EASTERN UNIVERSITY, SRI LANKA

SECOND YEAR EXAMINATION IN SCIENCE 2002/2003

SECOND SEMESTER

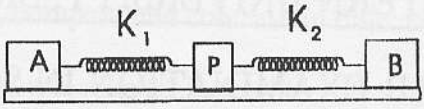
(MARCH/APRIL 2004)

REPEAT

PH 206 WAVES AND VIBRATIONS

Time: 01 hour.

Answer ALL Questions



1. Figure shows a body P resting on a smooth table between two firm supports A, B and controlled by two massless springs. If mass of P is m and the force constants of the two springs are K_1 and K_2, show that the motion of the body is simple harmonic motion. If mass of P is $0.05Kg$ and the force constants of the two springs are $3Nm^{-1}$ and $2Nm^{-1}$

   (i) Find the frequency of small oscillations of P.

   (ii) Find the energy of oscillations for amplitudes $0.004m$.

   (iii) In $3sec$ the mass displaces from equilibrium position to half of its amplitude. Find the initial phase angle of the displacement.

2. A damped oscillating system has an effective mass m and a natural undamped frequency ω_0 and has a damping co-efficient proportional to the velocity of magnitude $\frac{m\omega_0}{\sqrt{2}}$. If there is a driving force $Fcos\left(\frac{\omega_0 t}{\sqrt{2}}\right)$ Show that

   (i) Displacement of the system is

   $$\frac{\sqrt{2}F}{m\omega_0^2}cos\left(\frac{\omega_0 t}{\sqrt{2}} - \frac{\pi}{4}\right)$$

   (ii) Velocity of the system is

   $$\frac{F}{m\omega_0}sin\left(\frac{\omega_0 t}{\sqrt{2}} - \frac{\pi}{4}\right)$$

   (iii) Work done in the first quarter is

   $$\frac{F^2}{4m\omega_0^2}(\pi - 2)$$