2.

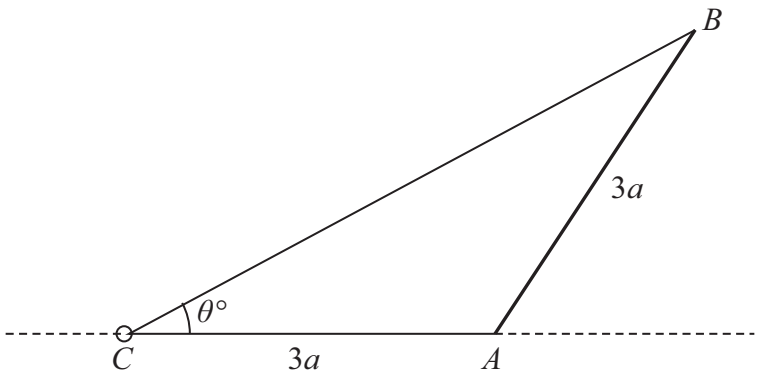


Figure 1

Figure 1 shows a uniform rod AB of mass M and length $3a$.
The rod is smoothly hinged at A to a fixed point so that the rod can rotate in a vertical plane.

A small smooth ring is fixed at point C, a distance $3a$ from A, on the same horizontal level as A and in the same vertical plane as AB.

One end of a light elastic string is attached to A. The string passes through the ring at C and the other end of the string is attached to B.

The rod rests in equilibrium with angle $BCA = \theta°$, where $0 < \theta < 45$

(a) Show that the tension in the string is $\dfrac{Mg\cos(2\theta°)}{2\sin\theta°}$

(3)

Given that the string has natural length $3a$ and modulus of elasticity $\dfrac{2}{5}Mg$,

(b) show that $\tan(2\theta°) = \dfrac{5}{4}$

(4)

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Question 2 continued

(Total for Question 2 is 7 marks)