FE (sem II (All Branch)

Applied Physics - II

11/12

10:30 to

Con. 3703-09.

(REVISED COURSE)

SP—8468

(2 Hours)

[Total Marks : 75]

N. B. :   (1)   Question No. **1** is **Compulsory**.

(2)   Attempt any **four** questions from Q. nos. **2** to **7**.

(3)   Figures to the **right** indicate **full** marks.

(4)   Use **suitable** data wherever **necessary**.

1.   Solve any **five** from the following :—   1

(a)   Why is the wave nature of matter not more apparent in our daily life.

(b)   Explain why the system of Newton's rings observed by transmitted light is complimentary to that observed by reflected light.

(c)   Distinguish between single mode and multimode optical fibres.

(d)   Why x-ray and Laser are so powerful than ordinary visible light.

(e)   Explain the terms Diamagnetism, Paramagnetism and ferromagnetism on the basis of magnetic dipoles of atoms.

(f)   What are the types of diffraction and differentiate between them.

(g)   Explain the relationship between $\vec{B}$, $\vec{H}$, and $\vec{I}$.

2.   (a)   What is grating and grating element ? Explain the experimental method of   1
determination of wavelength of spectral line using diffraction grating.

(b)   Compute the maximum radius allowed for a fibre having core refractive index 1·47 and cladding refractive index 1·46. The fibre is to support only one mode at a wavelength of 1300 nm.

3.   (a)   What is de Broglie concept of matter waves ? Derive one dimensional time   1
dependent schrodinger equation for matter waves.

(b)   A soap film of refractive index 4/3 and thickness $1\cdot5 \times 10^{-4}$cm is illuminated by white light incident at an angle of 45°. The light reflected by it is examined by a spectroscope in which is found a dark band corresponding to a wavelength of 5000 A°. Calculate the order of interference band.

4.   (a)   What are the factors responsible for Hysterisis loss ? Prove that the area of B-H curve is equal to the Hysterisis loss per unit volume of the specimen in one cycle.

(b)   Explain Heisenberg's uncertainty principle with an example and give its physical significance.

(c)   Calculate the kinetic energy of an electron whose de-Broglie wavelength is 5000 A°.
(Given Mass of electron = $9\cdot108 \times 10^{-31}$ kg.

Planck's constant = $6\cdot625 \times 10^{-34}$ J.sec.)

5. (a) Obtain the expression for n^{th} dark ring in case of Newton's rings experiment. Hence explain the suitable way to calculate refractive index of a liquid using same set up.

(b) Explain the terms :
   (1) Spontaneous emission
   (2) Stimulated emission
   (3) Metastable state
   (4) Population Inversion

(c) An electron has a speed of 400 m/sec with uncertainity of 0·01%. Find the accuracy in its position.

6. (a) Explain with neat sketch the principle, working and application of the Nd : YAG laser. 1(

(b) A magnetic material has magnetizing force 198 A/m and magnetization of 2300 A/m. Find.
   (1) Corresponding flux density   (2) Relative Permeability.

7. (a) Write short notes on :—   1(
   (1) Molecular modeling in biophysics