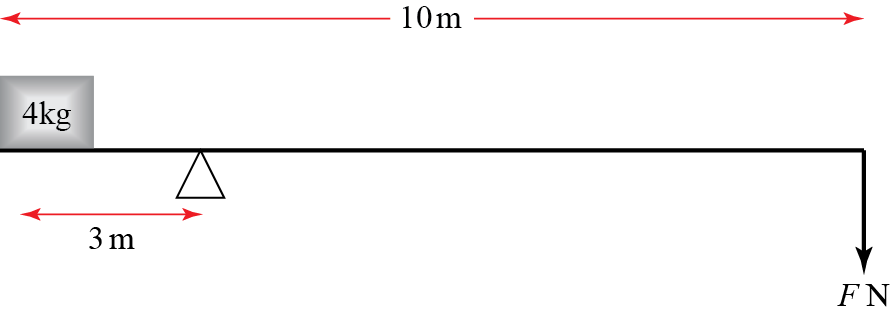
**SECTION B: MECHANICS K**

**Answer ALL questions.**

**4.1** A light see-saw is 10 m long with the pivot 3 m from the left.

**Figure 1**

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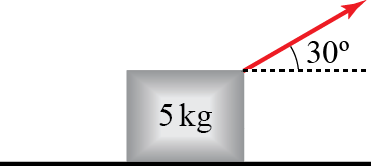
**a** A 4 kg weight is placed on the left-hand end of the see-saw. Write down the anticlockwise moment about the pivot. **(3 marks)**

**b** A force of magnitude *F* N is applied to the right-hand end of the see-saw. The force acts vertically downwards. Write down the clockwise moment about the pivot due to this weight. **(1 mark)**

**c** Find the value of *F* for which the system is in equilibrium. **(3 marks)**

**5.3** An object resting on a rough surface is attached to a rope angled at 30° to the horizontal. The rope is pulled with a force of *P* N. The mass of the object is 5 kg.

**Figure 1**



**a** Draw a diagram showing all the forces acting on the object. Describe the origin of each force using words. **(4 marks)**

**b** By resolving forces in the horizontal and vertical directions, calculate the magnitude of each force in the diagram, giving your answers in terms of *P* where appropriate. **(4 marks)**

**c** If *P* = 20, the object does not slip. Use this information to give a bound on in the form of an inequality. **(6 marks)**

**8.3** A ball falling vertically through viscous fluid is subject to a drag force of magnitude *kv* N, where *v* m s−1 is the speed of the ball at time *t* seconds. The mass of the ball is 1 kg.

**a** Draw a force diagram showing the forces on the ball. **(2 marks)**

**b** Find an expression for *v* when the ball is in equilibrium. **(2 mark)**

**c** Explain why **(3 marks)**

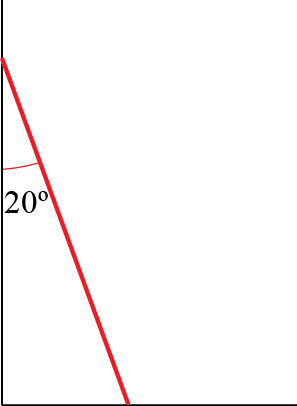
**d** Show, by substitution, that satisfies this equation in part c. **(3 marks)**

**e** Explain why this solution agrees with your answer to part **b**. **(1 mark)**

**f** Describe one limitation of this model. **(1 mark)**

**7.1** A 10 m long, uniform ladder has a mass of 6 kg and makes an angle of 20° with a smooth vertical wall. It stands on a rough horiztonal floor, which has coefficient of friction 0.3 with the bottom of the ladder.

**Figure 1**

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**a** Draw a diagram showing all the forces acting on the ladder. Describe the origin of each force using words. **(4 marks)**

**b** Calculate the magnitude of each force and hence determine whether or not the ladder slips. **(13 marks)**