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 Mathematics)
AUPY331.2c: Optics, Magnetism and Electricity

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

SECTION – A

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

1. Why do the Newton's rings appear in a circular pattern ?

2. What is meant by diffraction of light ?

3. Give the expression for the resolving power of a grating.

4. Give the relation between B, H and M

5. What is meant by magnetic susceptibility ?

6. What are meta – stable states ?

7. What is meant by critical angle ?

8. Give one application of laser.

9. Give the expression for the resonant frequency of an LCR series circuit.

10. Give the relation between RMS value and peak value.

(10 × 1 = 10 Marks)

SECTION – B

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

11. State the conditions under which two waves can produce interference pattern.

12. Distinguish between interference and diffraction.

13. Infinitely thin films appear dark when viewed by reflected light. Explain.

P.T.O.

14. Distinguish between Fresnels and Frounhofer diffraction.

15. Why is the prism spectrum brighter than the grating spectrum ?

16. What is meant by population inversion ?

17. Explain optical pumping.

18. How do step index optical fibres differ from graded index optical fibres ?

19. Distinguish between dia, para and ferromagnetic materials.

20. What are antiferromagnets ?

21. Discuss current voltage relation for an AC through an RC circuit.

22. What are choke coils ?

(8 × 2 = 16 Marks)

SECTION – C

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

23. With a Newton's ring arrangement it is seen that the m th dark ring for light of wavelength λ_1 coincides with the (m+1) th dark ring of wavelength λ_2. If the radius of curvature of the convex surface is 90cms, find the diameter of the m the dark ring for λ_1. Given λ_1 =600 nm and λ_2 =450 nm.

24. In a plane diffraction grating, the number of lines per cm is 5000. Find the angular separation between the wavelength 546 nm and 548 nm in the second order.

25. What is the longest wavelength that can be observed in third order spectrum for a grating having 6000 lines per cm. Assume normal incidence ?

26. An iron bar of cross section area $3 \times 10^{-5}\ m^2$,and length 0.2 m is kept parallel to a magnetic field of intensity 5000 A/m. It acquires a magnetic moment of 3 A-m^2. Calculate the magnetic susceptibility of the material.

27. The magnetic susceptibility of a ferromagnetic material at 1500 K is 4×10^{-4} and at 1100 K is 2×10^{-3}. Find the Curie constant and Curie temperature.

28. In an optical fibre, the core material has refractive index 1.61 and the cladding material has a refractive index 1.35. What is the value of the critical angle ?

29. Find the ratio of population of the two states in a He-Ne laser at 37^0 C that produces light of wavelength 632.8 nm.

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30. Magnetic flux through a coil increases according to the relation

$\Phi_B = 10^{-3}(6t^2 + 7t)$ with time t in seconds. What is the magnitude of the induced emf in it at time t= 2 seconds.

31. A 50 mH inductor is connected to an ac generator with $E_m = 30\,V$. What is the amplitude of the resulting alternating current if the frequency of the emf is 1.0 K.Hz

(6 × 4 = 24 Marks)

SECTION – D

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

32. Derive the expression for the path difference introduced when a thin film is viewed by reflected monochromatic light.

33. Give the theory of plane transmission grating and describe how it is used to determine the wavelength of light.

34. An alternating *emf* is applied to a circuit containing a capacitor and resistance in series. Calculate the current in the circuit at any instant and the impedance.

35. Give the electron theory of Magnetism.

(2 × 15 = 30 Marks)

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