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

# INSTITUTE OF AERONAUTICAL ENGINEERING
## (Autonomous)
B.Tech I Semester End Examinations (Regular) - December, 2017
**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) Define Polarizability and derive an expression for electronic polarizability. **[10M]**

   (b) A solid elemental dielectric with density $3 \times 10^{28}$ atoms/$m^3$ shows electronic polarizability of $10^{-40}$ farad $m^2$. Assuming internal electric field to be Lorentz field, calculate the dielectric constant of the material. **[4M]**

2. (a) Define magnetic moment. Explain the origin of magnetic moment in dia and para magnetic substances. **[10M]**

   (b) The magnetic field intensity in a piece of ferric oxide is $10^6$ amp/m. If susceptibility of the material is $1.5 \times 10^{-3}$, calculate the magnetization of material. **[4M]**

## UNIT – II

3. (a) What are Einstein's coefficients? Explain the main components of any laser system. **[10M]**

   (b) Find the ratio of population of two energy levels in a laser if the transition between them produces light of wavelength 694.3 nm. Assume the ambient temperature to the 27°C. **[4M]**

4. (a) Describe the construction and working of semiconductor diode laser with energy level diagram. **[10M]**

   (b) A ruby laser emits a pulse of 20 ns duration with average power per pulse being 100 KW. If the numbers of photons in each pulse is 6.98 x $10^{15}$. Calculate the wavelength of photons. **[4M]**

## UNIT – III

5. (a) Explain briefly bottom-up fabrication of nanomaterial by sol-gel method. **[10M]**

   (b) Explain briefly characterization of nonmaterial by TEM. **[4M]**

6. (a) What are carbon nanotubes. Discuss the important applications of nanotechnology. **[10M]**

   (b) Explain briefly quantum dots of the nanoworld. **[4M]**

7. (a) State the deBroglie hypothesis. Describe Davisson and Germer's experiment for confirmation of deBroglie hypothesis with neat sketch. **[10M]**

   (b) Find the kinetic energy and group velocity of an electron with deBroglie wavelength of 0.2 nm. **[4M]**

8. (a) State the Heisenberg's uncertainity principle. Obtain an expression time independent Schrodinger wave equation in one dimension. **[10M]**

   (b) A particle of mass 0.65 MeV/$c^2$ has a kinetic energy of 80 eV. Calculate the deBroglie wavelength and group velocity. **[4M]**

## UNIT – V

9. (a) Write short notes on direct and indirect band gap semiconductors. **[8M]**

   (b) Explain the effect of temperature and dopant on the Fermi level in a semiconductor. **[6M]**

10. (a) What are the classification of solids. Derive the expression for thermal equilibrium hole concentration (p) in an semiconductor. **[10M]**

    (b) The energy gap of Ga As is 1.42 eV. The effective masses of electrons and holes are:0.067 $m_0$ and 0.48 $m_0$ respectively. Calculate the concentration of holes at 300 K. **[4M]**

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