5.4 Homework

A-Level Applied Mathematics : Mechanics : Year 2

Projectiles (Kinematics III)

Any solution based entirely on graphical
or numerical methods is not acceptable

Marks Available : 30

Question 1

The points *A* and *B* lie on level horizontal ground, 24 m apart.

A particle is projected from *A* towards *B*, with a speed of 15 ms^{-1} at an angle of elevation 60° and, at the same time, another particle is projected from *B* towards *A*, at an angle of elevation 30°

The particles collide in mid air.

Determine the speed of the particle projected from *B*, just before impact with the other particle.

[10 marks]

Question 2

A particle is projected from a point O on level horizontal ground at an angle of elevation θ, and continues to move freely under gravity without any air resistance. The particle just clears a vertical wall of height 2 m, which is at a horizontal distance of 4m away from O.

In the subsequent motion the particle just clears the top of a vertical transmitter of height 12 m, which is at a horizontal distance of 36 m away from O.

Calculate the value of θ.

[10 marks]

Question 3

A particle P is projected from a point O on level horizontal ground with speed 26 ms^{-1} at an angle θ to the horizontal.

At the same time, another particle Q is projected horizontally with speed 10 ms^{-1} from a point A, which lies 78.4 m vertically above O.

The motion of both particles takes place in the same vertical plane with both particles moving through still air without any resistance.

The particles hit the ground at the same time at two points which are d m apart.

Calculate the value of d.

[10 marks]