Homework 18

1) An object of mass 3kg is acted on by a force $(3\mathbf{i}+5\,\mathbf{j})$ newtons for 6 seconds.

   The object starts from rest.

   Determine the velocity of the object after 6 seconds. **3**

2) A machine of mass 7kg is placed at rest on a rough slope which is inclined at an angle of 10° to the horizontal.

   The machine has an engine which produces a power of 50 watts and drives the machine up the slope. The coefficient of friction between the slope and the machine is $0{\cdot}1$.

   a) Calculate the acceleration of the machine at the instant when the speed is 2ms^{-1}. **2**

   On reaching a speed of 2ms^{-1} the machine reduces power so as to maintain this speed.

   b) Determine the new power of the machine. **2**

3) A ball of mass $0{\cdot}4\,\text{kg}$ is dropped from a height of 3 metres. Each time it hits the ground it loses 25% of its energy and it bounces back up.

   What height will the object reach after its second bounce? **3**

4) A car goes around a track which is banked at an angle of 25° to the horizontal. The radius of the track is 200 metres and the coefficient of fraction between the tyres and the road is $0 \cdot 4$.

What is the minimum possible speed the car can take this bend without slipping? **6**

5) An object of mass $0 \cdot 6 \text{kg}$ on the end of a piece of string of length 50 cm is given a push with an initial speed of $3 \cdot 5 \text{ms}^{-1}$.

Determine the speed the mass will be travelling at when the string goes slack?

5

6) A particle executes simple harmonic motion about a point O. One second after passing through O it is 60 cm from O, then one second later it is 40cm from O.

a) Determine the amplitude of the motion. **4**

b) Determine the maximum speed of the particle. **1**