MAR IVANIOS COLLEGE (AUTONOMOUS)
THIRUVANANTHAPURAM

Reg. No. :…… **Name :…….**

Third Semester B.Sc. Degree Examination, November 2016
First Degree Programme under CBCSS
Complementary Course: Physics – III (for Chemistry)
AUPY331.2b: Optics, Magnetism and Electricity

(*for 2014 Admissions – **Improvement** Only*)

Time: **3** Hours Max. Marks: **80**

SECTION – A

*Answer **ALL** questions in a word or one or two sentences.*

1. What do you mean by the term optical path ?
2. What is meant by interference of light ?
3. Which optical phenomenon shows that light waves are transverse in nature ?
4. What is the origin of a circularly polarized light ?
5. What are the essential parts of a laser ?
6. What is meant by a step index fibre ?
7. In which direction a ferromagnetic material align when it is freely suspended in an external magnetic field ?
8. What is the relation between the magnetic vectors H, M and B ?
9. What is the form factor of a sinusoidal current ?
10. In a purely inductive circuit, what is the value of the power consumed ?

(10 × 1 = 10 Marks)

SECTION – B

*Answer any **EIGHT** questions, not exceeding a paragraph.*

11. What are the conditions for obtaining sustained interference ?
12. Why thick films do not exhibit interference ?
13. Write any two differences between interference and diffraction patterns.

14. Distinguish between Fresnel and Fraunhofer diffractions.
15. What do you mean by the resolving power of an optical instrument ?
16. List four different ways of producing linearly polarized light.
17. What is Brewster's law ?
18. Define the term specific rotation.
19. Distinguish between spontaneous and stimulated emission.
20. What do you mean by magnetic susceptibility ?
21. Define the term rms value of an alternating current.
22. Why a choke coil is preferred over an ohmic resistance for diminishing current in an ac circuit ?

(8 × 2 = 16 Marks)

SECTION – C

*Short essay type / Problems : Answer any **SIX** questions.*

23. Monochromatic light of wavelength 600 nm from a narrow slit is incident on a double slit. If the overall width of 10 fringes on a screen placed 1m away is 1 cm, what is the separation of the slits ?
24. In Newton's rings experiment with reflected light, the diameter of 15^{th} ring is 0.6 cm and that of 5^{th} ring is 0.3 cm. If the radius of the plano – convex lens is 100 cm, determine the wavelength of light used.
25. In 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 0.2 mm and the first minima lie at 5 mm on either sides of the central maximum, what is the wavelength of light used ?
26. Determine the minimum number of lines on a grating that will just resolve the sodium D1 and D2 lines 5890 Å and 5896 Å in the first order spectrum.
27. Calculate the thickness of doubly refracting glass plate capable of producing a path difference of $\frac{\lambda}{4}$ between ordinary and extraordinary waves. Given, the wavelength of light $\lambda = 5890$ Å, refractive index of ordinary ray = 1.54 and the refractive index of extra ordinary ray =1.53.
28. Determine the ratio of populations of the two states in a laser that can produce stimulated emission of wavelength of 6328 Å at 27 °C.

29. A step index fiber has a core of refractive index 1.55 and cladding of refractive index 1.5. Determine the numerical aperture of the fiber. Assume that light enters the fiber from air.
30. A magnetic material has a magnetization of 3300 A/m and flux density 0.0044 weber/m^2. Determine the magnetizing field intensity.
31. A coil has an inductance of 0.1 H and resistance of 12 ohms. It is connected to 220 V, 50 Hz mains. Determine the impedance of the coil.

(6 × 4 = 24 Marks)

SECTION – D

*Long essay type : Answer any **TWO** questions.*

32. Discuss the analytical treatment of interference. Plot the energy distribution and prove that the formation of interference fringes is in accordance with the energy conservation law.
33. Explain the Fresnel diffraction of a cylindrical wavefront at a straight edge. Draw the intensity distribution in the illuminated region and in the geometrical shadow.
34. Discuss the electron theory of magnetism and explain Ferromagnetism.
35. Obtain the relation between voltage and current in a series LCR circuit. Discuss the condition for resonance.

(2 × 15 = 30 Marks)

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