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Reg. No. : .....

Name : .....

Third Semester B.Sc. Degree Examination, January 2023

First Degree Programme Under CBCSS

Physics

Complementary Course for Mathematics

PY 1331.1 – OPTICS, MAGNETISM AND ELECTRICITY

(2019 Admission onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** the questions. **Each** carries **1** mark.

1. Define bandwidth.
2. Define coherent sources.
3. What is the use of Fresnel's biprism?
4. What is interference in thin film?
5. What is wattless current?
6. What is the condition of constructive interference?
7. What is meant by diffraction of light?
8. What is magnetic susceptibility?

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9. What is diamagnetism?

10. What is permanent magnet?

(10 × 1 = 10 Marks)

SECTION – B

Answer any **eight** questions. **Each** carries **2** marks.

11. What is diffraction?

12. What is ferromagnetism?

13. What are the properties of diamagnetic materials?

14. Why paramagnetic substances are those which get weakly magnetised when placed in an external magnetic field?

15. Define rms value of an AC.

16. What is optical pumping in laser?

17. Why Newton's rings are circular?

18. Intensities of spectral lines with a grating are much less than those with prism. Why?

19. Explain relative permeability.

20. Define magnetic flux density (B) and magnetic field intensity (H) and give the relationship.

21. What are the disadvantages of step index fiber?

22. What is dispersive power of grating?

23. What is LCR circuit?

24. Explain power factor.

25. Write the conditions for constructive and destructive interference.

26. Explain population inversion.

(8 × 2 = 16 Marks)

SECTION – C

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

27. Find the radius of 25th Newton's ring if the wavelength is 750 nm and radius of 10th ring is 0.25 cm.

28. A capacitor of capacitance 2 μF is in an AC circuit of frequency 1000 Hz. If the rms value of the applied emf is 10 V. find the effective current flowing in the circuit.

29. Difference between interference and diffraction.

30. A plane transmission grating produces first order diffraction maximum at 19.5° for light of wavelength 5461 Å. Calculate the number of lines on the grating per unit length.

31. Derive the RMS value of an AC circuit.

32. A step index fiber has a numerical aperture of 0.15. If the core refractive index is 1.45 and the core diameter is 90 μm. find the number of modes supported by the fiber with a wavelength of 0.9 μm.

33. Distinguish between ferromagnetism and antiferromagnetism.

34. Explain the numerical problems with step index profile.

35. The Fraunhoffer diffraction pattern due to a narrow slit, a screen is placed 2 m away from the lens to obtain the pattern. If the slit width is 0.2mm and the first minima lie 5mm on either sides of the central maximum, find the wavelength of light.

36. Explain the principle of optical fiber.

37. In Newton's rings experiment the diameter of certain order of dark ring is measured to be double that of second ring. What is the order of the ring?

38. The volume susceptibility of a magnetic material is 30×10^{-4}. Calculate the relative permeability. What is the nature of the substance?

(6 × 4 = 24 Marks)

SECTION – D

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

39. Draw and explain the step index and graded index fiber.

40. Describe the phenomenon of Fraunhoffer diffraction at a single slit.

41. With necessary theory and schematics describe the Fresnel diffraction at a straight edge.

42. State the properties of ferromagnetic materials. Explain with the help of the domain theory and also explain Curie temperature.

43. Give the theory of the series resonance (L,C,R in series) circuit. Obtain an expression for the resonance frequency and for the impedance at resonance.

44. Discuss the theory of interference in thin transparent film due to reflected light and obtain condition for the intensity to be maximum and minimum.

(2 × 15 = 30 Marks)
