3 A spring is fixed at one end and attached to the frame of a pulley at the other end. A cable is passed around the wheel of the pulley. The spring is stretched to a fixed length using the cable and pulley.

Fig. 3.1 shows the view from above of the spring, cable and pulley.

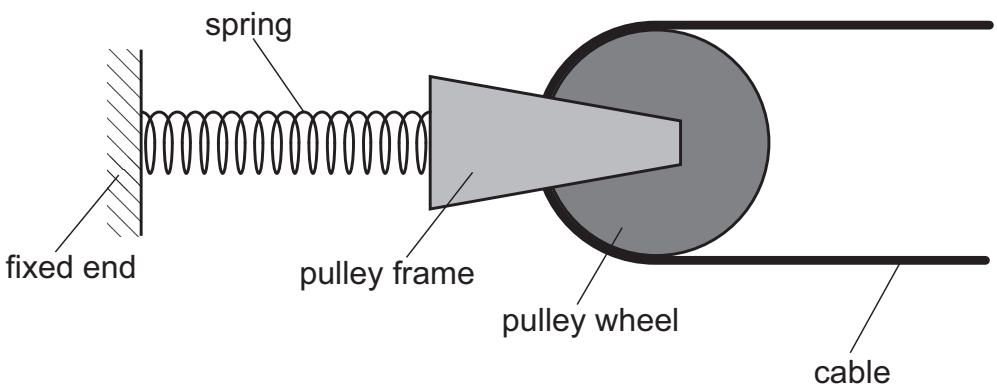

Fig. 3.1

The spring obeys Hooke's law and has a spring constant k of $250\,\text{N}\,\text{m}^{-1}$. A force F acts on the spring. The tension in the cable is T. The pulley is in equilibrium.

(b) The force F is 110 N.

(i) Determine T.

T = ... N [1]

(ii) Calculate the extension of the spring.

extension = ... m [2]

(c) A second identical spring with the same spring constant of $250\,\text{N}\,\text{m}^{-1}$ is now also connected to the pulley, as shown in Fig. 3.3.

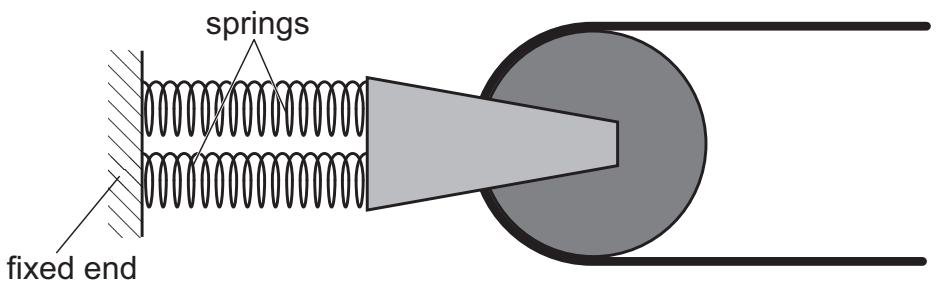

Fig. 3.3

The tension in the cable is kept the same. The pulley is again in equilibrium.

(i) Determine the extension of the springs.

extension = ... m [2]

(ii) The elastic potential energy stored in the spring in Fig. 3.1 is E_1. The **total** elastic potential energy stored in the two springs in Fig. 3.3 is E_2.

Calculate the ratio $\frac{E_1}{E_2}$.

ratio = ... [2]

[Total: 9]