Reg. No. : ...............................

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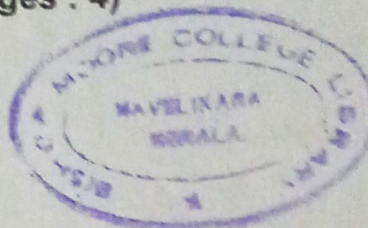
Third Semester B.Sc. Degree Examination, March 2022

First Degree Programme under CBCSS

Physics

Complementary Course for Chemistry

PY 1331.2 : OPTICS, MAGNETISM AND ELECTRICITY

(2018 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions. **Each** carries **1** mark.

1. What are coherent sources?

2. Define bandwidth.

3. Distinguish between Fresnel and Fraunhofer diffraction.

4. What is a grating?

5. State Brewster's law.

6. What is meant by pumping?

7. Give two properties of ferromagnetic substances.

8. What is meant by rms value of an alternating current?

9. Define magnetic permeability.

10. What is a choke coil?

$$(10 \times 1 = 10 \text{ Marks})$$

## SECTION – B

Answer any **eight** questions. **Each** question carries **2 marks.**

11. Explain the phenomenon of color of thin films.

12. What are Fresnel's half period zones? Why are they called so?

13. How will you determine the refractive index of a liquid using Newton's rings?

14. Write down the condition for diffraction maxima and minima in a double slit Fraunhofer diffraction and explain the symbols.

15. Explain how elliptically polarized light can be produced.

16. What are negative and positive crystals?

17. What is the difference between a step index fiber and graded index fiber?

18. Write the relation between B, H and M in magnetism.

19. Explain diamagnetism based on electron theory.

20. What is the difference between a step-up and step-down transformer.

21. Write the expression for the impedance of a circuit containing inductance and resistance in series.

22. Give the expression for the resonant frequency of a LCR series circuit.

$$(8 \times 2 = 16 \text{ Marks})$$

# SECTION – C

Answer any six questions. Each question carries 4 marks.

23. A soap film is illuminated by white light incident at an angle of $30°$. The reflected light is examined by a spectroscope in which dark band corresponding to the wavelength 600 nm is found. Calculate the smallest thickness of the film. $\mu = 1.33$.

24. In a Newton's ring experiment, the radius of curvature of the lens is 5m and its diameter is 2cm. Calculate the total number of rings formed. Wavelength = 5500 $A°$. Also calculate the number of rings, if the system is kept in water. $\mu$ of water is 1.33.

25. Calculate the thickness of (a) a quarter waveplate, and (b) a half waveplate. Given $\mu_0 = 1.973$, $\mu_e = 2.656$, and wavelength is 590 nm.

26. A plane transmission grating which has 5500 lines/cm is used to produce a spectrum from a mercury lamp. What will be the angular separation of the two yellow mercury lines of wavelength = 577nm and 579.1nm when viewed in the second order.

27. Find the half angular width of the central bright maximum in the Fraunhofer diffraction pattern of a slit of width $12 \times 10^{-5}$cm, when the slit is illuminated by monochromatic light of wavelength 600 nm.

28. The energy level difference between two laser levels is 0.21 eV. Determine the wavelength of radiation.

29. An iron rod, 0.2m long, 10mm in diameter and of relative permeability 1000 is placed inside a long solenoid wound with 300 turns per meter. If a current of 0.5A is passed through the rod, find the magnetic moment of the rod.

30. Show that the current leads the applied emf by $\pi/2$ when ac is passed through a circuit containing a capacitor.

31. A coil has an inductance of 0.1 H and a resistance of $12\Omega$. It is connected to a 220V, 50Hz mains, determine the reactance of the coil and impedance of the coil.

(6 × 4 = 24 Marks)

## SECTION – D

Answer any **two** questions. **Each** carries **15** marks.

32. What are Newton's rings. With a neat diagram, explain how these can be used to determine the wavelength of monochromatic light.

33. Discuss in detail Fraunhofer diffraction due to a double slit.

34. An alternating emf is applied to a circuit containing an inductor, capacitor and resistor in series, Obtain expressions for the current, impedance and phase of the current.

35. Give the theory of plane diffraction grating. Explain how it is used to measure the wavelength of a given source of light.

(2 × 15 = 30 Marks)