24019

B.Tech. 2nd Semester F-Scheme Examination,
May–2018
PHYSICS–II
Paper–PHY–102–F
Common for All Branches

Time allowed : 3 hours] *[Maximum marks : 100*

Note : *Attempt five questions in all, including* ***Question No. 1 which is compulsory.*** *Select* ***one*** *question from each section. All questions carry equal marks.*

1. (i) X-rays of wavelength 1.5 A° make a glancing angle 60° in the first order when diffracted from NaCℓ structure. Find the lattice constant of NaCℓ. 3

   (ii) What is Planck's constant ? Discuss its importance. 3

   (iii) What is density of slates ? Discuss briefly. 3

   (iv) Distinguish between conductor, semiconductor and insulators by drawing energy level diagram. 3

   (v) What do you mean by ferromagnetic domains ? 3

   (vi) Write a short note on quantum size effect ? 3

   (vii) What is photoconductivity ? 2

Section–I

2. (a) Explain the crystal structure of diamond. In diamond crystal, what is the number of nearest neighbours, the no. of atoms per unit cell and packing fraction ? Show that it has comparatively loose packing. 10

   (b) Derive Bragg's law of crystal diffraction $2d \sin \theta = n\lambda$ and give its significance. Also describe in detail powder method and its usefulness. http://haryanapapers.com 10

3. (a) What are the shortcomings of old quantum theory ? Explain in detail. 10

   (b) Derive time independent Schrodinger wave equation in 3-D. 10

Section–II

4. Derive the Richardson's thermionic emission equation. 20

5. (a) Write a note on nano technology. 10

   (b) Derive an expression for conductivity of metals on the basis of Drude-Lorentz theory. 10

Section–III

6. Discuss Kronig-Penney model. Using the model show the energy spectrum of electron consisting of a number of allowed energy bands separated by forbidden bands. 20

7. Why does the electrical conductivity increases when certain solids are exposed to light of suitable wavelengths ? Suggest simple model of a photoconductor and explain the following : (a) gain, (b) response time, (c) effect of traps. 20

Section–IV

8. Give Langevin's theory of Paramagnetism and hence prove that susceptibility (χ) is inversly proportional to absolute temperature. 20

9. (i) What is the magnetic dipole moment associated with a current carrying loop ?

   (ii) Why is ferromagnetism found in solids only not in fluids ?

   (iii) What are ferromagnetic domains ? Explain.

   (iv) What is hysteresis curve ? What does the area of this curve represent ? $5 \times 4 = 20$