

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

(2018 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

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

1. What does the optical path length indicate?
2. Give the expression for the fringe width produced by Young's double slit experiment.
3. What are the factors on which the resolving power of a grating depends?
4. Diffraction at straight edge gives only few bands. Why?
5. Why does the core of the optical fiber have a higher refractive than cladding?
6. What is laser?
7. Why does Q factor be important in the degree of selectivity of the circuit while tuning?

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8. Classify magnetic materials in terms of the relative permeability.
9. What is power factor?
10. What is the sharpness of resonance?

(10 × 1 = 10 Marks)

SECTION – B

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

11. State the principle of superposition. Explain why superposition of different wave trains cannot produce interference.
12. Why do only thin films exhibit interference?
13. Why do the interference fringes produced by Newton's ring experiment be known as fringes of equal thickness?
14. Distinguish between interference and diffraction.
15. Discuss the determination of wavelength of a spectral line using transmission grating.
16. Obtain the expression for the resolving power of a plane transmission grating.
17. Distinguish between step index fiber and graded index fiber.
18. Explain the processes involved in the interaction of light and matter.
19. What is the difference between Curie temperature and Neel's temperature?
20. Why does a choke coil be significant for reducing the current in the ac circuit?
21. Discuss briefly the energy losses in transformers.
22. Explain the origin of atomic magnetic moments.

(8 × 2 = 16 Marks)

SECTION – C

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

23. What is the ratio of intensity at the centre of a bright fringe to the intensity at a point one quarter of the distance between two fringes from the centre?
24. When a liquid of refractive index 1.44 is introduced between the lens and the plate in the Newton's ring experiment, the diameter of the ring is reduced to 0.25 cm. What is the diameter of the same ring in the absence of the liquid?
25. Show that the area of all half period zones in the same.
26. In the Fraunhofer diffraction due to a narrow slit, the screen is placed 2 m away from the lens to obtain the pattern. Determine the slit width if the first minima lie 5 mm on either side of the central maximum. The wavelength of the monochromatic light used is 500 nm.
27. An optical fiber has a core refractive index of 1.450 and cladding refractive index of 1.445. Find its critical angle. What will be the angle of refraction if the light falls from cladding to core with the angle of incidence same as critical angle? Will there be total internal reflection?
28. Show that in an ac. circuit containing inductance and resistance in series the current lags in phase behind the emf by an angle $\tan^{-1}(L\omega/R)$
29. A resistance of 50Ω is connected in series with an inductance of 50 mH . What capacitance must be put in series with the combination to obtain maximum current? What will be the potential drop across each element of circuit, if it is connected to 220 V, 50 Hz mains?
30. The magnetic field intensity in a piece of ferric oxide is $2.5 \times 10^6 \text{ A/m}$, If the susceptibility of the material is 1.5×10^{-3} , calculate the magnetisation of the material, relative permeability and the magnetic field.
31. The electron in hydrogen atom revolves in an orbit of radius $50 \times 10^{-12} \text{ m}$ with frequency $7.0 \times 10^5 \text{ m}$ Find the current and magnetic field.

(6 × 4 = 24 Marks)

SECTION – D

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

32. Explain the construction and working of ruby laser with a neat energy level diagram.
33. Discuss the Fraunhofer diffraction at double slit.
34. How does emf be induced in a coil rotating in a magnetic field? Determine the mean, rms and effective value of ac current and voltage during a complete and half cycle.
35. Compare the features of various magnetic materials.

(2 × 15 = 30 Marks)

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