B. N. Bandodkar College of Science, Thane

Second Semester Examination, March 2012 (Additional)

F. Y. B. Sc.

PHYSICS : USPH 201

Duration : 2 Hours] [Marks : 60

N.B. (1) All questions are compulsory.
(2) Figures to the right indicate full marks.
(3) Use of non programmable calculator is allowed.

1. (a) Attempt any **ONE** of the following: 8

   1) Discuss the composition of two mutually perpendicular simple harmonic motions with the same period but different amplitudes and initial phases and show that the path of the resultant motion in general, is an ellipse.
   2) Set up the equation of motion of a rocket and solve it to get an expression for velocity as a function of time. What is the maximum velocity attained by the rocket?

   (b) What are Lissajous figures? On what factors do their shapes depend? 4

   (c) A particle executes SHM with amplitude of 5cms. It completes 10 oscillations in 20 seconds. The phase of the SHM 2 seconds after the start is 270 degrees. Find the epoch and the equation of SHM. 3

2. (a) Attempt any **ONE** of the following: 8

   1) Derive an expression for the focal length of a combination of two thin lenses of focal length f_1 and f_2 separated by a distance d.
   2) Explain with necessary theory the formation of Newton's rings in reflected light from a Plano-convex lens. Also show that the radius of the nth dark ring is proportional to the square root of a natural number.

   (b) Write a short note on chromatic aberration. 4

   (c) A double convex lens has equal radii and a focal length of 80cms. If the refractive index of glass is 1.5 find the radius of curvature. 3

3. (a) Attempt any **ONE** of the following: 8

   1) With the help of a neat labelled diagram of optical resonator, explain the basic principle of laser and the amplification process.
   2) With the help of a neat diagram explain the light propagation through an optical fibre.

   (b) Explain briefly the reconstruction of image in holography. 4

   (c) Write a short note on fibre optic temperature sensor. . . . 3

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4. (a) Attempt any **THREE** of the following: 12

1) Explain the concept of centre of mass in a rigid body.
2) Derive an expression for total kinetic energy of a rigid body in the centre of mass frame.
3) Describe Schuster's method in a spectrometer. Why this is done?
4) Calculate the wavelength of light incident normally on a wedge-shaped film of glass of refractive index 1.5.The angle of the wedge is 30 seconds of an arc and the fringe width is of the order of 0.15cm.
5) What are the advantages of optical fibre in modern communication?

(b) What are the properties of laser? 3

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