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 $g = 9.81 m/s^2$.The static deflection due to weight and the time period of the oscillations,respectively,are
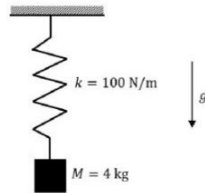

Fig. 0.

$$F = -kx^2 \qquad (6)$$

$$ma = -kx^2 \qquad (7)$$

$$m(-\omega^2 x^2) = -kx^2 \qquad (8)$$

$$\omega = \sqrt{\frac{k}{m}} \qquad (9)$$

$$\omega = \sqrt{\frac{100}{4}} \qquad (10)$$

$$\omega = 5 \qquad (11)$$

$$T = \frac{2\pi}{\omega} \qquad (12)$$

$$T = \frac{2\pi}{5} seconds \qquad (13)$$

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

$$Mg = kx \qquad (1)$$

$$4 \cdot 9.81 = 100x \qquad (2)$$

$$39.24 = 100x \qquad (3)$$

$$x = 0.3924m \qquad (4)$$

$$x = 39.24\text{cm} \qquad (5)$$

2) Time period of oscilattion