QUIZ#11- CHAPTER 12
DATE: 18/11/19

Name: Key Id#: Sect.#:

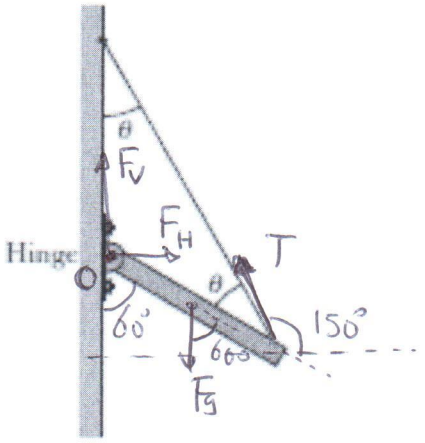
In the figure, one end of a uniform beam of weight 222 N is hinged to a wall; the other end is supported by a wire that makes angles θ = 30.0° with both wall and beam. Find

(a) the tension in the wire.

$$\tau_o = -\frac{L}{2} F_g \sin 60^\circ + L T \sin 150^\circ = 0$$

$$T = \frac{\frac{1}{2} F_g \sin 60^\circ}{\sin 150^\circ} = \frac{96.1}{0.5}$$

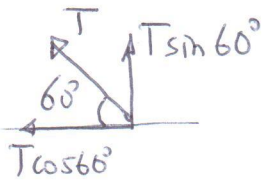
$$\boxed{T = 192\ \text{N}}$$



(b) the magnitude and direction of the force of the hinge on the beam.

x-axis: $-T\cos 60^\circ + F_H = 0$

$$F_H = \boxed{96\ \text{N}}$$



Y-axis: $F_V + T\sin 60^\circ - F_g = 0$

$$F_V = F_g - T\sin 60^\circ = \boxed{55.7\ \text{N}}$$

magnitude $\boxed{F_{hinge} = 111\ \text{N}}$

direction $\theta = \tan^{-1}\left(\frac{55.7}{96}\right) = \boxed{30^\circ}$

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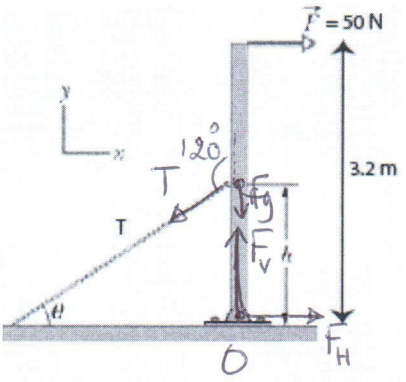
The figure shows a uniform beam with a weight of 60.0 *N* and length of 3.20 *m* is hinged at its lower end and a horizontal force F of magnitude 50.0 *N* acts at its upper end. The beam is held vertical by a cable that makes an angle θ = 30.0° with the ground and is attached to the beam at a height *h* = 1.60 *m*.
Calculate:

(a) The tension (T) in the cable is.



$$\tau_O = hT\sin 120^\circ - F\ell\sin 90^\circ = 0$$

$$T = \frac{F\ell\sin 90^\circ}{h\sin 120^\circ} = \boxed{115.5\,N}$$

(b) The magnitude and direction of the force of the hinge on the beam.

X-axis: $F_H + F - T\cos 30^\circ = 0$

$$F_H = T\cos 30^\circ - F = \boxed{50\,N}$$

Y-axis: $F_V - mg - T\sin 30^\circ = 0$

$$F_V = F_g + T\sin 30^\circ = \boxed{117.8\,N}$$

$$F_{hinge} = \boxed{128\,N}$$

$$\theta = \tan^{-1}\left(\frac{117.8}{50}\right) = \boxed{67^\circ}$$

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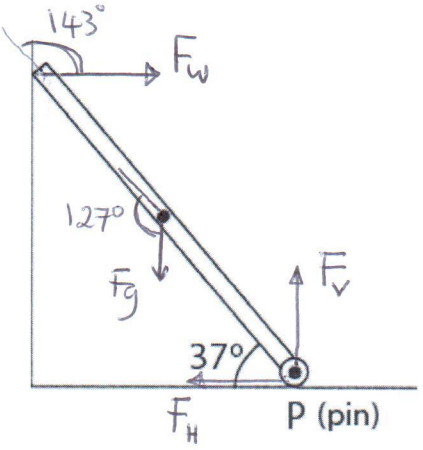
A uniform beam having a mass of 60 kg and a length of 2.8 m is held in place at its lower end by a pin (P). Its upper end leans against a vertical frictionless wall as shown in the figure.

(a) Calculate the force on the beam from the wall.

$$\tau_P = mg\frac{L}{2}\sin 127^\circ - F_W L \sin 143^\circ = 0$$

$$F_W = \frac{\frac{mg}{2}\sin 127^\circ}{\sin 143^\circ} = \frac{234.8}{0.602}$$

$$\boxed{F_W = 390\,N}$$



(b) Calculate the force of the hinge on the beam. (magnitude & direction)

x-axis: $F_W - F_H = 0 \Rightarrow F_H = F_W = 390\,N$

Y-axis: $F_V - F_g = 0 \Rightarrow F_V = F_g = 588\,N$

$$\vec{F}_{Hinge} = -390\hat{i} + 588\hat{j}\ N$$

magnitude = $\boxed{706\,N}$

direction: $\theta = \tan^{-1}\left(\frac{588}{-390}\right) = \boxed{-56^\circ}$