

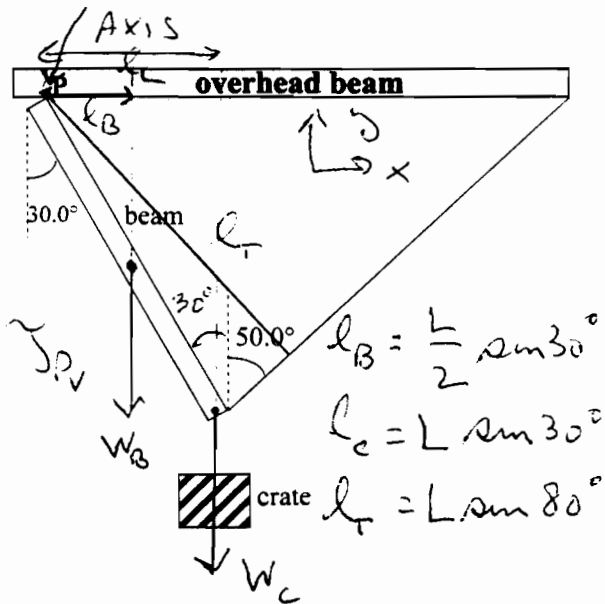
EXAM 3

Name: _____

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TA (circle one): Aaron Eric Farid Heather Mark

A 1.20×10^3 N uniform beam is attached to an overhead beam as shown. A 2.00×10^3 N crate hangs from the end of the beam. The bottom of the beam is supported by a cable attached to the right end of the overhead beam.
 LET $L =$ LENGTH OF BEAM



A. [20 pts.] What is the tension in the cable attached to the overhead beam? (Note: You do not need to know the length of the beam.) USE ROT. EQUIL.

$$\sum \tau_i = 0 = \tau_{W_B} + \tau_{W_C} + \tau_T + \tau_{P_H} + \tau_{P_V}$$

$$0 = -W_B l_B - W_C l_C + T l_T$$

$$= -(1200N) \left(\frac{L}{2} \sin 30^\circ\right) - (2000N)(L \sin 30^\circ) + T(L \sin 80^\circ)$$

$$l_B = \frac{L}{2} \sin 30^\circ$$

$$l_C = L \sin 30^\circ$$

$$l_T = L \sin 80^\circ$$

$$T = \frac{(1600N)(.5) + (2000N)(.5)}{\sin 80^\circ}$$

$$T = 1320 \text{ N}$$

B. [16 pts.] What are the vertical and horizontal components of the force the overhead beam exerts on the hanging beam at point P? (See figure.) USE TRANSLATIONAL EQUIL.

$$\sum F_x = 0 = -P_H + T \sin 50^\circ$$

$$P_H = T \sin 50^\circ = (1320N)(\sin 50^\circ)$$

$$P_H = 1010 \text{ N}$$

$$\sum F_y = 0 = P_V + T \cos 50^\circ - W_B - W_C$$

$$P_V = W_B + W_C - T \cos 50^\circ = 3200N - (1320N) \cos 50^\circ$$

$$P_V = 2350 \text{ N}$$