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

MODEL QUESTION PAPER – I

Four Year B.Tech I Semester End Examinations, December – 2016

Regulation: R16

ENGINEERING PHYSICS

(Common to EEE, ECE, CSE and IT)

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

Answer any 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 electronic polarization? Derive an expression for electronic polarizability in terms of the radius of the atom. [10M]
   (b) Write short notes on polarization and dielectric constant related to a dielectric material. [4M]
2. (a) How would you classify diamagnetic, paramagnetic and ferromagnetic substances based on their magnetic behavior along with examples. 10M]
   (b) If a magnetic field of strength 300 amp/meter produces a magnetization of 4200 A/m in a ferromagnetic material, find the relative permeability of the material. [4M]

Unit – II

3. (a) Describe the construction of He-Ne laser and discuss its working principle with relevant energy level diagram. [10M]
   (b) A semiconductor diode laser has a wavelength of $1.55\mu m$. Find its band gap in eV. [4M]
4. (a) Explain the principle, construction and working of a semi conductor laser with the help of a suitable diagram. [10M]
   (b) State application of lasers in industry, medicine and military. [4M]

Unit – III

5. (a) What are the two principle factors that cause the properties of nanomaterials to differ from other materials? Discuss in detail these two principle factors. [7M]
   (b) Analyze chemical vapour deposition method of preparing nanomaterials. Give any four applications of nanomaterials in bio fields. [7M]
6. (a) How do the electrical properties, magnetic properties and mechanical properties of nanomaterials change with size. [7M]
   (b) What is the principle behind the TEM? Explain Transmission Electron Microscopy characterization technique of nanomaterials. [7M]

Unit – IV

7. (a) Illustrate the physical significance of wave function. Derive time independent Schroedinger wave equation for a free particle. [10M]

   (b) If the kinetic energy of the neutron is $0.025eV$, calculate its de Broglie wavelength. (mass of neutron $= 1.674 \times 10^{-27}\ kg$). [4M]

8. (a) What is dual nature of light? Derive the expression for de Broglie wavelength by extending dual nature of light to material particle. [10M]

   (b) An electron is bound in one-dimensional box of size $4 \times 10^{-10}m$. What will be its minimum energy? [4M]

Unit – V

9. (a) Estimate the position of fermi level and calculate concentration of electrons in an n-type semiconductor. [10M]

   (b) Illustrate the effect of doping and temperature on conductivity mechanism of Intrinsic and extrinsic semiconductors. [4M]

10. (a) Derive an expression for carrier concentration of an intrinsic semiconductor . Show that the Fermi level lies at the centre of energy gap. [10M]

    (b) Where does the Fermi level exists in case of p-type and n-type semiconductors at $T = 0K$. [4M]