PHYSICS
(PH-101, Dec 2004)

Time: 3 Hrs   Max Marks: 60

Note: Section A is compulsory. Attempt any five questions from Section B and C taking at least two questions from each Section.

Section-A
1. (a) State the faraday's law in electromagnetic induction.
    (b) Define magnetic intensity and magnetization.
    (c) What is difference between stimulated and spontaneous emission?
    (d) What is numerical aperture?
    (e) State Einstein's postulates of special theory of relativity.
    (f) Explain Bragg's law.
    (g) What is Uncertainty principle?
    (h) What is meissner effect?
    (i) Give the Born interpretation of wave function.
    (j) What is dielectric polarization?

Section-B
2. State and prove the Gauss's law in electrostatics and express it in differential form
    $\Delta . E = P/\varepsilon_0$
3. What do you understand by magnetic materials? What are differences between hard and soft magnetic materials?
4. What do you understand by holography? Derive the relation between Einstein coefficients.
5. What is total internal reflection? Calculate the numerical aperture and hence the acceptance angle for an optical fiber given than refractive index of the core and cladding are 1.45 and 1.40 respectively.

Section-C
6. Show that the mass of the body in motion is given by $m = m_0 / \sqrt{(1-v^2/c^2)}$
    Where m_0 is the rest mass and v is the velocity of the body.
7. Explain the production of characteristic X-ray spectra. An X-ray tube operated at 40 KV emits a continuous X-ray spectrum with a short wavelength limit $X_m = 0.310$ Å. Calculate the Plank's constant.
8. For a particle in one dimensional box, show the value of uncertainly product
    $\Delta x \, \Delta p = h [(n^2\pi^2)/12 - 1/2]^{1/2}$
9. What is superconductivity? What are differences between Type-I and Type-II superconductors? A type-I superconductor with $T_C = 7K$ has shape $dB_T/d_T = -25mT/K = T_C$
    Estimate its critical field at 6K. Calculate the jump in specific heat at T_C.