K17U 0743

Reg. No. : ....

Name : ....

IV Semester B.Sc. Degree (CCSS – Supple./Imp.) Examination, May 2017
CORE COURSE IN PHYSICS
4B04PHY : Optics
(2012-13 Admissions)

Time : 3 Hours

Max. Weightage : 30

PART – A

Answer **all** questions, **each** bunch carries **1** W.

1. I) The properties of an optical system can be obtained from
   a) Translation matrix
   b) Refraction matrix
   c) Reflection matrix
   d) System matrix

   II) Two source of light are coherent if the wave produced by them have the same
   a) Wavelength
   b) Amplitude
   c) Wavelength and constant phase difference
   d) Amplitude and wavelength

   III) Laser light is considered to be coherent because it consists of
   a) Divergent beam
   b) Co-ordinated waves of exactly the same wavelength
   c) Many wavelengths
   d) Uncoordinated waves

   IV) In a biprism experiment, if the equal angles of the two component prisms are slightly increased, the fringe pattern will
   a) Remain unchanged   b) Gets enlarged
   c) Vanish   d) Shrink   **(W=1)**

P.T.O.

2. I) To obtain Fraunhoffer diffraction from a single slit, the wavefront of the incident light must be
   a) Spherical   b) Cylindrical   c) Plane   d) Elliptical

II) A system of white and dark fringes obtained by white light is called
   a) Achromatic fringes   b) Localised fringes
   c) Non localized fringes   d) Etalon fringes

III) Light waves can be polarized because they have
   a) High frequencies   b) Short wavelength
   c) Transverse nature   d) Reflective properties

IV) Perfectly monochromatic light is perfectly coherent and
   a) Completely polarized   b) Partially polarized
   c) Completely non polarized   d) None of these   **(W=1)**

PART – B

Answer **any six** questions. **Each** question carries **1 W.**

1. What is a coherent source of light ? Give example.

2. Why don't thick films exhibit interference ?

3. What is a zone plate ?

4. Distinguish between refraction and translation.

5. What are the conditions for producing interference fringes ?

6. Distinguish between temporal coherence and spatial coherence.

7. Radiowaves diffract around buildings while light waves do not. Explain.

8. What is Brewster's law ? Mention its use.   **(6×1=6)**

PART – C

Answer **any nine** questions. **Each** carries **2 W.**

1. Obtain the system matrix for a combination of two thin lenses of focal lengths separated by a distance D and hence find out the equivalent focal length of the system.

2. How is zone plate made ? What is the radius of the first zone in a plate of principal focal length 0.2 m for light of wavelength 512 nm ?

3. Consider a diffraction grating of width 5 cm with slit width 10^{-6} m separated by a distance of 2×10^{-6} m. What is the corresponding grating element ? How many orders would be observable if $\lambda = 550$ nm ?

4. What is the difference between right circularly polarized light and left circularly polarized light ?

5. Construct a suitable matrix to represent the effect of translation of a homogeneous medium for paraxial rays.

6. A thin film of oil spread over the surface of water appears coloured in sunlight. Why ? A thin layer of oil is spread over water in a container. When a light is incident on the surface, light of W.I. 6000Å is absent in reflected light. What is the thickness of oil ?

7. Give the theory of diffraction due to a straight edge and show that the bands produced are not equally spaced.

8. What is polarization ? Explain polarization of light on the basis of electromagnetic energy.

9. State and explain the law of Malus.

10. A thin sheet of transparent material of refractive index 1.6 is placed in the path of one of the interfering beams in a biprism experiment using sodium light of wavelength 5893 Au. The central fringe shifts to a position originally occupied by the 12th bright fringe. Calculate the thickness of the sheet.

11. What is the radius of the first half period zone in a zone plate behaving like a convex lens of focal length 0.62 m for a light of wavelength 5890 Au ?

12. A 200 mm long tube containing 48CC of sugar solution produces an optical rotation of 11 degrees when placed in a polarimeter. If the specific rotation of sugar solution is 66 degrees, calculate the quantity of sugar contained in the tube in the form of a solution.   **(9×2=18)**

PART – D

Answer **any one** question.

1. What is the advantage of using matrix method in paraxial optics ? Obtain the system matrix for a general optical system.

2. Discuss the theory of a zone plate and compare it with that of a converging lens. Does the zone plane suffer from chromatic aberration ? Justify.   **(1×4=4)**

_____