(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 199202 Roll No. | | | | | | | | | | |

B.Tech.

(SEM. II) THEORY EXAMINATION 2013-14

ENGG. PHYSICS –II

For Mechanical/Automobile/Chemical/Civil/BT etc. Groups

Time : 3 Hours *Total Marks : 80*

Note :– Attempt questions from each Section as per instructions.

SECTION—A

1. Attempt all parts of this question. Each part carries 2 marks. **(8×2=16)**

   (a) What are de-Broglie's matter waves ?

   (b) What is the difference between phase velocity and group velocity ?

   (c) Explain penetration depth in superconductors.

   (d) What are multi-walled carbon nano tubes ?

   (e) What is hysteresis ? What does the area of hysteresis curve represent ?

   (f) How dielectric constant depends on frequency ?

   (g) What are Bravais Lattices ? Illustrate them.

   (h) What is refrigerant ? Describe some properties of an ideal refrigerant.

SECTION—B

2. Attempt any **three** parts of this question. Each part carries **8** marks. **(8×3=24)**

   (a) An electron has de-Broglie wavelength 2.0×10^{-12}m. Find its kinetic energy. Also find the phase and group velocities of its de-Broglie waves.

   (b) A superconducting material has a critical temperature of 3.7 K in zero magnetic field of 0.306 Tesla at 0 K. Find the critical field at 2 K.

   (c) The dielectric constant of helium at 0°C and 1 atmospheric pressure is 1.000074. Find the dipole moment induced in helium atom when the gas is in an electric field of intensity 100 V/m. Number of atoms per unit volume of helium gas are 2.68×10^{27}.

   (d) Calculate the longest wavelength that can be analyzed by rock salt crystal of spacing d = 2.82 Å in the first order.

   (e) A platinum thermometer has a resistance of 100Ω at 25°C.

      (i) Find its resistance at 65°C if the platinum has a resistance temperature co-efficient of 0.00392/°C.

      (ii) If the temperature has a resistance of 150Ω, calculate the temperature.

SECTION—C

Note :– Attempt any **one** part of all the questions of this Section. Each question carries 8 marks. **(8×5=40)**

3. (a) What is Heisenberg's Uncertainty Principle ? Using this principle explain non-existence of electrons in the nucleus.

   (b) Derive Schrondinger time independent and time equations for matter waves.

4. (a) What are Type I and Type II superconductors ? Explain.

   (b) What are buckyballs ? How can the buckyballs be created ? Where are these buckyballs used ?

5. (a) Derive Claussius-Mossotti relation in dielectrics subjected to static field.

   (b) Discuss the Langevin's theory for diamagnetic and paramagnetic materials.

6. (a) What are Miller Indices ? How are they calculated that describes plane in a crystal ? What is the importance of Miller Indices ?

   (b) Obtain Bragg's law for X-ray diffraction in crystals. Show how it can be experimentally verified.

7. (a) Discuss the theory of Joule-Thomson effect. Describe the porous plug experiment and indicate the results.

   (b) Describe the working of rotary oil pump for producing low pressures. How are these pressures measured ?

Physical Constants :

Mass of electron	$m_e = 9.1\times10^{-31}$ kg
Speed of Light	$c = 3\times10^{8}$ m/s
Planck's constant	$h = 6.63\times10^{-34}$ J-s
Mass of Proton	$m_p = 1.67\times10^{-27}$ kg
Permeability of free space	$\mu_o = 4p\times10^{-7}$ H/m
Permittivity of free space	$\varepsilon_o = 8.854\times10^{-12}$ F/m
Avogadro's number	$N = 6.023\times10^{23}$ per mole