BACHELOR'S DEGREE (C.B.C.S) EXAMINATION, MARCH 2025
2018, 2019, 2020, 2021, 2022 ADMISSIONS SUPPLEMENTARY
SEMESTER IV - COMPLEMENTARY COURSE 2 (PHYSICS)
PH4C02B18 - Physical Optics , Laser Physics and Superconductivity

Time : 3 Hours   Maximum Marks : 60

Part A

I. Answer any Ten questions. Each question carries 1 mark   (10x1=10)

1. Distinguish between Haidinger's fringes and fringes of equal thickness

2. Explain the factors which affect the width of interference fringes.

3. Define the term resolving power.

4. For a plane diffraction grating with 5000 lines/cm, used at normal incidence. Find the longest wavelength of light for which the spectrum can be observed.

5. The quarter and half wave plates are generally called retardation plates. Why?

6. Distinguish between plane of polarization and plane of vibration.

7. Distinguish between positive and negative uniaxial crystals.

8. Explain the quantum theory of light.

9. Explain the features of stimulated emission.

10. Define critical angle. Obtain the relation connecting refractive index and critical angle.

11. Distinguish between holography and photography.

12. Explain the term superconductivity.

Part B

II. Answer any Six questions. Each question carries 5 marks   (6x5=30)

13. Prove that two interfering waves of equal amplitude produce a region of maximum amplitude and complete darkness.

14. Two coherent sources whose amplitudes are in the ratio 4: 7 produce an interference pattern. Calculate the ratio of maximum and minimum intensity in the fringe system.

15. A narrow slit illuminated by the light of wavelength 450 nm is placed at a distance of 20cm from a straight edge. Calculate the distance between the second and third diffraction maxima formed on a screen placed at a distance of 60cm from a straight edge.

16. At what angle of incidence will the light reflected from glass (μ = 1.5) be completely polarized? Does this angle depend on the wavelength of light? Justify your answer.

17. Find the thickness of calcite plate which would convert plane polarized light into circularly polarized light. Wavelength of light used is 5890 Å. n_E=1.486 and n_O=1.658. .

18. Prove that the probability of stimulated absorption is equal to that of stimulated emission.

19. The ratio of population of two states energy levels out of which the upper one corresponds to metastable state is 2.54×10^{-30}. Find the frequency of light emitted at $T = 430 K$.

20. Explain the application of fiber optics in communication system.

21. Describe ac and dc Josephson effect.

Part C

III. Answer any Two questions. Each question carries 10 marks   **(2x10=20)**

22. Explain Young's double-slit experiment set up and derive the expression for the fringe width.

23. With necessary theory, explain an experiment to determine the wavelength of prominent lines of white light using diffraction grating.

24. Explain double refraction on the basis of Huygens theory .

25. With the help of a schematic diagram, explain different types of fiber optic configurations.