Hall Ticket No | | | | | | | | | | Question Paper Code: AHS006

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech I Semester End Examinations (Regular) - December, 2016

Regulation: IARE – R16

ENGINEERING PHYSICS

(Common for CSE/IT/ECE/EEE)

Time: 3 Hours **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) What is internal field in a dielectric? Obtain an expression for internal field for a one dimensional array of dipoles and extend it to a cubic solid. **[7M]**
   (b) Explain the mechanisms of ionic and orientation polarization. Which one of them does not depend on temperature? **[7M]**
2. (a) Distinguish between para and diamagnetism. Give one example for each class of material. **[7M]**
   (b) Define magnetic field intensity (H) and magnetic induction (B). Derive relation between B&H. **[7M]**

UNIT – II

3. (a) Explain the construction of working ruby laser with energy level diagram **[7M]**
   (b) What is ratio of populations of the two energy levels correspondence to the lasing wavelength of 694.3nm in ruby laser **[7M]**
4. (a) Define the term laser. What are the characteristics of laser beam ? **[7M]**
   (b) Describe the construction of He-Ne laser and explain its working with the help of energy level diagram. **[7M]**

UNIT – III

5. (a) Compare the surface to volume ratios of a spherical object when the size (radius) is reduced from 1000 cm to 1 nm. **[7M]**
   (b) What are the causes for drastic changes in properties of a material when its size is reduced to the nanoscale? Explain. List some important applications of nano materials. **[7M]**
6. (a) Outline the sol gel and chemical vapour deposition techniques for the preparation of nano materials with emphasis on the merits of each process **[7M]**
   (b) What are the main parts of a transmission electron microscope? Explain the working of a TEM and list the applications of TEM. **[7M]**

UNIT – IV

7. (a) Obtain the wave function for a particle in an infinite potential well along with normalization condition. Specify wave function, energy and the probability densities for the ground and first two excited **[7M]**

   (b) An electron is in the ground state in an infinite potential well of width $5A^0$, calculate the excitation energy required to raise the electron to the third excited state. **[7M]**

8. (a) Setup the time independent one dimensional Schrödinger wave equation. **[7M]**

   (b) Explain the deBroglie hypothesis and derive expression for deBroglie wavelength. Calculate the deBroglie wavelengths of a photon and a proton having energy of 100 eV
   (Mass of proton $=1.67 \times 10^{-27} kg$). **[7M]**

UNIT – V

9. (a) Calculate the Hall coefficients in semiconductors with carrier densities equal to **[7M]**
      i. $1.9 \times 10^{14}/cm^3$
      ii. $1.6 \times 10^{17}/cm^3$

   (b) Determine the Fermi energy in the following cases with suitable energy level diagrams **[7M]**
      i. Intrinsic semiconductor
      ii. P-type semiconductor
      iii. n-type semiconductor

10. (a) What is the hall effect? Obtain the expression for hall coefficient. **[7M]**

    (b) Mobilities of electrons and holes in a sample of intrinsic germanium at 300K are $0.36 m^2V^{-1}s^{-1}$ and $0.17 m^2V^{-1}s^{-1}$ respectively. If the resistivity of the specimen is $2.12\Omega - m$, compute the forbidden energy gap for germanium. **[7M]**