7 A particle P of mass m kg moving along a rough horizontal table has displacement x m from a fixed point O on the table and velocity $v\,\mathrm{m\,s^{-1}}$ at time t s. The particle P is subject to a resistive force of magnitude $mgkv$ N, where k is a positive constant, and a frictional force of magnitude μmg. The particle P is initially at O with speed $U\,\mathrm{m\,s^{-1}}$.

(a) Show that $t = \dfrac{1}{gk}\ln\left(\dfrac{kU+\mu}{kv+\mu}\right)$. [4]

It is given that $U = 10$, $k = 0.04$ and $\mu = 0.2$.

(b) Find the distance P moves before coming to rest. [4]

(c) Find the average speed of P over the period it is moving. [2]

Additional page

If you use the following page to complete the answer to any question, the question number must be clearly shown.