21100832

QP CODE: 21100832

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) EXAMINATION, MARCH 2021

Fourth Semester

Complemetary Course - PH4CMT02 - PHYSICS - OPTICS AND SOLID STATE PHYSICS

(Common for B.Sc Chemistry Model I, B.Sc Geology Model I)

2017 Admission onwards

3F2A95E2

Time: 3 Hours Max. Marks : 60

Part A

*Answer any **ten** questions.*

*Each question carries **1** mark.*

1. Excessively thin films even when illuminated with white light appear black in reflected light. Explain why?
2. Distinguish between interference and diffraction.
3. What is polarization? Can sound wave be polarised ? Explain.
4. Explain polarization by selective absorption.
5. State Malu's law.
6. What do you mean by active medium in laser?
7. Why population inversion is not possible in two level systems?
8. Write two examples of non-polar molecules.
9. Describe formation of electric polarisation in a thin sheet of dielectric placed in an electric field.
10. What do you mean by pyroelectric effect?
11. List the basic crystal systems.
12. Calculate the linear density along the face diagonal of an FCC unit cell of lattice constant a.

(10×1=10)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. A two slit young's experiment is done with monochromatic light of wavelength 6000 Å. Slits are 2 mm apart and fringes are observed on a screen placed 10 cm away from the slits. If a transparent plate of thickness 0.5 mm is placed in front of one of the slit interference pattern shifts by 5mm. Find the refractive index of the transparent plate.

14. Two straight and narrow parallel slits 1 millimeter apart are illuminated by a monochromatic light. Fringes formed on the screen held at distance of 100 cm are 0.5 mm apart. What is the wavelength of the light used?

15. Newton's rings are observed in reflected light of wavelength 5893 Å. The diameter of 10^{th} dark ring is 0.005 m. Find the radius of curvature of the lens and thickness of the air film.

16. A plane transmission grating has 140000 lines to an inch for a length of 6 inches. If the wavelength region is $5x10^{-5}$ cm, find the resolving power of the grating in the first order and the smallest wavelength difference that can be measured.

17. A 20 cm long tube containing 50 cm^3 sugar solution producers and optical rotation of 10^0. Calculate the quantity of sugar solution contained in the solution. Specific rotation of sugar is 65^0.

18. What is laser? What are the main components in a laser source? Distinguish between spontaneous emission and stimulated emission.

19. Two parallel plates have equal and opposite charges and are separated by a dielectric 5 mm thick, of dielectric constant 3. If the electric field intensity in the dielectric is 10^6 v/m, calculate the polarization P in the dielectric and the electric displacement vector D in the dielectric.

20. Discuss the NaCl crystal structure.

21. X-rays with wavelength 1.54 Å are reflected from the (1 1 0) planes of a cubic crystal with unit cell a = 6 Å. Calculate the Bragg angle, θ, for all orders of reflection, n.

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **10** marks.*

22. Derive an expression for conditions of brightness and darkness on a plane film.

23. What are the differences between fresnel and fraunhofer diffraction? Derive the expression for the wavelength in normal incidents.

24. With the help of geometry of optical fibre explain how light is propagated through and optical fibre. Derive the equation of numerical aperture of an optical fibre.

25. describe the crystal systems with neat diagrams.

(2×10=20)