XE 71

EE23BTECH11048-Ponugumati Venkata Chanakya*

QUESTION: A spring mass system is shown in the figure . Take the value of acceleration due to gravity as $g = 9.81m/s^2$.The static deflection due to weight and the time period of the oscillations,respectively,are
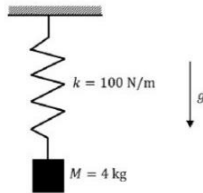

Fig. 0.

$$F = -kx^2 \tag{6}$$

$$ma = -kx^2 \tag{7}$$

$$m(-\omega^2 x^2) = -kx^2 \tag{8}$$

$$\omega = \sqrt{\frac{k}{m}} \tag{9}$$

$$\omega = \sqrt{\frac{100}{4}} \tag{10}$$

$$\omega = 5 \tag{11}$$

$$T = \frac{2\pi}{\omega} \tag{12}$$

$$T = \frac{2\pi}{5} seconds \tag{13}$$

The static deflection due to weight and the time period of the oscillations,respectively,are $39.24 cm and \frac{2\pi}{5} seconds$

Solution:

1) Static deflection due to weight(sdw)
   let x be sdw.
   At mean position in equilibrium

$$Mg = kx \tag{1}$$

$$4 \cdot 9.81 = 100x \tag{2}$$

$$39.24 = 100x \tag{3}$$

$$x = 0.3924m \tag{4}$$

$$x = 39.24cm \tag{5}$$

2) Time period of oscilattion