7.

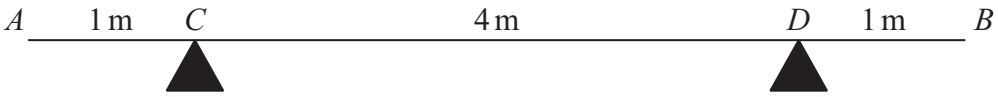

Figure 2

A non-uniform rod AB has length 6 m and mass 8 kg. The rod rests in equilibrium, in a horizontal position, on two smooth supports at C and at D, where $AC = 1$ m and $DB = 1$ m, as shown in Figure 2.

The magnitude of the reaction between the rod and the support at D is twice the magnitude of the reaction between the rod and the support at C.

The centre of mass of the rod is at G, where $AG = x$ m.

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

(6)

The support at C is moved to the point F on the rod, where $AF = 2$ m.

A particle of mass 3 kg is placed on the rod at A. The rod remains horizontal and in equilibrium.

The magnitude of the reaction between the rod and the support at D is k times the magnitude of the reaction between the rod and the support at F.

(b) Find the value of k.

(6)

(Total for Question 7 is 12 marks)