Code: CE2T3, CS2T3, IT2T3

I B.Tech - II Semester – Regular/Supplementary Examinations
April - 2018

ENGINEERING PHYSICS
(Common for CE, CSE & IT)

Duration: 3 hours   Max. Marks: 70

PART – A

Answer *all* the questions.   All questions carry equal marks

$$11x\ 2 = 22\ M$$

1.
   a) Give an account of Heisenberg's Uncertainty principle.
   b) Can matter waves travel faster than light? Justify your answer.
   c) Why X-rays are used for crystal structure analysis?
   d) What are lattice parameters?
   e) Draw the E-K diagram for free electrons at different values of k, indicating the allowed and forbidden bands.
   f) What is atomic polarisability? What is the relation between dipole moment and atomic polarisability?
   g) What are direct and indirect band gap materials?
   h) Define magnetic susceptibility (χ) and relative permeability (μ_r). Write the relation between them.
   i) Differentiate between spontaneous and stimulated emission processes.

j) Explain total internal reflection. What are the conditions to have T.I.R?

k) What is quantum confinement in nano materials?

PART – B

Answer any ***THREE*** questions. All questions carry equal marks.

$$3 \times 16 = 48 \text{ M}$$

2. a) Obtain the time independent Schrodinger wave equation for a free particle in a one dimensional box.   8 M

b) Derive the expression for de-Broglie wavelength of an electron accelerated through a potential difference.   4 M

c) Calculate the de-Broglie wavelength of electron which has kinetic energy of 15 eV.   4 M

3. a) Evaluate the atomic radius of S.C, B.C.C, and F.C.C. structures.   6 M

b) Discuss briefly the Laue experimental method for crystal structure determination by X-ray diffraction.   5 M

c) X-rays of wavelength 1.5 A^o makes a glancing angle of 60° in the first order when diffracted from (111) plane of NaCl crystal. Find the lattice constant of NaCl.   5 M

4. a) What is the effect of periodic potential on the energy of electrons in a metal? Explain it on the basis of Kronig Penney model and explain the formation of energy bands.

6 M

b) Discuss different types of polarizations in dielectrics. 6 M

c) If an ionic crystal is subjected to an electric field of 1000 Vm^{-1} and the resulting polarization 4.3×10^{-8} cm^2. Calculate the relative permittivity of NaCl. 4 M

5. a) Derive the expression for the carrier density in an n-type semiconductor and the position of Fermilevel in n-type Semiconductor. 6 M

b) Discuss about diamagnetic, paramagnetic and ferromagnetic substances citing one example of each. 6 M

c) The magnetic susceptibility of aluminum is 2.3×10^{-5}. Find its permeability and relative permeability. 4 M

6. a) Discuss with suitable diagram the principle, construction and working of He-Ne LASER. Describe any three applications of LASER. 6 M

b) Explain the terms Numerical aperture and acceptance angle of a fiber. Derive the expression for them. 6 M

c) Calculate the Numerical aperture and acceptance angle of optical fiber of refractive indices for core and cladding 1.62 and 1.52 respectively. 4 M