6.

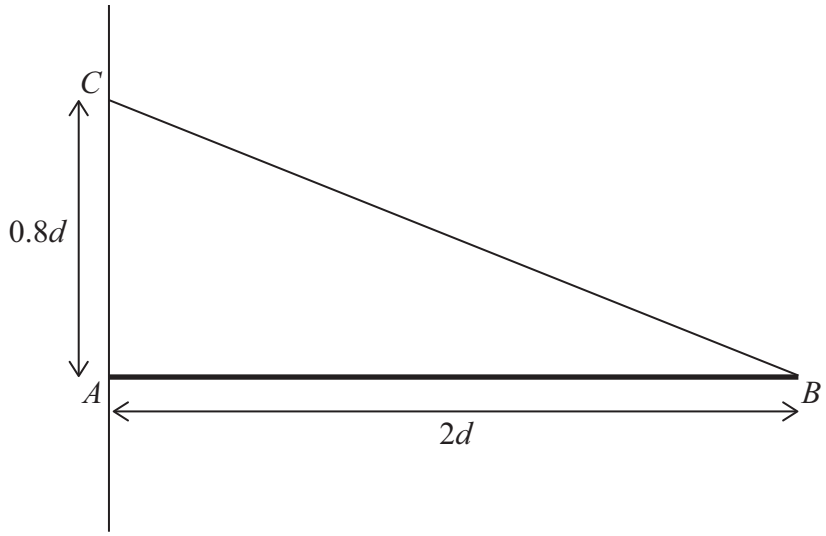


Figure 2

A uniform rod AB has mass m and length $2d$.

The rod is held in equilibrium in a horizontal position, with the end A against a rough vertical wall, by a light inextensible string.

One end of the string is attached to the rod at B.

The other end of the string is attached to the wall at the point C, where $AC = 0.8d$ and C is vertically above A, as shown in Figure 2.

A particle of mass km is attached at B and the rod AB remains in equilibrium in a horizontal position.

The particle, rod and string are in a vertical plane perpendicular to the wall.

(a) Show that the tension in the string is

$$\frac{mg\sqrt{29}}{4}(2k+1)$$

(4)

The resultant force acting on the rod at A makes an angle θ with the horizontal.

(b) Given that $\tan\theta = \frac{1}{8}$, find the exact value of k.

(6)

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Question 6 continued

(Total for Question 6 is 10 marks)