BACHELOR OF SCIENCE EXAMINATION, 2017

(2nd Year, 1st Semester)

PHYSICS (Subsidiary)

Paper: SO6

Time: 2 Hours   **Full Marks: 50**

Answer any _four_ questions

1. a) State and explain Huygen's Principle for the propagation of light waves.
   b) With the help of this principle deduce the laws of reflection and refraction of a plane wave at a plane surface.

$$4\tfrac{1}{2} + (4 + 4)$$

2. a) State and explain the conditions for the production of sustained interference fringes.
   b) Consider two coherent sources of same frequency and of intensities I and 2I. Find the ratio of maximum intensity to minimum intensity in their interference pattern.
   c) What do you mean by coherent sources?

$$5 + 5 + 2\tfrac{1}{2}$$

3. a) Explain the formation of Newton's ring. Show that the diameters of bright rings in a Newton's experiment when viewed in reflected light are proportional to the square roots of odd natural numbers.
   b) In a Newton's ring experiment, the diameters of the 4th and 12th dark rings are 0.40 cm and 0.70 cm, respectively. Find the diameter of the 20th dark ring.

$$8\tfrac{1}{2} + 4$$

4. a) Derive an expression for the intensity of Fraunhofer diffraction pattern due to a single slit.
   b) Find the conditions for maxima and minima.
   c) A convex lens of focal length 40 cm is employed to focus the Fraunhofer diffraction pattern of a single slit of 0.3 mm width. Calculate the width of central band. Take the wavelength of incident light 589 nm.

$$6 + 3 + 3\tfrac{1}{2}$$

5. a) What do you understand by double refraction? What are ordinary and extra-ordinary rays?
   b) Explain how Nicol prism can be used as a polarizer and as an analyzer.
   c) State Malus's law. Two nicols have parallel polarizing directions so that the intensity of transmitted light is maximum. Through what angle must either nicol be turned if intensity is to drop by one-fourth of its maximum value?

$$4 + 4\tfrac{1}{2} + 4$$

6. a) State Brewster's law.
   b) A light of wavelength 546 nm gets plane polarized on reflection from a glass plate at an angle of 60^0. Find the refractive index of glass.
   c) What is a quarter-wave plate? Find the thickness of a quarter wave plate for sodium light of wavelength 589.3 nm. Given n_0 =1.5442 and n_e =1.5533.

$$2 + 4 + 2\tfrac{1}{2} + 4$$