EASTERN UNIVERSITY, SRI LANKA

SECOND EXAMINATION IN SCIENCE – 2012/2013

SECOND SEMESTER (PROPER / REPEAT)

OCTOBER 2016

PH 206 WAVES AND VIBRATION

: 01 hour

er ALL Questions

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a. Define "spring constant" of a spring. .....(10 Points)

b. An object of mass m is placed on a frictionless plane and connected with the end of a spring with spring constant k. The other end of the spring is fixed firmly on a wall.

i. Show that the motion of the object is simple harmonic. .....(10 Points)

ii. Show that the displacement of the object at any time t is given by:

$x = A\sin(\omega_o t + \emptyset)$, where the symbols have their usual meaning.

.....(10 Points)

iii. Show that the maximum kinetic energy and potential energy of the object in the above case is: $\frac{1}{2}kA^2$. .....(20 Points)

iv. Hence show that the total energy of the system is constant. .....(10 Points)

v. Sketch the variations of the potential energy and the kinetic energy of the object against the displacement in a single graph. .....(30 Points)

vi. A mass m = 100 g is attached at the end of a light spring
constant k = 250 N/m. The other end of the spring is fixed firml
The mass is pushed against the spring and compress the spring
its relaxed position. The system is then released and the
towards opposite direction. If the friction is ignored at what
mass will be moved as it shoots away? .....

2.

a. What do you understand by the terms "relaxation time", a
factor" of a light damped harmonic oscillator? .....

b. The differential equation that describes a damped oscillator ca
as $m\ddot{x} + D\dot{x} + kx = 0$, where the symbols have their usual mea

i. Define the following terms using the parameters in the
equation, and describe the motion in each case: heav
critical damping, and light damping. .....

ii. Obtain equations for the displacement x in the heavy d
light damping. .....

iii. Show that the quality factor (Q) for the damped oscillator
$\frac{1}{D}\sqrt{km}$ .....

iv. Illustrate the relaxation time of the light damping is $\frac{m}{D}$.

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