MAR IVANIOS COLLEGE (AUTONOMOUS)
THIRUVANANTHAPURAM

Reg. No. :…… **Name :…….**

Third Semester B.Sc. Degree Examination, November 2015
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. A single slit diffraction pattern is obtained on a screen using yellow light. If the yellow light is replaced by blue light without making any other changes in the experimental set up, what will happen to the diffraction bands ?
2. How are the coherent rays obtained for the interference pattern in Newton's ring arrangement ? Give the ray diagram for the set – up.
3. Plane polarised light is allowed to pass through a quarter wave plate with the angle between the direction of vibration and the optic axis as 60°. What will be the nature of the resulting light ?
4. What is the polarising angle for glass ?
5. What is Peak factor ?
6. What is the difference between impedance and resistance ?
7. What is Susceptance ?
8. What are the conditions for total internal reflection ?
9. What do you mean by the term 'resolving power of grating' ?
10. Represent graphically the variation of refractive index across the diameter of i). Step index fibre and ii). Graded index fibre.

(10 × 1 = 10 Marks)

P.T.O.

SECTION – B

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

11. Why optical fibre cable is preferred to metallic cables in communication systems ?
12. Explain why very thin films appear black in reflected light.
13. What is population inversion ? Give one method of achieving it.
14. Distinguish between diamagnetic, paramagnetic and ferromagnetic materials with reference to their relative permeabilities.
15. What is meant by Q factor ?
16. What is power factor of an A.C circuit ?
17. Obtain the expression for fringe width in Young's double slit experiment.
18. Show that the resolving power of a grating depends on the total number of lines on it.
19. With the help of Fresnel's theory show that light travels in straight line.
20. Explain double refraction.
21. State and explain Brewster's law.
22. What is the relation between quality factor & bandwidth ?

(8 × 2 = 16 Marks)

SECTION – C

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

23. A magnetic material has a magnetization of 3300 A/m and flux density 0.0044 weber/m^2. Determine the magnetizing field intensity and susceptibility.
24. Calculate the numerical aperture for a step index fibre with $n_1 = 1.470$, $n_2 = 1.455$ and $n_0 = 1$.
25. A laser transition takes place between the energy levels 20.66 eV and 18.7 eV. Find the wavelength of the laser beam produced. [Given Planck's constant = 6.63×10^{-34} Js].
26. In Newton's ring experiment, the diameter of fourth and twelfth rings is 4 mm and 7 mm respectively. Calculate the diameter of the 20^{th} ring.

27. A transmission grating 4 cm long has 4000 lines per cm. Compute the resolving power of the grating for a wavelength of 589 nm. Will the grating separate the two lines of wavelength 589 nm and 589.6 nm which constitute the sodium yellow doublet ?
28. A coil has an inductance of 0.1 H and resistance of 12 ohm. It is connected to a 220V, 50 Hz main. Determine i). the reactance of the coil ii). impedance of the circuit and iii). power factor.
29. A circuit containing an inductance of 50 μH in parallel with a capacitor is used to pick up radio waves of frequency 1.007 MHz. What is the capacitance of the capacitor ?
30. A rod of magnetic material 0.5 m in length has a coil of 200 turns wound over it uniformly. If a current of 2 A is sent through it, calculate i). the magnetizing field ii). the intensity of magnetization and iii). the magnetic induction. Given susceptibility $\chi = 6 \times 10^{-3}$.
31. Calculate the specific rotation if the plane of polarization is turned through 26.4^0, traversing 20 cm length of 20% sugar solution.

(6 × 4 = 24 Marks)

SECTION – D

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

32. Discuss the theory of diffraction grating. Describe in detail how would you use a transmission grating to determine the wavelength of light.
33. Explain the basic principle of laser action. Describe how lasing action is achieved in ruby laser.
34. Give an account of internal magnetic field theory in ferromagnetism. On the basis of this how will you explain hysteresis and Curie point ?
35. Give the theory of a series resonant circuit. What is meant by sharpness of resonance ? How does it depend on the constants of the circuit ?

(2 × 15 = 30 Marks)

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