

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

PAPER ID : 199202

Roll No.

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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 $d = 2.82 \text{ \AA}$ 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 $0.00392/^\circ\text{C}$.
 - (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 Schrodinger 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	$m_e = 9.1 \times 10^{-31} \text{ kg}$
Speed of Light	$c = 3 \times 10^8 \text{ m/s}$
Planck's constant	$h = 6.63 \times 10^{-34} \text{ J-s}$
Mass of Proton	$m_p = 1.67 \times 10^{-27} \text{ kg}$
Permeability of free space	$\mu_o = 4\pi \times 10^{-7} \text{ H/m}$
Permittivity of free space	$\epsilon_o = 8.854 \times 10^{-12} \text{ F/m}$
Avogadro's number	$N = 6.023 \times 10^{23} \text{ per mole}$