



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

Time: 3 Hours

Max. Marks: 80

SECTION – A

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

1. What is destructive interference ?
2. What is the relation between phase difference and path difference ?
3. What is diffraction ?
4. What is double refraction ?
5. What is stimulated emission ?
6. What is numerical aperture ?
7. What is Curie temperature ?
8. Define magnetic permeability.
9. Define the effective value of an alternating current.
10. What is the power factor of an ac circuit ?

(10 × 1 = 10 Marks)

SECTION – B

Answer any EIGHT questions, not exceeding a paragraph.

11. Explain the colour of thin film.
12. Using analytical treatment of interference, obtain the expression for intensity of light.

P.T.O.

1579

13. What are the conditions for producing an observable interference pattern ?
14. Distinguish between Fresnel and Fraunhofer diffraction.
15. Derive an expression for the resolving power of a plane transmission grating.
16. Distinguish between positive and negative crystals.
17. Explain the characteristics of a laser beam.
18. Distinguish between a step index fiber and a graded index fiber.
19. What are the properties of a ferromagnetic substance ?
20. Explain diamagnetism on the basis of electron theory of magnetism.
21. Derive an expression for the emf induced in a coil rotating in a uniform magnetic field.
22. Show that $I_{rms} = \frac{I_0}{\sqrt{2}}$

(8 × 2 = 16 Marks)

SECTION – C

Short essay type / Problems : Answer any SIX questions.

23. An oil film of refractive index 1.5 is illuminated by a light of wavelength 5890 Å. If the eighth dark band is seen at an angle of 30° from the normal, find the thickness of the film.
24. A plane transmission grating has 5000 lines per cm and is adjusted for normal incidence. At what angle will the second order spectral line be seen using a light of wavelength 5790 Å ?
25. A screen is placed 2 m away from a narrow slit which is illuminated with a light of wavelength 6000 Å. If the first minimum lies 5 mm on either side of the central maximum, calculate the slit width.
26. A calcite prism having refracting angle 60°, cut with its axis parallel to the edge is taken and sodium light is incident normally on one of the faces. Calculate the deviation for the ordinary and extra ordinary rays ($\mu_O = 1.658$, $\mu_E = 1.486$).
27. The faces of a quartz plate are cut parallel to the optic axis of the crystal. What is the thinnest possible plate that would serve to put the ordinary and extra ordinary rays of wavelength 5890 Å a half wave apart on emerging out ? ($\mu_O = 1.544$, $\mu_E = 1.553$).

28. The tube in a polarimeter is 20 cm long is filled with sugar solution formed by dissolving 10 g of sugar in 40 cc. If the rotation is 34° , find the specific rotation of the sugar.
29. What is the critical angle of an optical fiber if the refractive indices of core and cladding are 1.53 and 1.42 respectively ?
30. The horizontal component of the magnetic flux density of the earth's field is 0.3×10^{-4} T. What is the horizontal component of the magnetic intensity ?
31. A coil of inductance 0.5 H and resistance 100Ω is connected to a 240 V, 50 Hz ac supply. What is the maximum current through the coil ?

(6 × 4 = 24 Marks)

SECTION – D

Long essay type : Answer any TWO questions.

32. Describe the theory and experiment to determine the wavelength of light by Newton's rings method.
33. Describe with figure and necessary theory the diffraction effects produced by two slits. Explain the missing orders in a double slit diffraction pattern.
34. Define magnetic induction B, magnetization M and magnetic intensity H. Deduce the relation between these three vectors. Deduce the relation between susceptibility and permeability.
35. With the help of a neat figure and phasor diagram, derive an expression for the instantaneous current in a series LCR ac circuit. Also obtain the condition for resonance.

(2 × 15 = 30 Marks)

∫*