Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Optm/SEM-2/BO-201/2013

2013
PHYSICAL OPTICS – II

Time Allotted : 3 Hours *Full Marks :* 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

   i) Holography is an application field of
      a) interference of light
      b) diffraction of light
      c) polarisation of light
      d) refraction of light.

   ii) Laser is a coherent source of light.
      a) True
      b) False.

   iii) If the number of lines/cm of a grating increases, the resolving power of the grating
      a) increases b) decreases
      c) remains constant d) becomes zero.

iv) In Fraunhoffer diffraction the incident wavefront is
   a) Plane b) Elliptical
   c) Circular d) None of these.

v) To demonstrate the phenomena of interference we require
   a) 2 sources which emit radiation of nearly same frequency
   b) 2 sources which emit radiation of same frequency
   c) 2 sources which emit radiation of different wavelengths
   d) none of these.

vi) For transmitted light the central Newton's ring is
   a) dark b) bright
   c) coloured d) none of these.

vii) Young's double slit experiments are based on
   a) division of wavefront b) division of amplitude
   c) both (a) & (b) d) none of these.

viii) In simple harmonic motion, kinetic energy of the particle is zero at mean position but still it crosses this point due to its
   a) Momentum b) Potential energy
   c) Inertia d) Restoring force.

ix) Which of the following phenomena proves the transverse nature of light ?
   a) Diffraction b) Polarization
   c) Interference d) Dispersion.

x) The *e*-ray in a crystal disobeys the laws of
   a) reflection b) refraction
   c) both (a) & (b) d) interference.

xi) The characteristic of SHM
   a) velocity is directly proportional to amplitude
   b) velocity is inversely proportional to amplitude
   c) acceleration directly proportional to amplitude
   d) both (b) & (c).

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. a) What is hologram ?

   b) How can you reconstruct the image from a hologram ? 2 + 3

3. a) What is the difference between the fringe pattern produced by Lloyd's single mirror and Fresnel's bi-prism ?

   b) What do you mean by resolving power of an optical instrument ? 3 + 2

4. Compare between prism spectra and grating spectra.

5. Distinguish between the following : $2\frac{1}{2} + 2\frac{1}{2}$

   a) Positive crystal and Negative crystal

   b) Interference and diffraction.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

6. a) What is the full form of LASER ?

   b) Explain the terms spontaneous emission, stimulated emission and spontaneous absorption.

   c) Explain, the basic principles involved in laser action.

   d) Describe Ruby laser. 1 + 3 + 5 + 6

7. a) Compare between Corpuscular theory and wave theory of light.

   b) Explain rectilinear propagation of light by corpuscular theory of light.

   c) State Huygens principle. Obtain the laws of reflection (plane wavefront at plane surface) by wave theory of light. 3 + 3 + 2 + 7

8. a) Define coherent sources of light.

   b) Deduce the condition of constructive and destructive interference.

   c) State the relation between path difference and phase difference.

   d) In Young's double slit experiment the separation of the slits is 1·9 mm and the fringe spacing is 0·31 mm at a distance of 1 m from the slits. Calculate the wavelength of light. 2 + 8 + 2 + 3

9. a) Write the construction of nicol prism.

   b) Write short notes on half wave and quarter wave retardation plate.

   c) Write working of Ruby Laser.

   d) State Brewster's law. Find the angle of polarization for the crown glass of refractive index 1·52.

   4 + 4 + 3 + 2 + 2