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RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B. Sc. (General) Degree
First Year - Semester I Examination – September / October 2013

PHY 1102 - WAVES AND VIBRATIONS

Answer any two questions **Time: 1 hour**

Use of a non-programmable calculator is permitted.

1. (a) What are "Lissajous figures"?

[10 marks]

(b) The logo of the Australian Broadcasting Corporation (ABC) takes the form of a Lissajous figure. The parametric equations that describe the logo are;

$y = \cos 3\omega t$
$x = \sin \omega t$

Use a graphical method to construct the logo of the ABC.

[40 marks]

2. (a) A block of mass 2 kg hangs from a spring of force constant $k = 800\ N\ m^{-1}$. The block is pulled 20 cm from the equilibrium and released.

(i) What are the amplitude, the angular frequency and the period of motion of the block? [15 marks]

(ii) What are the velocity and acceleration of the block when it is 12 cm away from the equilibrium? [10 marks]

(b) A spring-mass oscillator with a spring constant k undergoes Simple Harmonic Motion. It has a total mechanical energy E_0 and amplitude A_0.

(i) What is the kinetic energy (K) and the potential energy (U) when $x = A_0/2$? [15 marks]

(ii) For what value of x will K = U? [10 marks]

Contd.....

3. Write short notes on the following.

(i) Expanding universe [12 marks]

(ii) Total mechanical energy of a Simple Harmonic Motion [12 marks]

(iii) Recoil mechanism of a cannon [14 marks]

(iv) Principle of superposition [12 marks]

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