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K – 2446

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**

**(2019 Admission Regular)**

Time : 3 Hours

Max. Marks : 80

**SECTION – A**

Answer any ten questions, each carries 1 mark.

1. Name an experiment to study interference.
2. Write any one use of Newton's ring experiment.
3. What do you mean by diffraction?
4. Write the use of a transmission grating in laboratory.
5. Write the expansion of *LASER*.
6. Define optical fibre.
7. Define magnetic susceptibility.
8. Define Curie temperature.

P.T.O.

9. Define resonance in an LCR circuit.

10. Define *r.m.s* value of current.

**(10 × 1 = 10 Marks)**

**SECTION – B**

Answer any eight questions, each carries 2 marks.

11. State the principle of superposition of waves.

12. What are coherent sources.

13. What are the essential conditions to get interference of light?

14. What are the difference between interference and diffraction?

15. Write any two differences between Fresnel and Fraunhofer diffractions

16. Explain the resolving power of a grating.

17. Define grade index fibre.

18. Explain the propagation of light through an optical fibre.

19. Explain population inversion.

20. What are the properties of laser light?

21. Write the relations connecting M, B and H in magnetism.

22. Explain the term Hysteresis.

23. Define ferromagnetic domains.

24. Define power factor in an ac circuit

25. What is the use of a choke coil?

26. Write the working of a transformer.

**(8 × 2 = 16 Marks)**

## SECTION – C

Answer any six, each question carries 4 marks.

27. In Newton's ring experiment the diameter of the 4<sup>th</sup> and 12<sup>th</sup> dark rings are 0.42 cm and 0.6 cm respectively. Obtain the wavelength of light used. Given that the radius of curvature of the lens used is 1 m
28. Intensity ratio of two coherent sources are 36:16. Calculate the ratio of amplitudes of the waves produced by the sources.
29. In a Young's double slit experiment, the slits are separated by 0.3 mm and the screen is placed 2 m away. The distance between the central bright fringe and the fourth fringe is measured to be 1.6 cm. Determine the wavelength.
30. A grating has 6000 lines per cm. Find the angular separation of the two yellow lines of mercury of wavelengths 577 nm and 579 nm in the 1st order.
31. A plane wave front is incident on a circular aperture of diameter 2.4 mm. Calculate the wavelength if the most intense point on the axis is at a distance of 2.5m.
32. Calculate the smallest angular separation of two stars in radian, that may be observed through a telescope. The objective of the telescope has a diameter of 250 cm and the wavelength.
33. Calculate the ratio of spontaneous emission to stimulated emission by an incandescent bulb at 2000K. Given that frequency  $\nu = 6 \times 10^{14}$  Hz
34. A step index fibre has the following parameters.  $n_1 = 1.68$ ,  $n_2 = 1.44$  and  $n_{\text{air}} = 1$ . Calculate the critical angle and maximum angle of refraction.
35. A rod of magnetic material 1 m in length has a coil of 200 turns wound over it uniformly. If current of 2 A is passing through it, calculate the magnetic field H, the intensity of magnetization M, and magnetic induction B and the relative permittivity  $\mu_r$ . Given that susceptibility  $\chi_m = 6 \times 10^{-3}$ .
36. Derive the relation connecting magnetic permeability and magnetic susceptibility of a material

37. Derive the expression for ac current passing through a circuit containing a capacitance and resistance in series?
38. An electric lamp works in a 120 V dc, 10 A source is connected to an alternating voltage of 220 V at 50 Hz. Calculate the required inductance of choke of the circuit.

**(6 × 4 = 24 Marks)**

#### SECTION – D

Answer any **two** each question carries **15** marks

39. Explain the interference in thin films by a reflected system and a transmitted system. How colours of thin films are observed?
40. Explain the Fresnel's theory of rectilinear propagation of light.
41. Explain the Fraunhofer diffraction in a single slit. Derive the expression for intensity distribution and draw the intensity distribution.
42. Explain the working of ruby laser in detail. Write any four applications of lasers.
43. Explain various types of magnetic behaviour shown by materials.
44. Discuss the behaviour of a series ac LCR circuit. Derive the expressions for the current, impedance and condition for resonance.

**(2 × 15 = 30 Marks)**