

--	--	--	--	--	--	--	--	--	--

**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**

- (a) Define Polarizability and derive an expression for electronic polarizability. [10M]

(b) A solid elemental dielectric with density 3×10^{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]
- (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 1.5×10^{-3} , calculate the magnetization of material. [4M]

UNIT – II

- (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 be 27°C . [4M]
- (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 6.98×10^{15} . Calculate the wavelength of photons. [4M]

UNIT – III

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

(b) Explain briefly characterization of nanomaterial by TEM. [4M]
- (a) What are carbon nanotubes. Discuss the important applications of nanotechnology. [10M]

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

UNIT – IV

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 uncertainty principle. Obtain an expression time independent Schrodinger wave equation in one dimension. [10M]
(b) A particle of mass $0.65 \text{ MeV}/c^2$ 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]

– ○ ○ ○ ○ –