

Q.P. Code : 1044

(REVISED COURSE)

(2 Hours)

[Total Marks : 60

- N.B.:** (1) Question No.1 is **compulsory**.
 (2) Attempt any three questions from Q.2 to Q.6.
 (3) Use suitable data wherever required.
 (4) **Figures** to the **right** indicate **full** marks.

1. Attempt any five of the following :- 15
- Comment on colours in a soap film in sunlight.
 - What is Rayleigh's criterion of resolution ? Define resolving power of a grating.
 - Calculate V number for an optical fiber having numerical aperture 0.25 and core diameter $20 \mu\text{m}$ if it is operated at $1.55 \mu\text{m}$.
 - Compare light from ordinary source with laser light.
 - How phase difference between two signals is measured using CRO ?
 - What are the properties of matter waves ?
 - A superconductor has a critical temperature 3.7°K at zero magnetic field. At 0°K the critical magnetic field is 0.0306 Tesla . What is the critical magnetic field at temperature 2.0°K ?
2. (a) Show that the diameter of Newton's n^{th} dark ring is proportional to square root of ring number. In Newton's rings experiment the diameter of 5^{th} dark ring was 0.336 cm and that of 15^{th} dark ring was 0.590 cm . Calculate the radius of curvature of plano-convex lens if wavelength of light used is 5890 \AA . 8
- (b) Derive an expression for numerical aperture of step index optical fiber. What are the advantages of using an optical fiber ? 7
3. (a) Explain construction and working of He-Ne laser. What are its merits ? 8
- (b) Derive the condition for a thin transparent film of constant thickness to appear bright and dark when viewed in reflected light. 7
4. (a) Calculate the maximum order of diffraction maxima seen from a plane diffraction grating having $5500 \text{ lines per cm}$ if light of wavelength 5896 \AA falls normally on it. 5
- (b) Derive Schrodinger's time-independent wave equation. 5
- (c) Define the term superconductivity. Show that in the superconducting state the material is perfectly diamagnetic. 5

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5. (a) A slit of width 0.3 mm is illuminated by a light of wavelength 5890 Å. A lens whose focal length is 40 cm forms a Fraunhofer diffraction pattern. Calculate the distance between first dark and the next bright fringe from the axis. 5
- (b) An electron is accelerated through 1000 volts and is reflected from a crystal. The first order reflection occurs when glancing angle is 70° . Calculate the interplanar spacing of a crystal. 5
- (c) Explain construction and working of Atomic Force Microscope. 5
6. (a) State Heisenber's uncertainty principle. Show that electron cannot pre-exist in free state in a nucleus. 5
- (b) Draw a labelled diagram and explain construction and working of CRT. 5
- (c) Explain top down and bottom up approaches to prepare nanomaterials. 5
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