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1. A particle P moves on the x -axis. At time t seconds, its acceleration is $(5 - 2t) \text{ m s}^{-2}$, measured in the direction of x increasing. When $t = 0$, its velocity is 6 m s^{-1} measured in the direction of x increasing. Find the time when P is instantaneously at rest in the subsequent motion.

(6)

Q1

(Total 6 marks)

3

Turn over



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4.

Figure 1

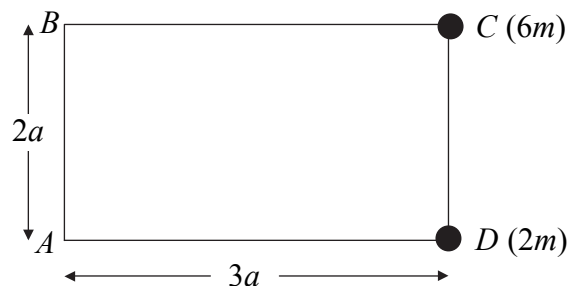


Figure 1 shows four uniform rods joined to form a rigid rectangular framework $ABCD$, where $AB = CD = 2a$, and $BC = AD = 3a$. Each rod has mass m . Particles, of mass $6m$ and $2m$, are attached to the framework at points C and D respectively.

(a) Find the distance of the centre of mass of the loaded framework from

- (i) AB ,
- (ii) AD .

(7)

The loaded framework is freely suspended from B and hangs in equilibrium.

(b) Find the angle which BC makes with the vertical.

(3)



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Question 4 continued

Lined area for writing the answer to Question 4.

Q4

(Total 10 marks)

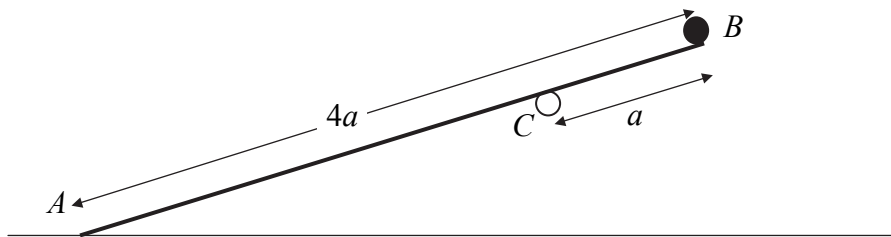
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6.

Figure 2



A wooden plank AB has mass $4m$ and length $4a$. The end A of the plank lies on rough horizontal ground. A small stone of mass m is attached to the plank at B . The plank is resting on a small smooth horizontal peg C , where $BC = a$, as shown in Figure 2. The plank is in equilibrium making an angle α with the horizontal, where $\tan \alpha = \frac{3}{4}$. The coefficient of friction between the plank and the ground is μ . The plank is modelled as a uniform rod lying in a vertical plane perpendicular to the peg, and the stone as a particle. Show that

(a) the reaction of the peg on the plank has magnitude $\frac{16}{5} mg$, (3)

(b) $\mu \geq \frac{48}{61}$. (6)

(c) State how you have used the information that the peg is smooth. (1)



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Question 6 continued

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(Total 10 marks)

Q6

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