

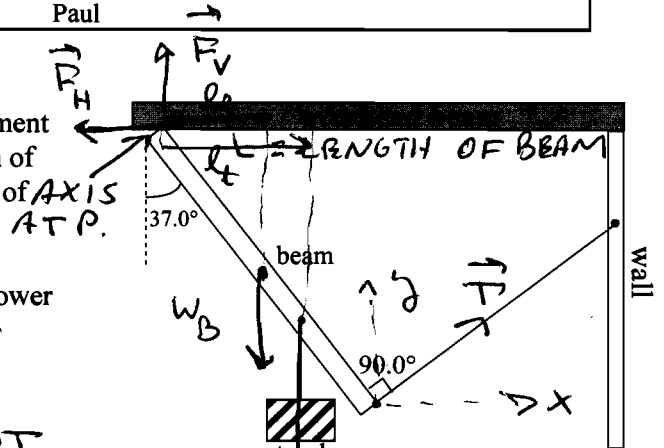
**EXAM 4**

Name: \_\_\_\_\_

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A  $2.20 \times 10^3 \text{ N}$  uniform beam is attached to an overhead beam as shown in the drawing. A  $3.60 \times 10^3 \text{ N}$  trunk hangs from an attachment to the beam two-thirds of the way down from the upper connection of the beam to the overhead support. A cable is tied to the lower end of the beam and is also attached to the wall on the right.



A. [20 pts.] What is the tension in the cable connecting the lower end of the beam to the wall? USE ROT. EQUIL.

$$\begin{aligned} \sum \tau_{\text{NET}} &= \sum \tau_i = 0 \\ &= \tau_{F_V} + \tau_{F_H} + \tau_{W_B} + \tau_{W_t} + \tau_T \\ &= 0 + 0 - W_B l_B - W_t l_t + T l_T \\ 0 &= -(2.2 \times 10^3 \text{ N}) \left( \frac{L}{2} \sin 37^\circ \right) - (3.6 \times 10^3 \text{ N}) \left( \frac{2L}{3} \sin 37^\circ \right) + T L \end{aligned}$$

NOTE:  
 $l_t = L$   
 $l_B = \frac{2}{3} L \sin 37^\circ$   
 $l_t = \frac{L}{2} \sin 37^\circ$

$$T = \frac{(2.2 \times 10^3 \text{ N})(.3) + (3.6 \times 10^3 \text{ N})(.4)}{1}$$

$$T = 2100 \text{ N}$$

B. [15 pts.] What are the vertical and horizontal components of the force the overhead beam exerts on the upper end of the beam at P? USE TRANSLATIONAL EQUILIBRIUM

$$\sum F_x = 0 = T \cos 37^\circ - F_H$$

$$F_H = (2100 \text{ N})(.8)$$

$$F_H = 1680 \text{ N}$$

NOTE: "+" IN MY CS

$$\sum F_y = 0 = F_V + T \sin 37^\circ - W_B - W_t$$

$$F_V = 2.2 \times 10^3 \text{ N} + 3.6 \times 10^3 \text{ N} - (2100 \text{ N})(.6)$$

$$F_V = 4540 \text{ N}$$

NOTE: "-" IN MY CS