

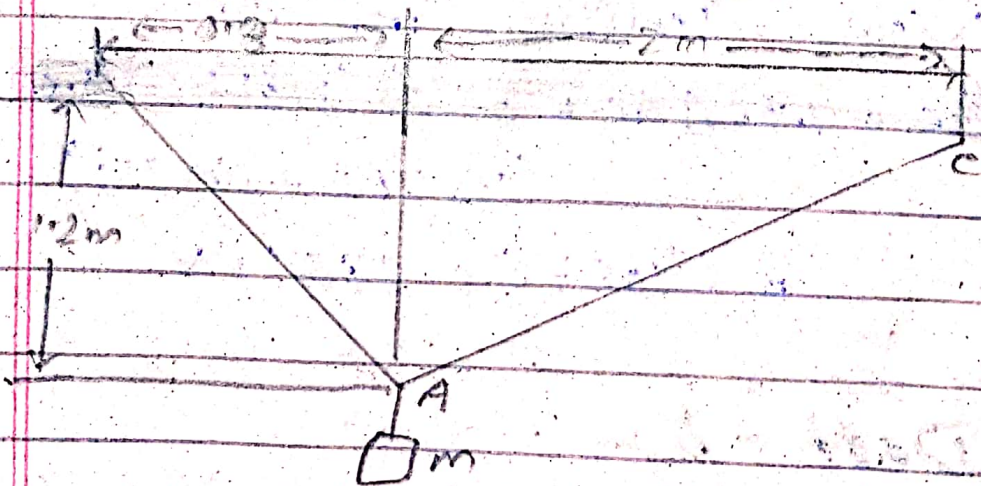
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NAME = Osama Zeb  
ID = 15139  
Section = 'A'  
Department = BE (C)  
Paper = Engineering mechanics  
Submitted To = M. Naeem Sir.

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QUESTION NO 02:

Solution:



$$\alpha = \tan^{-1} \left( \frac{1.2}{0.8} \right) = 56.3$$

$$\beta = \tan^{-1} \left( \frac{1.2}{2} \right) = 31.8$$

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$$\begin{aligned} \text{Total mass} &= 400 + 6613.9 \\ &= 713.916 \text{ or } 3181.45 \text{ kg} \end{aligned}$$

The total weight is being held by cable AB is 85.8%.

Part - (a):

Tension in AB

$$\begin{aligned} T_{AB} = T_{AB} \Delta AB &= 0.8 \cdot 58(3181.45)(9.81) \\ &\quad \{ \cos 56.31i + \sin 56.31j \} \end{aligned}$$

$$= 14857i + 22278j \text{ N}$$

Now Tension in AC

$$\begin{aligned} T_{AC} = T_{AC} \Delta AC &= 0.553(3181.45)(9.81) \\ &\quad \{ \cos 31i + \sin 31j \} \end{aligned}$$

$$= 14857i + 8921j \text{ N}$$

Part - b:

increase weight by 15%

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

increasing volume by 35%

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$$3000 + 1050 = 4050i \text{ or } 8928.716$$

$$\text{Total weight} = 8928.7 + 450$$

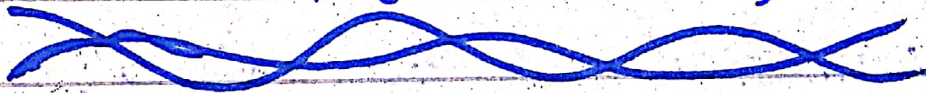
$$= 9388.716 \text{ or } 4258.7 \text{ kg}$$

Tension in AB

$$T_{AB} = T_{AB} \sin \theta = 0.555 (4258.7) (9.8)$$

$$\{ (\cos 35.0 + \sin 35) \}$$

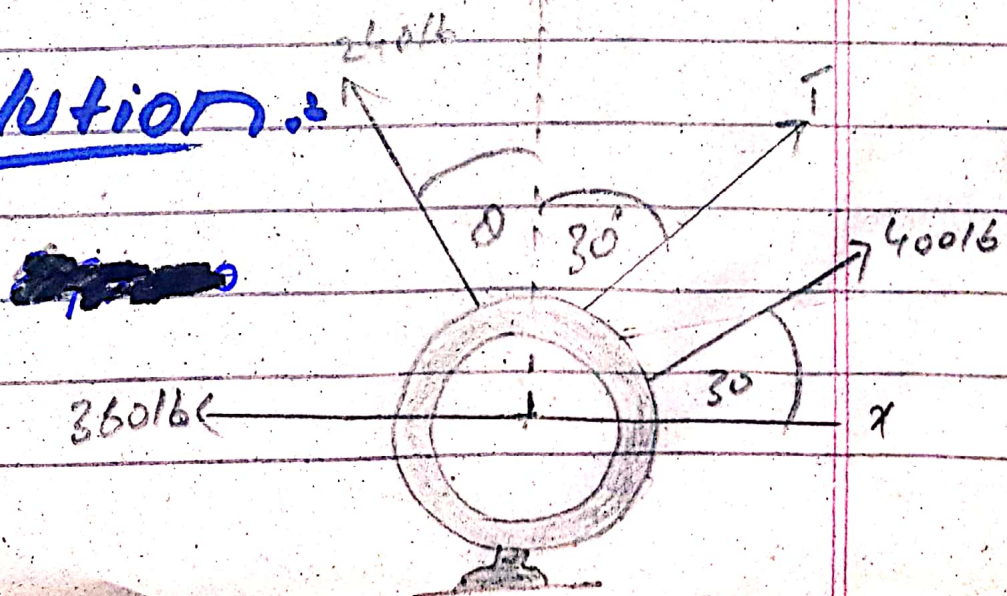
$$= 19874i + 11942j \text{ N}$$



## QUESTION NO 02.

Required =  $Q = ?$   
 $T = ?$

Solution:



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$$\sum F_x = 0$$

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

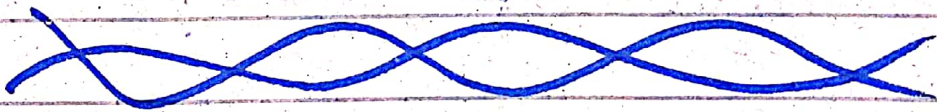
$$\sum F_y = 600$$

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

Numerical solution of (1) & (2)

$$Q = 21.7$$

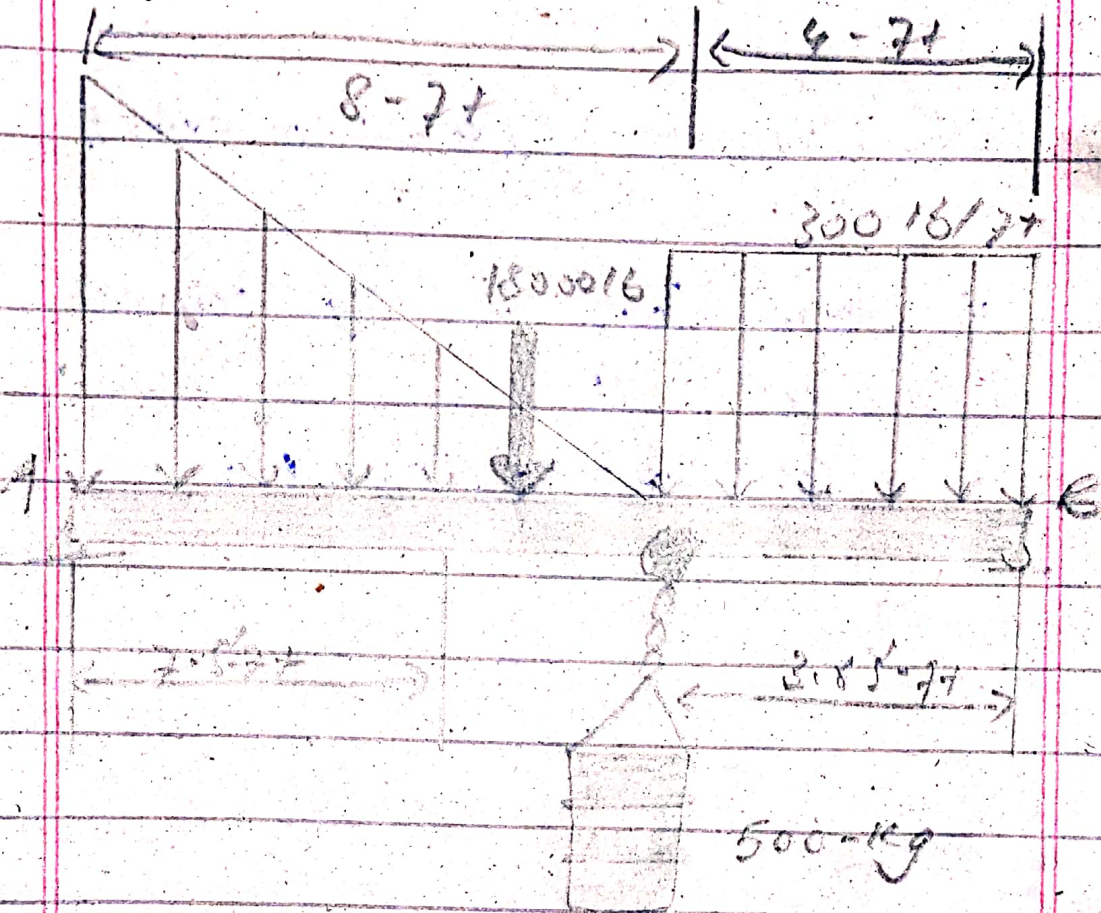
$$T = 204.16$$



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QUESTION NO 03:-

Given data:



Required:

$$A_y = ?$$

$$B_y = ?$$

Solution:

$\Rightarrow$  UDL = convert to point load

$$300 \times 4 = 1200 \text{ N}$$

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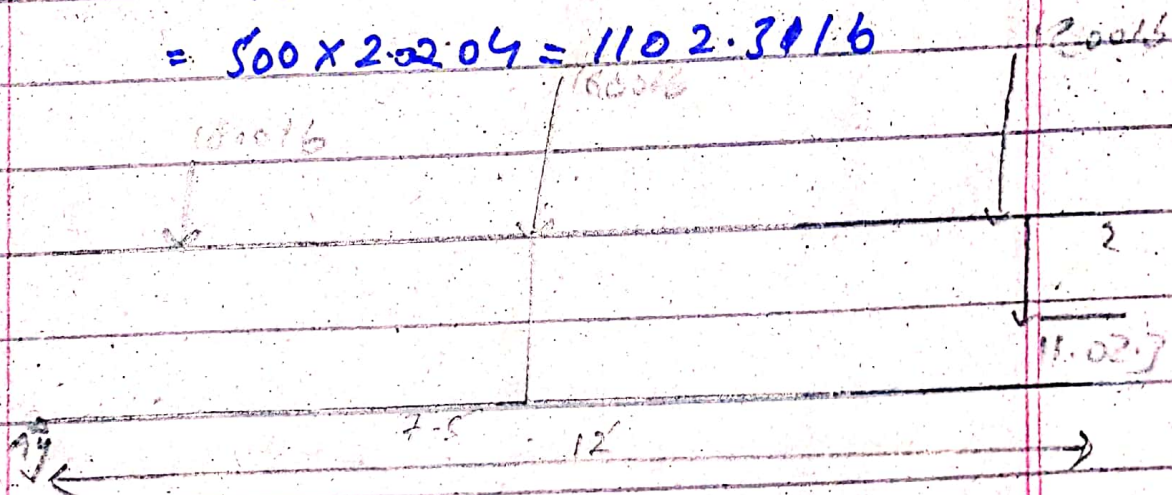
At point  $= \frac{1}{2} \times 4 = 2$  from B

$$\Rightarrow UUL = \frac{1}{2} \times 400 \times 8 = 1600 \text{ lb}$$

At distance  $= \frac{1}{3} \times 8 = 2.67$  from A

$\Rightarrow$  one load in kg convert  
to lb

$$= 500 \times 2.204 = 1102.31 \text{ lb}$$



$$A_x = 0$$

$$A_y = 0$$

$$\{ M_A = -1600 \times 2.67 - 1800 \times 7.5 - 1200$$
$$\times 10 - 1102.31 \times 8.25 + B_y \times 12$$

$$= -4256 - 13500 - 12000 - 9204.28$$
$$+ B_y \times 12$$

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$$= -160460 \cdot 12 \cdot R_{By} \times 12$$

$$B_y = \frac{160460 \cdot 12}{12}$$

$$B_y = 13371.6916$$

$$A_y = \{ \text{Total load by} \}$$

$$A_y = 1200 + 1102 \cdot 31 + 18000 - 16000$$
$$13371.69$$

$$A_y = 8530.3116$$

$$\boxed{A_y = 8530.3116}$$
$$B_y = 13371.69 \quad \uparrow S.$$

