RAMAKRISHNA MISSION VIDYAMANDIRA

(A Residential Autonomous College under University of Calcutta)

First Year, Second Semester (January – June), 2011

Mid-Semester Examination, March, 2011

PHYSICS (General)

Date : 11 March 2011 Full Marks : 25

Time : 11am – 12noon

1. a) What is S.H.M.? [1]

   b) Consider the linear superposition of two S.H.M. at right angles to each other. Show that the path of the particle will be an ellipse, when the two motions have the same period but different amplitudes and initial phases. What happens when the phase difference between the motions is π? [4+1]

   c) The equation of two S.H.M are $x = 0{\cdot}01 \sin \omega t$ and $y = 0{\cdot}01732 \sin \omega t$. These two S.H.M are acting simultaneously on a particle. Find the amplitude of the resultant motion. [2]

   d) The equation of motion of a particle executing S.H.M is $3f + 2x = 0$. Determine the time period of the motion. (f = acceleration of the particle and x = displacement of the particle) [2]

OR,

1. a) What do you mean by Sharpness of resonance? [2]

   b) If the motion of a damped harmonic oscillator be along x-axis, write down its differential equation. assuming damping force to be proportional to velocity. Solve the equation and show when the motion will be oscillatory. [1+4]

   c) The displacement of a particle executing S.H.M. at a time t is given by $x = a\sin\frac{\pi}{6}t + b\cos\frac{\pi}{6}t$ where a = 3m and b = 4m. Find (i) amplitude (ii) velocity at a time t = 2s. [3]

2. a) Deduce Poiseuille's equation for the rate of steady flow of a liquid through a narrow tube. What are the conditions to be satisfied for the deduction of the equation? [4+2]

   b) State the utility of Reynold's number? [1]

OR,

2. a) What do you mean by streamline flow and turbulent flow of liquid? [1+1]

   b) Determine Stoke's law using dimensional analysis. [2]

   c) Obtain an expression for the terminal velocity of a small spherical body falling through a liquid. [3]

3. What is optical path? State Fermat's principle and deduce the Snell's law of refraction using it. [2+2+4]

OR,

3. What is an Aplanatic surface? For refraction at any curved surface separating two media, deduce the expression $\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{r}$ and using this expression, deduce lens formula. [2+4+2]

◆◆❖◆◆