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**B.Sc. IV Semester Degree Examination, May - 2018****PHYSICS****Physical optics and Electricity****Paper - 4.1**

Time : 3 Hours

Maximum Marks : 80

**Instructions to Candidates:**

- 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) The concept of hypothetical medium Ether was proposed by
  - a) Newton
  - b) Huygen's
  - c) Foucault
  - d) Einstein
- ii) Newtons ring illustrates the phenomenon of
  - a) Interference
  - b) Diffraction
  - c) Polarisation
  - d) Dispersion.
- iii) In fraunhofer diffraction the incident and diffracted wave front
  - a) Plane.
  - b) Spherical
  - c) Cylindrical
  - d) None
- iv) In a resonant series LCR circuit.
  - a) The powerfactor is zero
  - b) The power factor is maximum and is equal to 1
  - c) The power factor is minimum and is zero
  - d) The power factor is infinity.

**P.T.O**



B) Fill in the blanks

- i) The energy of the photon is \_\_\_\_\_
- ii) The phase difference corresponding to a path difference of  $\frac{\lambda}{4}$  is \_\_\_\_\_
- iii) Polarisation of light conclusively proves that \_\_\_\_\_
- iv) The formula relating peak voltage and rms value is \_\_\_\_\_

C) State True or False

- i) In youngs double slit experiment, the distance between any two consecutive bright fringes is equal to the distance between any two consecutive dark fringes.
- ii) The width of diffraction spectrum is independent of the material of the grating.
- iii) Series resonant circuit is also called as rejector circuit.

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

- i) Who proposed corpuscular theory of light?
- ii) What are coherent sources?
- iii) What is meant by diffraction of light?
- iv) What is filter?

### Section - II

2. Write a note on the wave theory of light. (4×4=16)
3. Explain the phenomena of interference due to reflected light in thin film.
4. Write the comparison between zone plate and converging lens.
5. Explain how elliptically and circularly polarised light is produced.
6. Derive the expression for power in an AC circuit containing LC and R.
7. Explain the measurement of self inductance by using Maxwell's bridge.

### Section - III

8. a) Describe in detail an experiment to determine the wavelength of monochromatic light with Fresnel biprism. (9)
- b) Two coherent sources are 0.18 mm apart and the fringes are observed on a screen 0.80 metre away. It is found that with a certain monochromatic source of light, the fourth bright fringe is situated at a distance of 10.8 mm from the central fringe. Calculate the wavelength of light. (4)



9. a) Describe Michelson's interferometer. Explain how it is used to determine the wavelength of monochromatic light. (9)
- b) In a Michelson's interferometer 600 fringes cross the field of view when one of the mirrors is moved through the distance of 0.1768 mm. Calculate the wavelength of light used. (4)
10. a) Describe with necessary theory the Fresnel type of diffraction by straight edge. (9)
- b) Light of wavelength  $5000\text{\AA}$  is incident normally on a plane transmission grating having 6000 lines/cm. Find the angle of diffraction in the first order. (4)
11. a) Explain how Laurent's half shade polarimeter is used to find the specific rotation of a given optically active solution. (9)
- b) Calculate the thickness of a half wave plate of quartz for which  $\mu_o = 1.544$  and  $\mu_e = 1.553$  for light of wavelength  $5890\text{\AA}$ . (4)
12. a) Derive an expression for the current, impedance and resonant frequency when an alternating emf is applied to LCR series circuit. (9)
- b) An alternating emf 110 V, 50 cycles is applied to a circuit which contains an inductance of 0.02 henry and a resistance of 10 ohms in series. Determine the current and the phase lag. (4)
13. a) Explain with circuit diagram the working of half wave rectifier and hence calculate rms value current and efficiency of rectification. (9)
- b) An AC circuit consists of  $220\Omega$  resistance and a coil of 0.7 henry. Calculate
- Impedance
  - Current and power consumed from 220 volt of 50 Hz.
- Mains connected to this circuit if the resistance and the inductance are connected in series. (4)
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