



A uniform rod AB of length $3a$ and weight W is freely hinged to a fixed point at the end A . The end B is below the level of A and is attached to one end of a light elastic string of natural length $4a$. The other end of the string is attached to a point O on a vertical wall. The horizontal distance between A and the wall is $5a$. The string and the rod make angles θ and 2θ respectively with the horizontal (see diagram). The system is in equilibrium with the rod and the string in the same vertical plane. It is given that $\sin \theta = \frac{3}{5}$ and you may use the fact that $\cos 2\theta = \frac{7}{25}$.

- (i) Find the tension in the string in terms of W . [3]
- (ii) Find the modulus of elasticity of the string in terms of W . [4]
- (iii) Find the angle that the force acting on the rod at A makes with the horizontal. [3]