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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech I/II Semester Supplementary Examinations - July, 2017

Regulation: IA-R16

ENGINEERING PHYSICS

[Common for : I Semester (CSE, IT, ECE and 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

- Define the terms dipole moment and polarization. Discuss the different polarizations mechanisms in dielectrics. [8M]
 - If a NaCl crystal is subjected to an electric field of 1000 V/m and the resulting polarization is $4.3 \times 10^{-8} C/m^2$, calculate the dielectric constant of NaCl. [6M]
- What is internal field? Derive an equation for internal field in case of one dimensional array of atoms in dielectric solids. [8M]
 - A silicon material is subjected to a magnetic field of strength 1000 A/m. If the magnetic susceptibility of silicon is -0.3×10^{-5} , calculate its magnetization. Also evaluate the magnetic flux density of the field inside the material. [6M]

UNIT – II

- Obtain an expression for energy density of radiation under equilibrium condition in terms of Einstein coefficients. [8M]
 - Explain the three major engineering applications of laser. [6M]
- Explain the construction of He-Ne laser with neat diagram. Discuss its working in detail with energy level diagram. [8M]
 - Calculate the energy difference in eV between the two energy levels of Neon atoms of He-Ne laser if the transition between these levels results in emission of light of wavelength $\lambda = 632.8 \text{ nm}$ [6M]

UNIT – III

- What are nanomaterials? Explain their electrical and magnetic properties. [7M]
 - Explain briefly quantum confinement nature of nano materials. [7M]
- Explain qualitatively why nanomaterials are significantly different from bulk materials of the same chemical composition. [7M]
 - Explain briefly chemical vapour deposition method of fabrication of nano materials with neat sketch. [7M]

UNIT – IV

7. (a) What are the properties of wave functions? Obtain the expression energy Eigen values an energy functions for a practice in one dimensional potential well of infinite height. [7M]
- (b) What are matter waves? Derive the expression for de-Broglie wavelength. [7M]
8. (a) Describe Davisson and Germer experiment to verify matter waves. [7M]
- (b) An electron is bond in one dimensional potential well of width 0.12 nm. Find the energy values in the ground state and also the first two excited state in eV. [7M]

UNIT – V

9. (a) Define Fermi level in case of semiconductors and mention its position in intrinsic and extrinsic semiconductors at 0 K. [7M]
- (b) The effective density of states for electrons and holes in silicon at 300 K are: $2.8 \times 10^{19} \text{ cm}^{-3}$ and $1.04 \times 10^{19} \text{ cm}^{-3}$ respectively. The energy gap is 1.1 eV. Calculate the intrinsic carrier concentration at 450 K. [7M]
10. (a) State and explain Hall effect and derive the expression for Hall coefficient. [8M]
- (b) A silicon plate of thickness 1mm, breadth 10mm and length 100mm is placed in a magnetic field of 0.5 wb/m^2 acting perpendicular to its thickness. If 10^{-2} A current flows along its length, calculate Hall voltage developed if Hall coefficient is $3.66 \times 10^{-4} \text{ m}^3/\text{coulomb}$. [6M]

