5.

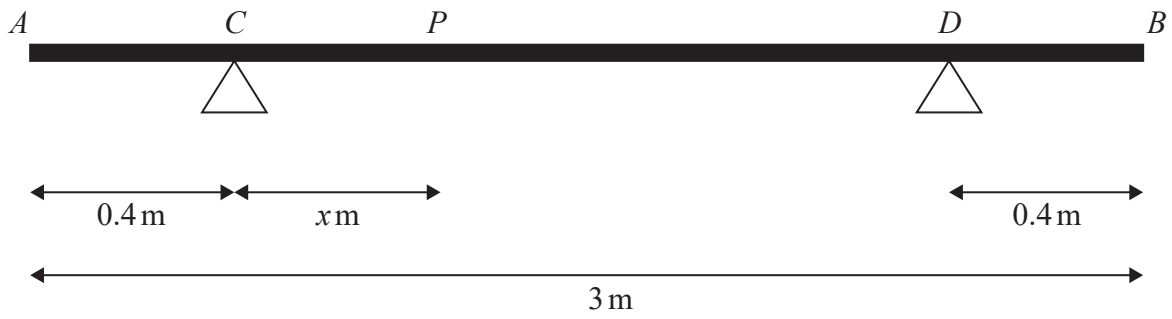

Figure 4

A beam AB has mass 30 kg and length 3 m.

The beam rests on supports at C and D where $AC = 0.4$ m and $DB = 0.4$ m, as shown in Figure 4.

A person of mass 55 kg stands on the beam between C and D.

The person is modelled as a particle at the point P, where $CP = x$ metres and $0 < x < 2.2$

The beam is modelled as a uniform rod resting in equilibrium in a horizontal position.

Using the model,

(a) show that the magnitude of the reaction at C is $(686 - 245x)$ N.

(3)

The magnitude of the reaction at C is **four** times the magnitude of the reaction at D.

Using the model,

(b) find the value of x

(4)

The person steps off the beam and places a package of mass M kg at A.

The package is modelled as a particle at the point A.

The beam is now on the point of tilting about C.

Using the model,

(c) find the value of M

(3)

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Question 5 continued

(Total for Question 5 is 10 marks)