QP Code : **3057**

(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) Use suitable **data** wherever **required**.
   (4) **Figures** to the **right** indicate **full** marks.
   (5) **Illustrate** your answer with **sketches** wherever **necessary**.

1. Solve any **five** from the following:- 15
   (a) Explain the formation of colors with in a thin film of transparent material when illuminated by sunlight?
   (b) Calculate the numerical aperture of a fibre with core index 1 .61 and cladding index 1.55?
   (c) Explain optical resonator used in laser source?
   (d) State and explain De' Brogli's hypothesis about matter?
   (e) Define relative permeability and susceptibility and write the relation between them?
   (f) What is magnetic circuit? Define magnetomotive force and reluctance?
   (g) What are different ranges of vacuum? Write name of various gauges used to measure vacuum?

2. (a) Explain construction and working of He-Ne laser source? Comment on its efficiency? 8
   (b) Light falls normally on a soap film of thickness 5×10^{-5} cm and refractive index 1.33. Calculate the wavelength in the visible region reflected most strongly? 7

3. (a) Derive the expression for numerical aperture and acceptance angle for step index optical fibre? Write its significance? 8
   (b) Describe the construction and working of semiconductor laser Write its importance? 7

4. (a) Show that in Newton's rings experiment diameter of nth dark ring is directly proportional to square root of natural number? 5
   (b) If the de-broglie wavelength associated with the moving electron is 5000 A^0, calculate its kinetic energy in terms of electron volt? 5
      (Given m_e = 9.108 $\times 10^{-31}$ kg Planks constant = 6.625 $\times 10^{-34}$ J-Sec.)
   (c) Define magnetomotive force? Calculate the current required to demagnetise the magnet of coercivity 5×10^3 amp/m kept in a solenoid of length 10cm and having 50 turns. 5

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5.   (a) Light incident on a grating of 0.5 cm wide with 3000 lines. Find the angular   5
          separation in Second order of two sodium lines 5893 A⁰ and 5896 A⁰
     (b) State and explain Heisenberg's uncertainty principle? Give its experimental   5
          illustration?
     (c) Explain the construction and working scanning electron microscope?   5

6.   (a) Calculate the minimum space required by the electron to be confined in an   5
          atom if the uncertainty in the measurement of its speed is 2 X 10⁴ m/sec.
          (Given m_e = 9.108 X 10⁻³¹ kg, h = 6.63 X 10⁻³⁴ J-Sec.)
     (b) Explain the laboratory method to determine the wavelength of light source   5
          using plane transmission grating?
     (c) Sketch the hysteresis loop and explain the terms retentivity, coercivity,   5
          magnetization and magnetic suceptibility?

7.   (a) Distiguish between single mode and multimode optical fibre?   5
     (b) Distinguish between holography and ordinary photography?   5
     (c) Distinguish between soft and hard magnetic material?   5

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