Circular motion – AS Further Mathematics Mechanics

1. June/2022/Paper_7366/02/No.8

A particle, of mass 3 kg, is attached to one end of an elastic string.

The particle is placed on a smooth horizontal table.

The other end of the string is attached to a fixed point O on the horizontal table.

The elastic string has natural length 1 metre and modulus of elasticity 200 N

The particle is set in motion so that it moves in a horizontal circle, centre O, with a constant speed of $4\,\mathrm{ms^{-1}}$, as shown in the diagram below.
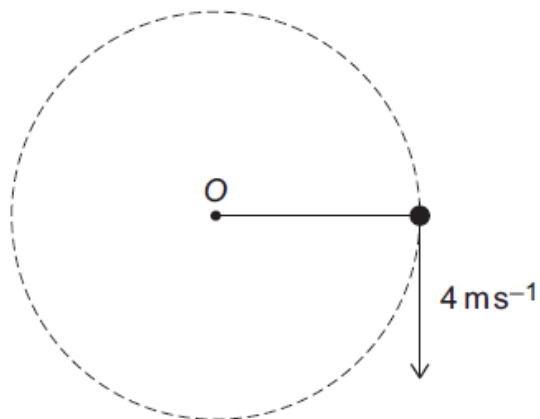
Throughout the motion, the extension of the string is x metres and the tension is T newtons.

(a)   Show that $T = 200x$

[1 mark]

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(b) By considering the circular motion of the particle, show that

$$25x^2 + 25x - 6 = 0$$

[4 marks]

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(c) Hence deduce the radius of the circle.

[2 marks]

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(d) Describe one limitation of the model that you have used.

[1 mark]

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