Reg. No. : ....

Name ; ....

Third Semester B.Sc. Degree Examination, February 2024

First Degree Programme under CBCSS

Physics

Complementary Course for Chemistry and Polymer Chemistry

PY 1331.2 : OPTICS, MAGNETISM AND ELECTRICITY

(2018 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions in **one** or **two** sentences. Each question carries **1** mark.

1. What is the difference between constructive and destructive interference phases?

2. What happens to the fringe width in double slit experiment if the distance between the coherent sources is reduced to half and distance between the sources and screen is doubled?

3. On what factors colours observed on a soap bubble depend?

4. What is meant by diffraction of light?

5. Define resolving power of a grating?

6. What is polarisation?

7. Distinguish between e-rays and o-rays?

8. What are the properties of laser?

9. Define the term magnetic susceptibility?

10. Why do we use RMS?

<div align="right">(10 × 1 = 10 Marks)</div>

SECTION – B

Answer any **eight** questions not exceeding a paragraph. Each question carries 2 marks.

11. Why are Newton's rings circular and the fringes due to air wedge straight?

12. A thin film of oil on the surface of water appears colored. Explain.

13. Why do the fringes in Young's double-slit experiment become indistinct if one of the slits is covered with a cellophane?

14. What is single slit diffraction? Draw the experimental setup

15. Distinguish between interference bands and diffraction bands.

16. Distinguish between grating and prism spectra?

17. Explain the differentiate between polarised and unpolarized light

18. State and explain Brewster's law?

19. Describe how a Nicol prism can be used as an analyzer?

20. Distinguish between step index and graded index fibre?

21. Distinguish between diamagnetic and paramagnetic materials?

22. What is a choke coil? Give some of its uses?

<div align="right">(8 × 2 = 16 Marks)</div>

SECTION – C

Answer any **six** questions. Each question carries **4 marks**.

23. White light is incident on an oil film of thickness 0.01 mm and reflected at an angle 45° to vertical. The refractive index of oil is 1.4 and refracted light falls on the slit of a spectrometer, calculate the number of dark bands seen between wavelengths $4000\,\overset{\circ}{A}$ and $5000\,\overset{\circ}{A}$.

24. 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 $\dfrac{I_1}{I_2}$?

25. Newton's rings observed in reflected light of $\lambda = 5.9 \times 10^{-7}$ m. The diameter of the 10th ring is 0.5cm. Find the radius of curvature of the lens and the thickness of the air film.

26. A diffraction grating which has 5000 lines/cm is used at normal incidence. Calculate the dispersive, power of the grating in the second order spectrum in the wavelength region $6000\,\overset{\circ}{A}$.

27. Find the half angular width of the central bright maximum in the Fraunhofer diffraction pattern of a slit of width 12×10^{-5} am when the slit is illuminated by monochromatic Wavelength $6000\,\overset{\circ}{A}$.

28. Calculate the thinkness of the doubly refracting crystal required to introduce a path difference of $\dfrac{\lambda}{2}$ between the ordinary and extra ordinary ray when $\lambda = 6000A$, $\mu o = 1.55$ and $\mu e = 1.54$.

29. A bar magnet place with its axis at 30° with a uniform magnetic field of 0.25T experiences a torque of magnitude equal to 4.5×10^{-2}J. What is the magnitude of magnetic moment of the magnet?

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30. 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?

31. An ac voltage of peak value 283V and frequency 50Hz is applied to a series LCR circuit in which L = 25.48 Mh, C = 79μF, and R = 3Ω Find the impedance of the Circuit?

<div align="right">(6 × 4 = 24 Marks)</div>

<div align="center">SECTION – D</div>

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

32. Discuss the analytical theory of Young's double slit experiment. Derive an expression for bandwidth.

33. Discuss the theory and intensity distribution of the Fraunhofer diffraction by a double slit.

34. Explain the production and analysis of elliptically and circularly polarized light.

35. Obtain an expression for a current in a series LCR circuit? Also deduce an expression for impedance and resonance in the circuit.

<div align="right">(2 × 15 = 30 Marks)</div>

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