



Physics 102
Semester 1 2020
Assignment 2

/25

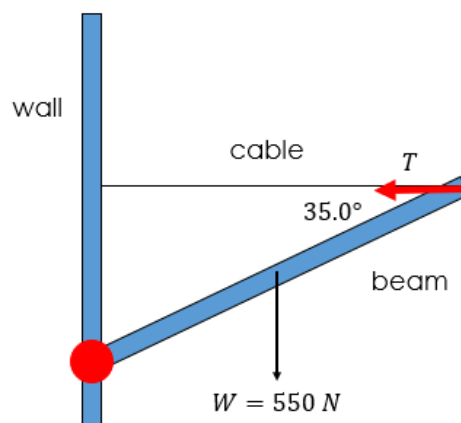
Due: Sunday 29th March 2020, 11:59pm
Total marks = 25

For all questions, complete and clear working must be shown. Explain your working where appropriate. Assume that air resistance is negligible in the mechanics problems unless stated otherwise. Remember to state the appropriate units for your answer if they are not already given.

Take $g = 9.8 \text{ ms}^{-2}$.

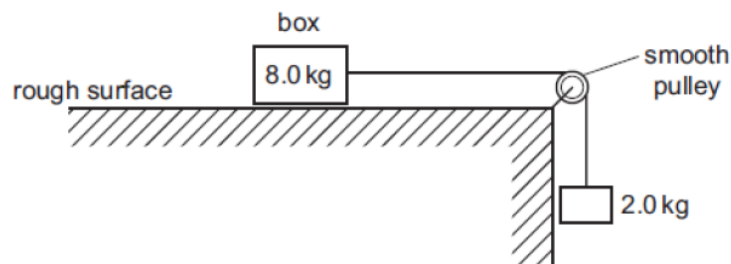
Question One (4 marks)

Calculate the magnitude of the tension force in the cable that is holding up the 3.0 m long, 550N beam (attached to the wall) in the diagram below. [4]



Question Two (4 marks)

A box of mass 8.0 kg rests on a horizontal rough surface. A string attached to the box passes over a smooth pulley and supports a 2.0 kg mass at its other end.



When the box is released, a frictional force of 6.0 N acts on it.

What is the acceleration of the box?

[4]

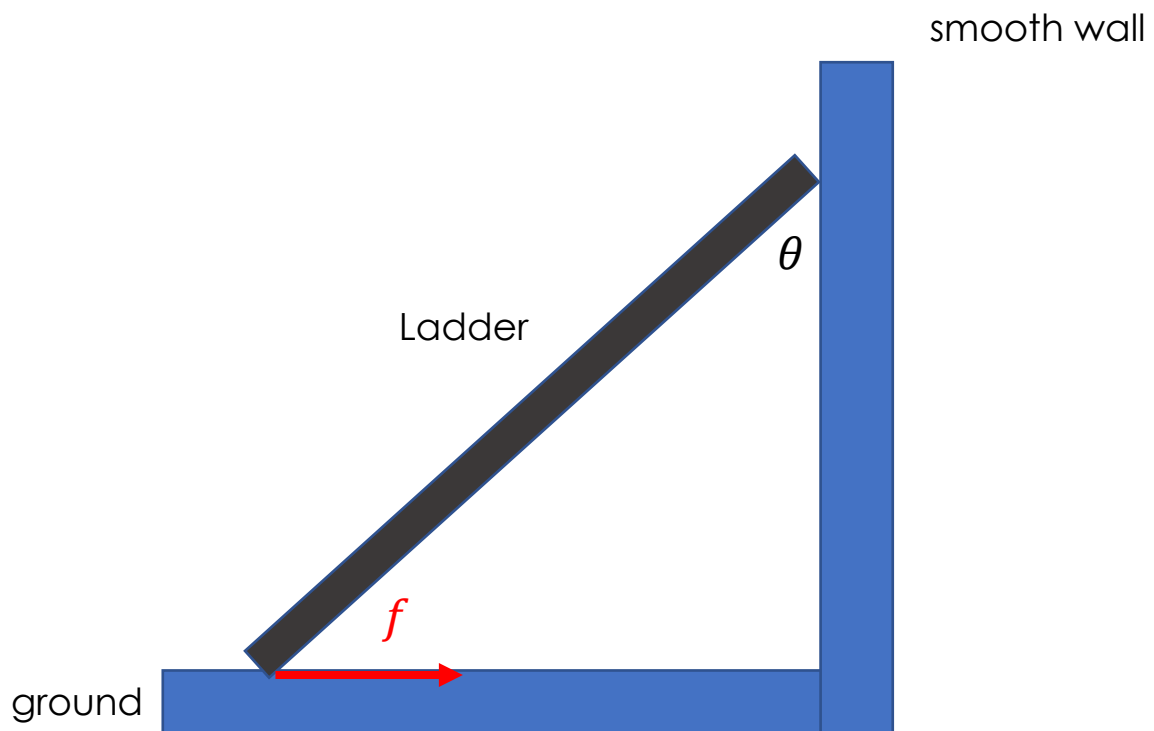
Question Three (6 marks)

A ship needs 11m of water to pass down a channel safely. At low tide, the channel is 6.0m deep and at high tide, 14.0m deep. Low tide is at 5.30am and high tide at 11.30am. Assume that the tidal motion is SHM.

- a) State the amplitude and the period of the motion [2]
- a) Show that the earliest time that a ship can pass through the entrance is approximately 9am. [4]

Question Four (7 marks)

A 3.0 m long ladder with a weight of 155N rests against a smooth wall (frictionless) at an angle of $\theta = 60^\circ$ to the wall as shown in the diagram below.



- a) The maximum frictional force f that will stop the ladder from slipping is 120 N. State whether or not the ladder will slip in the position shown in the diagram. [3]
- b) Determine the angle θ at which the ladder will start to slip. Hint: $\tan\theta = \frac{\sin\theta}{\cos\theta}$ [3]
- c) If the wall was rough, state the direction of the frictional force that the wall would apply to the ladder. [1]

Question Five (4 marks)

A block of mass 8.5 kg slides down an inclined plane, inclined to the horizontal at an angle of 20° . The total resistive force while it is sliding is 7.2 N . If the block starts from rest, what will be the block's speed after 4.2 s ? [4]

