7.

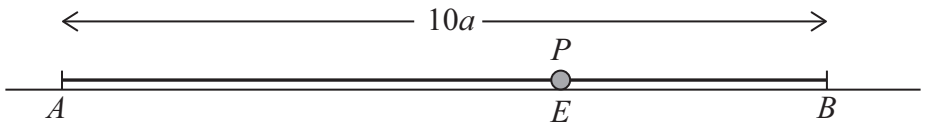


Figure 6

The fixed points A and B lie on a smooth horizontal surface with $AB = 10a$.

A particle P has mass m.

One end of a light elastic string, of natural length $5a$ and modulus of elasticity $\frac{1}{3}mg$,

is attached to P and the other end is attached to A.

One end of another light elastic string, of natural length $3a$ and modulus of elasticity

$\frac{2}{5}mg$, is attached to P and the other end is attached to B.

The particle P is resting in equilibrium at the point E on the surface, as shown in Figure 6.

(a) Show that $EB = \frac{11a}{3}$

(3)

Particle P is now held on the surface at the point C, between A and B, where $CB = 3a$, and released from rest.

(b) Show that P moves with simple harmonic motion about E.

(4)

(c) Show that the simple harmonic motion has period $2\pi\sqrt{\frac{5a}{g}}$

(2)

In any one complete oscillation of the simple harmonic motion, the particle is less than

a distance $\frac{1}{3}a$ from E for a time S.

(d) Find S in terms of π, a and g.

(3)

(Total for Question 7 is 12 marks)

TOTAL FOR PAPER IS 75 MARKS