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4. A light elastic string has modulus of elasticity $2mg$ and natural length l. One end of the string is fixed to a point A on a rough plane inclined to the horizontal at angle α, where $\sin\alpha = \frac{3}{5}$. A particle, P, of mass m is attached to the other end of the string. Initially P is held at rest on the plane at the point B, where B is above A and $AB = \frac{1}{2}l$. The string lies along a line of greatest slope of the plane.

The particle P is released from rest and moves down the plane along the line of greatest slope. The coefficient of friction between P and the plane is μ, where $\mu < \tan\alpha$.

Given that P comes to instantaneous rest at the point C, where $AC = l + e$,

(a) show that

$$\mu = \frac{9l^2 + 6le - 10e^2}{4l(3l + 2e)}$$

(6)

Given that $e = l$

(b) find the magnitude of the instantaneous change in the acceleration of P at C.

(5)

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