Answer on Question 50088, Physics, Mechanics | Kinematics | Dynamics

Question:

A spring is used to suspend a 3kg load. At rest the spring is extended by 12mm. Calculate the spring constant and the frequency of oscillation of this system.

Solution:

By the definition of the Hooke's law:

$$F = kx,$$

where F is the force acting on the spring, k is the spring constant, x is the elongation of the spring.

Considering that $F = mg$ we can obtain the spring constant:

$$k = \frac{mg}{x} = \frac{3kg \cdot 9.8\frac{m}{s^2}}{0.012m} = 2450\frac{N}{m}.$$

As we know the spring constant, we can obtain the frequency of oscillation of this system:

$$f = \frac{1}{2\pi}\sqrt{\frac{k}{m}} = \frac{1}{2\pi}\sqrt{\frac{2450\frac{N}{m}}{3kg}} = 4.55Hz.$$

Answer:

a) $k = 2450\frac{N}{m}.$

b) $f = 4.55Hz.$