One end of a light elastic string of natural length 0.4 m and modulus of elasticity 8 N is attached to a fixed point O on a smooth horizontal plane. The other end of the string is attached to a particle P of mass 0.2 kg which moves on the plane in a circular path with centre O. The speed of P is $v\,\mathrm{m\,s^{-1}}$ and the extension of the string is x m.

(i) Given that $v = 2.5$, find x. [4]

It is given instead that the kinetic energy of P is twice the elastic potential energy stored in the string.

(ii) Form two simultaneous equations and hence find x and v. [5]