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

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

MODEL QUESTION PAPER – II

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) Identify different types of polarization mechanism in dielectrics and derive an expression for ionic polarizability in terms of angular frequency. [10M]

   (b) What do you understand by electric susceptibility and displacement vector related to dielectric materials. [4M]

2. (a) Analyze the origin of magnetic moment and find the magnetic dipole moments due to orbital and spin motions of an electron. [10M]

   (b) Find the relative permeability of a ferromagnetic material if a field of strength 220 A/m produces a magnetization 3300 A/m in it. [4M]

Unit − II

3. (a) Compare the phenomenon of spontaneous emission of radiation with Stimulated emission. [4M]

   (b) Identify Einstein's coefficients with respect to absorption, spontaneous emission and stimulated emission of radiation? Derive relation between them. [10M]

4. (a) With necessary theory and energy level diagram, illustrate the principle, construction and working of a Ruby laser. [10M]

   (b) Calculate the wavelength of emitted radiation from a semiconductor diode laser, which has a band gap of $1.44eV$. [4M]

Unit − III

5. (a) Write about the origin of nanotechnology and surface to volume ratio of nano particles. [6M]

   (b) What is the principle behind the X-ray diffraction? Explain how XRD can be used for characterization of nanomaterials. [8M]

6. (a) Analyze chemical vapour deposition method of preparing nanomaterials. Give any four applications of nanomaterials in industry. [10M]

   (b) What are nanomaterials? Why do they exhibit different properties? [4M]

Unit – IV

7. (a) Comparing waves and particles, explain the concept of matter waves. [4M]

   (b) With support of Davisson and Germer experiment, show that material particle in motion exhibit wave properties. [10M]

8. (a) Estimate the energy of a particle limiting to one dimensional potential well and extend to three dimensions. [10M]

   (b) Show that the wavelength λ associated with an electron of mass m and kinetic energy E is given by $\lambda = \frac{h}{\sqrt{2mE}}$. [4M]

9. (a) What is Hall effect? Show that for a n-type semiconductor the Hall coefficient $R_H = -\frac{1}{ne}$

   (b) Calculate the density of charge carriers of semiconductor, given the Hall efficient is $-6.83 \times 10^{-5}\ m^3/Coulomb$.

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

   (b) Write notes on direct band gap and indirect band gap semiconductors. [7M]