

**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 \AA 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 states ? 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 inversely 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 ? $5 \times 4 = 20$