F.E - SEM-II - AP-II
(CBSGS)

(430)

19/05/201

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 whereever required.
(4) **Figures** to the **right** indicate **full** marks.

1. Attempt any five of the following :- 15
   (a) Comment on colours in a soap film in sunlight.
   (b) What is Rayleigh's criterion of resolution ? Define resolving power of a grating.
   (c) Calculate V number for an optical fiber having numerical aperture 0.25 and core diameter 20 μm if it is operated at 1.55 μm.
   (d) Compare light from ordinary source with laser light.
   (e) How phase difference between two signals is measured using CRO ?
   (f) What are the properties of matter waves ?
   (g) A superconductor has a critical temperature 3.7°K at zero magnetic field. At O°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 Å. 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 lines per cm if light of wavelength 5896 Å 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

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 form 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 70^0. 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
