B. Tech Common for all branches 2nd Semester

F Scheme Examination,

May–2015

PHYSICS–II

Paper–PHY–102–F

Time allowed : 3 hours]   [Maximum marks : 100

Note : *Question No.* **1** *is compulsory. Students have to attempt five questions in total selecting at least one question from each section. Each question carries equal marks.*

1. (i) What is photoelectric effect ? 2

    (ii) On what factor the velocity of photoelectron depends in the photoelectric effect ? 2

    (iii) What are Miller indices ? 2

    (iv) In a triclinic crystal, a lattice plane makes intercepts at a length a, 2 b and $\left(\dfrac{-3c}{2}\right)$. Find the Miller indices of the plane. 2

    (v) What are Bosons ? 2

    (vi) What are the limitations of classical free electron theory ? 2

    (vii) Name three semiconductors along with values of band gaps. 2

    (viii) Explain characteristics of solar cell. 2

    (ix) Bohr magneton is defined as ? 2

    (x) On what factors susceptibility of diamagnetic materials depend ? 2

Section–A

2. (a) Define terms space lattice, unit cell, translation vectors and Miller indices. Also discuss in detail. 8

    (b) What is X-ray diffraction ? Discuss Laue method for crystal structure determination. 12

3. (a) What is Compton effect ? Show that the change in wavelength of the photon is given by $\dfrac{2h}{mc}\sin^2\dfrac{\phi}{2}$. http://www.HaryanaPapers.com

    (b) A spectral line has wavelength 4000 Å. Calculate frequency and energy in eV of the photon associated with it. 5

Section–B

4. Discuss in detail important features of Nanoparticles. 20

5. The energy expression for the electron in one dimensional potential box is given by

$$En = \frac{\hbar^2}{2m}\left(\frac{n\pi}{L}\right)^2.$$ Derive the important conclusions from this equation. 20

Section–C

6. (a) Discuss the motion of electrons in a period field of a crystal and show that effective mass of an electron in a crystal is inversely proportional to the second derivative of E-K curve. Under what conditions the effective mass of an electron can become +ve, –ve and infinity. 15

   (b) Discuss intrinsic and extrinsic semiconductors. 5

7. State the principle of photoconductive cell. Describe its construction working and uses. Show the illuminating characteristics and spectral response. 20

Section–D

8. (a) Define atomic magnetic moment and discuss orbital diamagnetism. 10

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   (b) Distinguish between dia, para or ferromagnetic substances on the basis of their magnetic susceptibility. How will you explain the difference in their behaviour ? 10

9. Give an account of Langevin's theory of paramagnetism and point out its limitation. 20