



11421

B.Sc. IV Semester Degree Examination, May/June 2016
PHYSICS

Paper – 4.1 : Physical Optics and Electricity

Time : 3 Hours

Max. Marks : 80

- Instructions :** 1) *Section – I is compulsory.*
2) *Answer any four questions each from Section – II and from Section – III.*

SECTION – I

1. Answer **any twelve** of the following : **(12×1=12)**

A) Choose the correct answer :

- i) Photon is affected by
 - a) Electric field
 - b) Magnetic field
 - c) Both a) and b)
 - d) None of these
- ii) Which of the following cannot produce two coherent sources ?
 - a) Lloyd's mirror
 - b) Fresnel's Biprism
 - c) Young's double slit experiment
 - d) Prism
- iii) O-ray in calcite crystal obey's the law of
 - a) Reflection
 - b) Refraction
 - c) Both reflection and refraction
 - d) None of these
- iv) In parallel resonant circuit at resonance, the impedance is
 - a) Maximum
 - b) Minimum
 - c) Equal to $(X_L - X_C)$
 - d) None of these



B) Fill in the blanks :

- i) Point source at infinite distance will produced _____ wave front.
- ii) The fringe width in interference phenomena are _____
- iii) Dextro rotator substances rotates plane of polarization in _____ direction.
- iv) In a pure inductor the current _____ emf by $\pi/2$.

C) State **true** or **false** :

- i) The rest mass of the photon is zero.
- ii) CRO is used to measure frequency.
- iii) For a pure resistive circuit the power factor is zero.

D) Answer the following in **one** or **two** sentences :

- i) Define fringe width.
- ii) What is double refraction ?
- iii) What is electrical resonance ?
- iv) Define power factor.

SECTION – II

2. Write a note on the wave theory of light. (4×4=16)
3. Obtain an expression for fringe width in a wedge shaped air film.
4. Explain the construction of Zone plate.
5. Explain Fraunhofer diffraction at a single slit.
6. Explain High pass filter using RC or RL circuit.
7. Distinguish between series and parallel resonant circuit.

SECTION – III

8. a) Give the theory of Newton's rings. Explain how wavelength of monochromatic light is determined by using Newton's rings experiment.
- b) In Young's double slit experiment the separation of slit is 0.18×10^{-2} m at a distance of 1m from the slits. What is the wavelength of light ?
(fringe width = 0.03 mm)



9. a) Describe in detail an experiment to determine the wavelength of monochromatic light using Fresnel's Bi-prism.
- b) In a Michelson interferometer 200 fringes cross the field of view when the moveable mirror is displaced through 0.05896 mm. Calculate the wavelength of monochromatic light used. (9+4)
10. a) Give the theory of plane diffraction grating.
- b) In Fraunhofer diffraction pattern due to narrow slit a screen is placed 2 m away from the lens to obtain the pattern if the slit width is 0.2 mm and the first minima lies 5 mm on either sides of the central maxima, find the wavelength of light. (4+6+3)
11. a) Give the Huygen's theory of double refraction in uniaxial crystal.
- b) Calculate the length of the solution of concentration 50 kg/m^3 which produces an optical rotation of 45° . The specific rotation of the solution is $0.0523 \text{ rad} - \text{m}^2/\text{kg}$. (9+4)
12. a) Derive an expression for the current, impedance and resonant frequency when an alternating emf is applied LCR series circuit.
- b) A coil of resistance 60 ohm, inductance 3 henry and condenser of 4 microfarad are connected in series with an a.c. supply of 200 V and 50 hertz. Calculate impedance and phase difference between current and voltage. (9+4)
13. a) Explain with circuit diagram the working of half wave rectifier and hence calculate rms value, current and efficiency of rectification.
- b) In series LCR circuit, $L = 5\text{H}$, $C = 80 \mu\text{F}$ and $R = 40 \Omega$. Calculate the resonant frequency. (9+4)