Answer on Question #74175-Physics-Mechanics-Relativity

A uniform rod AB is of length l and weight 2W. It can turn freely about a smooth hinge at its upper end A. The rod is held in equilibrium by means of a horizontal force P applied at B, which is at a distance a from the vertical line through A. Find the value of P and show that the reaction at the hinge is W [(4l^2-3a^2)/(l^2-a^2)] ^1/2

Solution

$$P = T\sin\alpha = T\frac{a}{l}$$

$$W = T\cos\alpha = T\frac{\sqrt{l^2 - a^2}}{l}$$

Thus,

$$P = W\frac{a}{\sqrt{l^2 - a^2}}$$

The reaction at the hinge is

$$T = \frac{W}{\cos\alpha} = W\frac{l}{\sqrt{l^2 - a^2}}$$