

Con. 5731-11.

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MP-2500

(2 Hours)

[Total Marks : 75]

- N.B. :** (1) Question No. 1 is **compulsory**.
 (2) Solve any **four** questions from Question Nos. 2 to 7.
 (3) Use **suitable** data whenever **necessary**.

1. Answer any **five** from the following :— 15
 - (a) Explain the conditions of sustained interference pattern of light.
 - (b) What do you mean by diffraction and state its types.
 - (c) Explain two types of Light Sources used in optical communication systems.
 - (d) Why Electron microscope is consider better than optical microscope ?
 - (e) Explain De-Broglie's hypothesis.
 - (f) Define relative permeability and susceptibility. Write the relation between them.
 - (g) What do you mean by Vacuum ? What are various gauges used to measure vacuum ?
2. (a) Obtain the condition for maxima and minima due to interference in a wedge-shaped film observed in reflected light. Derive the expression for fringe width. 8
 (b) What is diffraction grating ? What is the advantage of increasing the number of lines in a grating ? In an experiment with grating, third order spectral line of wavelength λ , coincides with the fourth order spectral line of wavelength 4992 Å. Calculate the value of λ . 7
3. (a) What is De-Broglie concept of matter-waves ? Derive one dimensional time dependent Schrodinger equation for matter waves. 8
 (b) Derive the expression of numerical aperture for a step index fibre. Calculate the acceptance angle for the fibre in water of refractive index 1.33 given that N.A. is 0.2 and cladding refractive index is 1.59. 7
4. (a) Obtain an expression for the radius of the n^{th} dark ring in the case of Newton's rings. White light falls normally on a soap film of thickness 5×10^{-5} cm and of refractive index 1.33 which wavelength in the visible region will be reflected most strongly. 8
 (b) What is holography ? Explain the process of recording and reconstruction of hologram. 7
5. (a) With neat energy level diagram describe the construction and working of He-Ne laser. What are its merits and demerits ? 8
 (b) Differentiate between soft and hard magnetic materials. In a magnetic material the field strength is found to be 10^6 ampere/m. If the magnetic susceptibility of the material is 0.5×10^{-5} . Calculate the intensity of magnetization and the flux density in the material. 7
6. (a) Explain the atomic origin of ferromagnetism ? Differentiate between diamagnetic and paramagnetic materials. 8
 (b) Show that electron can not pre-exist in free state in a nucleus. An electron has a speed of 4×10^5 metre/sec. accurate to 0.01%. With what accuracy can we locate the position of the electron ? 7
7. Write short notes on any **three** of the following :— 15
 - (a) AFM.
 - (b) Rotary Pump.
 - (c) Anti reflecting film.
 - (d) Holography.