Roll No .....

BE - 201

B.E. I & II Semester Examination, December 2014

Engineering Physics

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each questions are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

Unit - I

1. a) What do you understand by wave function, discuss its physical significance?

   b) State and explain Heisenberg's uncertainty principle. Explain diffraction of electron beam by a single slit to illustrate this principle.

   c) The uncertainty in measuring the speed of an accelerated electron is 1.2×10^{5} m/s. Calculate the uncertainty in finding its location, while it is still in motion. Given $h=6.626\times10^{-34}$ Js and Mass of electron=9.31×10^{-31} kg.

   d) What is meant by operators? Obtain an operator for the energy "E", momentum "p" and use them to obtain Schrodinger wave equation.

   Or

   Define particle velocity, group velocity and phase velocity and derive the relation between them.

Unit - II

2. a) Explain the difference between interference and diffraction of light.

   b) State Brewster's law and prove that at Brewster's angle the reflected and refracted rays are perpendicular to each other.

   c) In Newton's ring experiment the diameter of 15th dark ring was found to be 0.59 cm and that of the 5th ring was 0.336 cm. If the radius of curvature of plano-convex lens is 100 cm. Calculate the wavelength of light used.

   d) Explain the formation of Newton's ring in reflected light. Prove that in reflected light $D_n \propto \sqrt{n}$ and $D_n^{'} \propto \sqrt{2n+1}$ where D_n and D'_n is diameter of dark and bright ring respectively.

   Or

   Discuss the phenomena of Fraunhofer diffraction at double slit. Derive the condition for maxima and minima for double slit diffraction pattern.

Unit - III

3. a) Why do we say that the nucleus behaves like a liquid drop?

   b) What do you understand by mass defect and binding energy with respect to the nucleus?

   c) The radius of Cyclotron dee's is 40 cm and magnetic field is 1.5 Wb/m^2. What is the maximum kinetic energy of beam of proton accelerated by the Cyclotron? Given mass of proton = 1.67×10^{-27} kg and Charge on Proton = 1.6×10^{-19} C.

   d) Explain construction, principle of working and limitations of LINAC. In LINAC show that the length L_n of the n^{th} drift tube is proportional to $\sqrt{n}$.

   Or

   Discuss the construction and working of Cyclotron with neat diagram. Derive and explain resonance condition.

Unit - IV

4. a) Superconductor is a perfect diamagnetic. Explain briefly.

   b) What is Zener breakdown. Explain briefly.

   c) A n-type semiconductor specimen has Hall coefficient $R_H = 3.66\times10^{-4}$ m^3/C. The conductivity of specimen is found to be 112 ohm^{-1} m^{-1}. Calculate the charge carrier density and electron mobility at room temperature.

   d) What is Hall effect? Deduce expression for Hall coefficient and Hall voltage of a solid. What important information's are obtained from its measurement?

   Or

   State and explain the terms dielectric polarization and Gauss's law. Derive the interrelationship between $\vec{E}, \vec{P}$ and $\vec{D}$ vectors.

Unit - V

5. a) What is meant by stimulate emission? Explain the basic condition in which stimulated emission dominated.

   b) Differentiate between Step Index and Graded Index optical fiber cable.

   c) A glass clad fiber has cladding refractive index 1.49925 and fractional refractive index of 0.0005. Determine the critical internal reflection angle.

   d) Explain the construction and working of Ruby LASER with necessary energy level diagram.

   Or

   Describe the construction of an optical fiber. Explain the principle of propagation of light waves within a fiber. Define acceptance angle, acceptance cone and numerical aperture.

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