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

(*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 coherence length ?
2. What are Haidinger fringes ?
3. The function of a Fresnel half period zone corresponds to which type of lens ?
4. What do you mean by the grating constant of a plane transmission grating ?
5. In a ruby laser, the energy levels used for lasing action are of which element ?
6. Draw the refractive index profile of a step index fiber.
7. What is the sign of magnetic susceptibility for a diamagnetic specimen ?
8. Write down the relation between the magnetic vectors H, M and B.
9. What is meant by copper loss in a transformer ?
10. In a purely capacitive circuit, what is the value of the power consumed ?

(10 × 1 = 10 Marks)

SECTION – B

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

11. Explain why the superposition of incoherent waves cannot produce interference pattern.
12. For interference in thin films in the reflected system, write down the condition for constructive and destructive interference.

13. What is diffraction ? What is the condition for obtaining a noticeable diffraction effect ?
14. Distinguish between single slit and double slit Fraunhofer diffraction patters using a neat diagram.
15. Write any two differences of prism and grating spectra.
16. Using suitable figure, discuss what is meant by induced absorption.
17. List four applications of lasers.
18. What is the principle of light propagation in an optical fiber ?
19. What do you mean by magnetic permeability ?
20. Discuss the magnetic ordering in anti – ferromagnetic materials.
21. Explain the term sharpness of resonance.
22. What do you mean by wattles current ?

(8 × 2 = 16 Marks)

SECTION – C

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

23. Two coherent sources are 0.2 m apart and the fringes are observed on a screen 1 m away. It is found that the fourth bright fringe is situated at a distance of 1.1 mm from the central fringe. Estimate the wavelength of light used.
24. A parallel beam of sodium light 589 nm is incident on a thin glass plate of refractive index 1.5 such that the angle of refraction into the plate is 60 degrees. Calculate the smallest thickness of the glass plate that will appear dark by reflection.
25. A parallel beam of monochromatic light is allowed to incident normally on a plane diffraction grating having 1250 lines/cm and a second order spectral line is observed to be deviated through 30 degrees. Calculate the wavelength of the spectral line.
26. Determine the angular width of the central bright maximum in the Fraunhofer diffraction pattern of a slit of width 12×10^{-5} cm when the slit is illuminated by monochromatic light of wavelength 600 nm ?
27. 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.
28. 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.

29. An iron rod of area of cross – section 0.5 cm^2 is subjected to a magnetizing field of 1000 Am^{-1}. If the susceptibility of iron is 599, determine the permeability of the specimen and magnetic induction.

30. Obtain the resonant frequency of a series LCR circuit with L = 3 H, C = 27μF and R = 7.4 ohms.

31. An alternating voltage of 10 volts at 100 Hz is applied to a choke coil inductance 5 H and resistance 200 ohms. Determine the power factor of the coil.

(6 × 4 = 24 Marks)

SECTION – D

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

32. With the help of a neat diagram discuss a method by which Newton's rings are formed. Write down the condition for bright and dark rings. Obtain a relation for the radius of the rings for the Newton's rings formed by reflected light.

33. Discuss the Fraunhofer diffraction pattern due to a single slit. Draw a curve showing the intensity distribution in the diffraction pattern.

34. Discuss the electron theory of diamagnetism, paramagnetism and ferromagnetism.

35. Obtain the relation between voltage and current in series LC and RC circuits. Draw the respective voltage and current waveforms.

(2 × 15 = 30 Marks)

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