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RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (General) Degree in Applied Sciences

First Year Semester I Examination – May / June 2016

PHY 1102 – WAVES AND VIBRATIONS

Time: One (01) hour

Answer two questions only.

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01. (a) Explain the combined effect of two perpendicular simple harmonic vibrations acting on the same particle. [10 marks]

(b) Consider a particle subjected to two simple harmonic vibrations in directions at right angles to one another given by;

$y = a \sin(\omega t)$
$x = b \sin(\omega t - \pi/2)$.

Show that the particle is moving in a **circle** if the amplitudes of both simple harmonic vibrations are the same. [40 marks]

02. A binary star system, of which the orbital period is 2.4 years, is studied and concluded that both the stars are of the same mass. A certain element present in the binary star system is known to give a spectral line at 460 nm, at a certain time (t = 0). 0.6 years later, the same spectral line is observed to be at 459.92 nm (blue shifted). At the same time, an additional spectral line coming from the binary star system is also observed.
(1 year = 365.25 days)

(a) Explain the above observation in detail. [20 marks]

(b) Where is the additional spectral line seen? [10 marks]

(c) What is the orbital speed of the binary star system? [10 marks]

(d) What is the radius of the orbit of the binary star system? [10 marks]

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03. Write **short notes** on the following;

(a) Physics behind automobile shock-absorbers. [12 marks]

(b) Theory of oscillating universe. [13 marks]

(c) Total mechanical energy of a simple harmonic motion. [12 marks]

(d) Kundt's Tube Experiment. [13 marks]

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