

5.

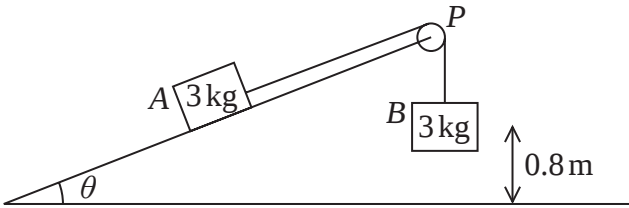


Figure 3

Two packages A and B , each of mass 3 kg , are attached to the ends of a rope.

Initially A is held at rest on a smooth fixed plane that is inclined at angle θ to the horizontal ground, where $\sin \theta = \frac{2}{7}$

The rope passes over a pulley, P , fixed at the top of the plane.

The pulley is modelled as small and smooth.

The part of the string from A to P is parallel to a line of greatest slope of the plane.

Package B hangs freely below P , as shown in Figure 3.

The packages are released from rest with the string taut and A moves up the plane.

In this model, the packages are modelled as particles and the rope as a light inextensible string.

The magnitude of the tension in the string immediately after the packages are released is T newtons.

(a) Find the value of T .

(6)

At the instant when the packages are released from rest, B is 0.8 m above the ground and A is at the point C on the plane.

When B reaches the ground, B is immediately brought to rest by the impact with the ground.

In the subsequent motion, A does not reach P and comes to instantaneous rest at the point D on the plane.

(b) Find the distance CD .

(5)

(c) State two limitations of the model that could affect the reliability of your answers.

(2)