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(Pages : 4)

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Reg. No. : .....

Name : .....

**Third Semester B.Sc. Degree Examination, March 2021**

**First Degree Programme under CBCSS**

**Physics**

**Complementary Course for Statistics**

**PY 1331.3 — OPTICS, MAGNETISM AND ELECTRICITY**

**(2018 Admission)**

Time : 3 Hours

Max. Marks : 80

**SECTION – A**

Answer all questions in 1 or 2 sentences; each question carries 1 mark)

1. Explain the phenomena of color of thin film.
2. What is meant by bandwidth of an interference fringes?
3. Why the center of Newton's rings is dark for reflected light?
4. What is meant by diffraction of light?
5. What are the essential requirements of a laser?
6. Explain how light wave is propagated through a fiber.
7. What is Bohr magneton?
8. Define the term magnetic susceptibility.

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9. Explain the difference between ferromagnetism and antiferromagnetism.
10. What are the advantages of ac over dc?

**(10 × 1 = 10 Marks)**

### SECTION – B

Answer any **eight** questions, not exceeding a paragraph; each question carries **2** marks.

11. What are Newton's ring?
12. What are the condition for producing sustained interference?
13. Distinguish between Fresnel's and Fraunhofer diffraction.
14. Distinguish between grating and prism spectra.
15. Explain the diffraction by a circular aperture.
16. What are Einstein coefficients?
17. What are the properties of laser?
18. Distinguish between step index and graded index fibre.
19. Distinguish between diamagnetism and paramagnetism.
20. Discuss adiabatic demagnetization in paramagnetic salts.
21. Write down the properties of magnetic field lines.
22. Distinguish between reactance and impedance.

**(8 × 2 = 16 Marks)**

## SECTION – C

Answer any six, each question carries 4 marks.

23. The source intensities  $I_1$  and  $I_2$  are superimposed so that the ratio of maximum to minimum intensity is found to be 25. Find  $\frac{I_1}{I_2}$ .
24. Newton's rings observed in reflected light of  $\lambda = 5.9 \times 10^7$  m. The diameter of the 10<sup>th</sup> ring is 0.5 cm. Find the radius of curvature of the lens and the thickness of the air film.
25. Find the half angular width of the central bright maximum in the Fraunhofer diffraction pattern of a slit of width  $12 \times 10^{-5}$  cm when the slit is illuminated by monochromatic wavelength 6000 Å.
26. A plane transmission grating has 14000 lines to an inch for a length of 6 inches. If the wavelength region is  $5 \times 10^{-5}$  cm, find the resolving power of the grating in the first and the smallest wavelength difference that can be resolved.
27. A glass fibre is made with core glass of refractive index 1.55 and cladding is doped to give a refractive index 1.5. Calculate the numerical aperture, acceptance angle and the fractional index change?
28. An ac voltage of peak value 283 V and frequency 50 Hz is applied to a series LCR circuit in which  $L = 25.48$  MH,  $C = 796 \mu\text{F}$  and  $R = 3 \Omega$ . Find the impedance of the circuit?
29. A solenoid of 2000 turns and area of cross section  $1.6 \times 10^{-4}$  m<sup>2</sup> carrying a current of 4 A is suspended through its centre allowing it to turn in a horizontal plane. What is the magnetic moment associated with the solenoid?
30. A bar magnet placed with its axis at  $30^\circ$  with a uniform magnetic field of 0.25T experiences a torque of magnitude equal to  $4.5 \times 10^{-2}$  J. What is the magnitude of magnetic moment of the magnet?
31. In a series LCR circuit the applied voltage is 5 V, drops across the resistance and the inductance are 3V and 4V respectively. What is the voltage across the capacitor?

(6 × 4 = 24 Marks)

## SECTION – D

Answer any **two** questions. Each question carries **15** marks.

32. Explain the theory of Fraunhofer diffraction pattern. Also draw the intensity distribution pattern.
33. With energy level diagrams explain the working of Ruby laser.
34. Obtain an expression for numerical aperture of an optical fibre. List out the application of optical fibre.
35. With circuit diagram, explain briefly AC voltage applied to an LCR circuit. Describe resonance condition also.

**(2 × 15 = 30 Marks)**

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