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Reg. No. : .....

Name : .....

Third Semester B.Sc. Degree Examination, March 2022

First Degree Programme Under CBCSS

Physics

Complementary Course for Mathematics

PY 1331.1 — OPTICS, MAGNETISM AND ELECTRICITY

(2013-2017 Admission)

Time : 3 Hours Max. Marks : 80

SECTION – A

(Answer **all** questions in **one** or **two** 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.

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 rings?

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. Green light of wavelength 5100 A from a narrow slit is incident on a double slit. If the overall separation of 10 fringes on a screen 200 cm away is 0.2 cm. Fins the slit separation?

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

25. Two plane glass surface in contact along one edge are separated at the opposite adage by a thin wire. If 20 fringes are observed between these edges in sodium light (λ= 5890 A) of normal incidence. What is the thickness of wire?

26. Find the half angular width of the central bright maximum in the Fraunhofer diffraction pattern of a slit of width 12×10^{-5} cm when the slit is illuminated by monochromatic wavelength 6000 A.

27. A plane transmission grating has 14000 lines to an inch for a length of 6 inches. If the wavelength region is 5×10^{-5} cm, find the resolving power of the grating in the first order and the smallest wavelength difference that can be resolved.

28. A monochromatic light of wavelength 5000 A from a distant source falls on a slit 0.5 mm wide. What is the distance between the two dark bands on each side of the central band of the diffraction pattern observed on a screen placed 2 m from the slit.

29. Find the numerical aperture, acceptance angle and the critical angle of the fibre if light enters from air. Given refractive index of the core = 1.52 and the refractive index of the cladding = 1.47

30. An LCR circuit with L = 4.0 H, C = 100 μF, R = 40 Ω, is connected to a variable frequency 220 V source. Calculate (i) resonance frequency (ii) impedance at resonance and (iii) amplitude of current at resonance.

31. An ac voltage of 240 V, 50 Hz is applied to an inductor of inductance 15 Mh. Calculate the (i) inductive reactance, (ii) r.m.s value of current (iii) peak value of current (iv) mean value of current.

($6 \times 4 = 24$ 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 foe 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)
