B.Tech. 2nd Semester Examination, May–2016

PHYSICS–II

Paper–Phy-102-F

Common for all branches

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

Note : *Attempt **five** questions in all selecting at least **one** question from each unit. **Question No. 1 is compulsory.***

1. (a) What are quarks and gluons ? 4

(b) What are Miller indices ? Give their significance. 4

(c) Discuss concept of effective mass for electron and holes. 4

(d) Show that group velocity and phase velocity are same in a non-dispersive medium. 4

(e) In a n-type semiconductor, the Fermi level lies 0.35eV below the conduction band at 300K. If the temperature is increased to 335K, find the position of new Fermi level. 4

Unit–I

2. (a) Explain the concept of Miller indices. Deduce formula for the distance between two adjacent planes of a simple cubic lattice. 10

(b) Discuss briefly the various crystal defects present in crystals. 10

3. (a) Derive time d ent and time independent Schrodinger eq for a particle. 16

(b) Discuss expect alue. 4

II

4. Discuss important ap ions of nanomaterials. Also discuss some tools tc nanostructures. 20

5. (a) How do you def rmi Energy and Fermi level? Derive an expr for Fermi Energy. 12

(b) Show that aver .E. of an electron is 60% of Fermi-energy a lute zero. 8

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6. (a) What is the ef f periodic potential on the energy of elect n a metal ? Explain on the basis of Kronni nny model and also explain the formation o gy bands. 15

(b) For intrinsic s onductor with gap width E_g = 0.7eV, de e the density of holes and electrons at 30 5

7. What is photovolta ll ? Explain in detail the construction and wo of a photovoltaic cell. Also explain solar cell and es. 20

Unit–IV

8. (a) Distinguish between diamagnetic and paramagnetic substances. Derive an expression for magnetic susceptibility of a paramagnetic material. 14

(b) How would you use hysteresis curve to select material for the construction of permanent magnets ? 6

9. (a) Describe the Weiss molecular theory of ferromagnetism and derive the Curie-Weiss law. 15

(b) A paramagnetic salt contains 10^{28} ions/m^3 with magnetic moment of one Bohr magneton. Calculate the paramagnetic susceptibility and the magnetization produced in a magnetic field of 10^6 amp/m when the temperature is 27°C. 5