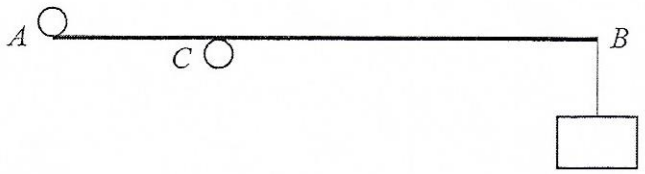
MOMENTS 4

1. The diagram shows a body, of mass 65 kg, attached to the end B of a uniform rigid rod AB of length 4 m. The mass of the rod is 35 kg. The rod is held horizontally in equilibrium by two smooth cylindrical pegs, one at A and another at C, where $AC = 1{\cdot}2$ m.



(a) Write down the moment of the weight of the rod about the point A. State your units clearly. [2]

(b) Find the forces exerted on the rod at A and C. [6]

2.

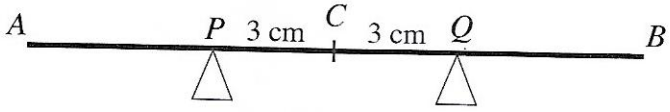
The diagram shows a uniform plank AB, of mass 20 kg and length 2·4 m, supported in horizontal equilibrium by two pivots, one at C and one at D. The distance AC and the distance DB are both 0·5 m. A person of mass 40 kg stands at a point which is 0·6 m from B.

(a) Calculate the magnitudes of the reaction at C and the reaction at D. [7]

(b) The person starts to walk towards A. Determine the greatest distance of the person from B if equilibrium is to be maintained. [3]

3. A light uniform rod AB, of length 3 m, has a particle of mass 2 kg attached to its midpoint and a particle of mass 0·8 kg attached to it at a distance 0·6 m from B. Another particle of mass 1·2 kg is attached to the rod at a distance of 0·5 m from A. Determine the distance of the centre of mass of the particles from B. [4]

4. A uniform rod AB, of length 20 cm and weight 6 N, is supported by two smooth supports at P and Q, one on each side of its centre C, with $PC = CQ = 3$ cm, as shown in the diagram.



A body, of weight 5 N, is placed on the rod at a point which is x cm from the centre C of the rod. Find the greatest value of x if equilibrium is maintained. [5]