engineering mechanics

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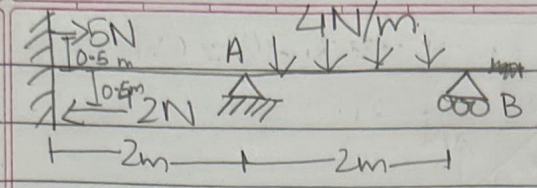
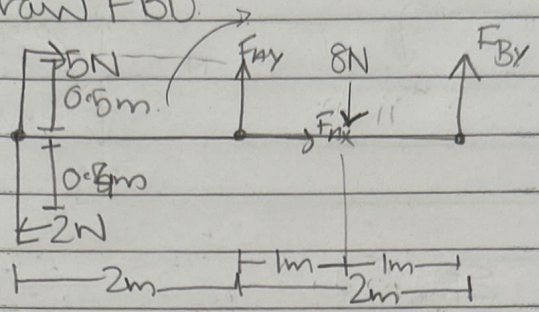


Find reactions at A & B.

Step 1: Draw FBD



Step 2: Write equation

$$\Sigma F_y = 0$$

$$\Sigma F_y \Rightarrow +F_{Ay} - 8N + F_{By} = 0$$

↑up ↓down ↑up

$$\Sigma F_x = 0$$

$$\Sigma F_x \Rightarrow +5 - 2 + F_{Ax} = 0$$

$$F_{Ax} = 2 - 5$$

$$= -3N \quad (-\text{ve sign} \rightarrow \text{opposite direction})$$

$$\Sigma M_A = 0 \quad \curvearrowright + (\text{clockwise as +ve})$$

$$0 + (8 \times 1) - (F_{By} \times 2) + (5 \times 0.5) + (2 \times 0.8)$$

(force)(dist) (force)(dist) (force)(dist)

$$8 - 2F_{By} + 2.5 + 0.8 = 0$$

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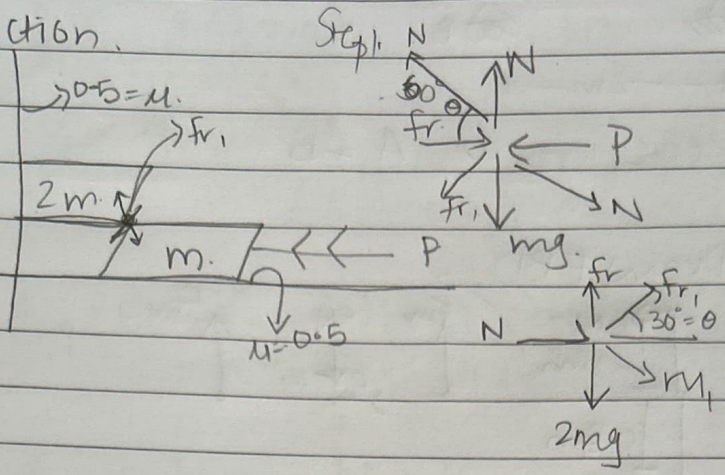
* friction.

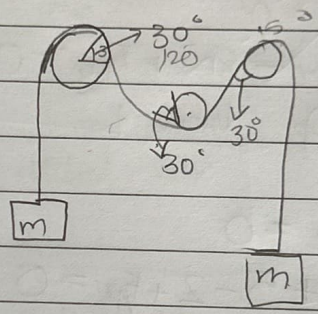


Step2 $\Sigma F_x = 0$

$\Sigma F_y = 0$

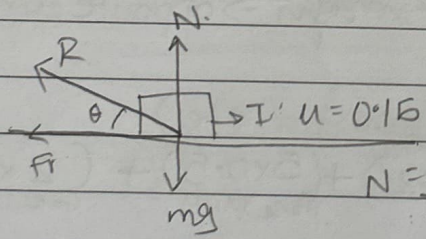
* Belt friction

$$\frac{T_T}{T_L} = e^{\mu\beta}$$



$$120 \times \frac{\pi}{180} = \beta$$

*

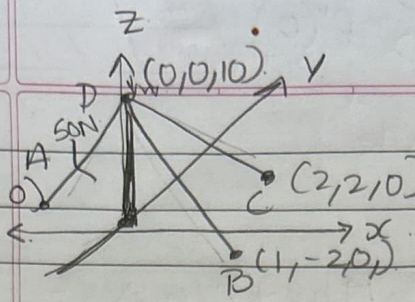


$N = \frac{fr}{\mu}$ $\quad fr = \mu N$

$R = 15°$

$\tan\theta = \frac{N}{fr} = \frac{N}{\mu N}$

$\tan 15 = \frac{1}{\mu}$



Q. a tower is attach w 3 strings & h=10

Space Force

$$F_{DA} = 50 \times \left[\frac{(-1-0)i + (1-0)j + (0-10)k}{x_2-x_1 \quad y_2-y_1 \quad z_2-z_1}\right]$$

$$F = F_1 \left(\frac{(x_2-x_1)i + (y_2-y_1)j + (z_2-z_1)k}{\sqrt{(x_2-x_1)^2+(y_2-y_1)^2+(z_2-z_1)^2}}\right)$$

$$F_{DA} = \frac{5 \times (-1i + j - 10k)}{\sqrt{1^2+1^2+10^2}}$$

$$F_{DB} = \frac{T_B(2i - 2j + 10k)}{\sqrt{8}}$$

$$F_{DC} = \frac{T_C(2i + 2j - 10k)}{\sqrt{2^2+2^2+10^2}}$$

$$= \frac{T_C(2i + 2j - 10k)}{\sqrt{108}}$$

B.

$$W = -10k$$

$$\Sigma F_x = 0$$

$$0 = \frac{-5i}{\sqrt{2}} + \frac{T_B 2i}{\sqrt{8}} + \frac{T_C}{\sqrt{108}} + 0$$

$$\Sigma F_y = 0$$

$$= \frac{5j}{\sqrt{2}} - \frac{T_B 2j}{\sqrt{8}} + \frac{T_C 2}{\sqrt{108}} + 0$$