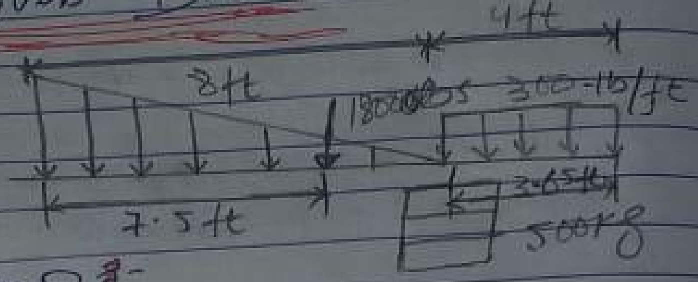
Q3 Given Data :



REQUIRED :-

Reactions of supports = ?

solution :

UDL is convert into point load

300 × 4 = 1200-lb

at point = ½ × 4 = 2' from point (B)

UVL = ½ × 400 × 8 = 1600-lb

at distance = ⅓ × 8 = 2.66 from (A)

convert load kg to pounds

500 × 2.204 = 1102.31-lb

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Now $\Sigma A x = 0$

$= 1600 \times 2.66 - 1800 \times 7.5 - 1200 \times 10 - 1102.31 \times By \times 12$

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

$= -160460.12 + By\ 12$

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

$By = 13371.68\ lb$

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

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

$Ay = 8530.31\ lb$

load of $Ay = 8530.31\ lb$

load $By = 13371.89\ lb$

for converting into kg

$\boxed{lb/2.204 = kg}$