(31)

One end of a linear spring is attached to a fixed support and a mass of 2 kg hangs from it at the other end. A force of 4 N causes a displacement of 0.02m. The mass is pulled down a distance of 0.04 m from its static equilibrium position and released with zero velocity

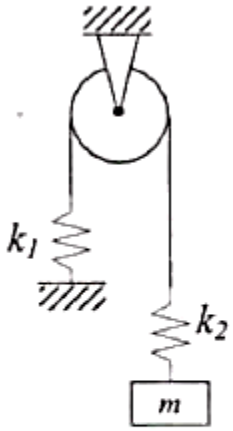
(a) The natural frequency of vibration is
(A) 1 rad/s (B) 1.59 rad/s (C) 5 rad/s (D) 10 rad/s

(b) The magnitude of velocity when the body has moved half way towards the static equilibrium position from its initial position is
(A) 0.212 m/s (B) 0.346 m/s (C) 0.4 m/s (D) 1.0 m/s

[XE GATE 2008]

(32)

A single degree freedom system consisting of 2 springs and a mass is shown in the figure.



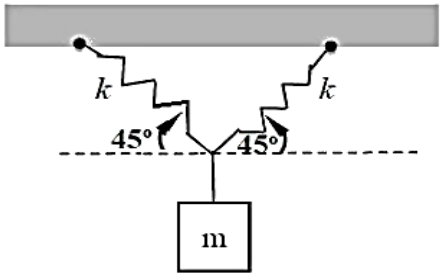
The natural frequency of the system in radians/sec is given by

(A) $\sqrt{\frac{k_1}{m}}$ (B) $\sqrt{\frac{k_2}{m}}$ (C) $\sqrt{\frac{k_1 k_2}{(k_1+k_2)m}}$ (D) $\sqrt{\frac{k_1+k_2}{m}}$

[XE GATE 2007]

(33)

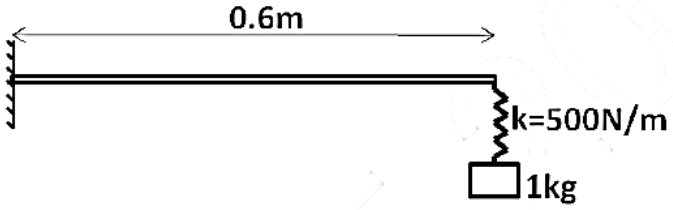
The natural frequency of the system suspended by two identical springs of stiffness k as shown in the figure is given by $\omega_n = a\sqrt{\frac{k}{m}}$ for small displacement. Both the springs make an angle of 45° with the horizontal. The value of a is_____ (in two decimal places).



[AE GATE 2017]

(34)

1kg mass is hanging from a spring of stiffness 500N/m attached to a massless,symmetric beam of length 0.6m, moment of inertia about the bending axis$I = 8.33 \times 10^{-10} m^4$ and Young's modulus E=210GPa as shown in the figure. The fundamental natural frequency (in *rad/s*) of the system is



(A) 3.24 (B) 20.36 (C) 22.36 (D) 3.56

[AE GATE 2014]

(35)

A cantilever beam of negligible mass is 0.6 m long. It has a rectangular cross-section of width 8 mm and thickness 6 mm and carries a tip mass of 1.4 kg. If the natural frequency of this system is 10 rad/s, Young's modulus of the material of the beam in GPa is _____

(36) *[AE GATE 2013]*

Consider a single degree of freedom spring-mass system of spring stiffness k_1 and mass m which has a natural frequency of 10 rad/s. Consider another single degree of freedom spring-mass system of spring stiffness k_2 and mass m which has a natural frequency of 20 rad/s. The spring stiffness k_2 is equal to

(A) k_1 (B) $2k_1$ (C) $\frac{k_1}{4}$ (D) $4k_1$

[AE GATE 2011]