



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

PAPER ID : 199242

Roll No.

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B. Tech.

(SEM. II) THEORY EXAMINATION, 2014-15

ENGINEERING PHYSICS-II (M)

(For ME/AU/MT/CH/CE/EV/TE/TT/FT/TC etc.)

Time : 3 Hours]

[Total Marks : 80

Note : Attempt questions from each Section as per instructions.

SECTION - A

1 Attempt all parts of this question. **2×8=16**

Each part carries 2 marks.

- (a) What do you mean by phase velocity and group velocity?
- (b) Explain Heisenberg's uncertainty principle.
- (c) Distinguish between Type-I and Type-II superconductors.
- (d) What are buckyballs?

- (e) What are the properties of diamagnetic materials?
- (f) What is dielectric loss?
- (g) What are Bravais lattices?
- (h) What do you mean by packing factor?

SECTION - B

2 Attempt any three parts of this question. $8 \times 3 = 24$
Each part carries 8 marks.

- (a) Find the de-Broglie wavelength of a neutron of energy 12.8 MeV. Mass of neutron is 1.675×10^{-27} kg.
- (b) The critical field for niobium is 1×10^5 A/m at 8K and 2×10^5 A/m at 0K. Calculate the transition temperature of the element.
- (c) An iron rod of volume 10^{-3} m^3 and relative permeability 1200 is placed inside a long solenoid wound with 5 turns per cm. If a current of 0.5 amp is passed through the solenoid, find the magnetic moment of the rod.

- (d) Calculate the number of atoms per unit cell of a metal with lattice parameter 2.9\AA , molecular weight 55.85, density $7870\text{ kg}\cdot\text{m}^{-3}$ and Avogadro number $6.02\times 10^{26}\text{ (kg}\cdot\text{mol)}^{-1}$.
- (e) A platinum thermometer has a resistance of $100\ \Omega$ at 25°C . (a) find its resistance at 65°C if the platinum has a resistance temperature coefficient of $0.00392 / ^\circ\text{C}$
(b) If the temperature has a resistance of $150\ \Omega$, calculate the temperature.

SECTION - C

Attempt any one part of all the questions of $8\times 5=40$ this section. Each question carries 8 marks.

- 3 (a) What are matter waves? Describe Davisson and Germer experiment for the study of electron diffraction and prove that electrons possess wave nature.
- (b) Find an expression for the energy states of a particle in a one – dimensional box. Also calculate the normalized wave function.

- 4 (a) How are Cooper pairs formed? Explain the BCS theory of superconductor.
- (b) What are carbon nanotubes? Describe a method for synthesis of carbon nanotubes.
- 5 (a) What do you mean by polarization in dielectrics? Explain different types of polarization and their mechanism.
- (b) What is meant by Hysteresis? Explain hysteresis loss. Prove that the area of the B-H curve is equal to the hysteresis loss per unit volume of the specimen in one cycle.
- 6 (a) What are Miller indices and how are they calculated? Give some applications of miller indices?
- (b) What is Bragg's law? Obtain Bragg's equation for x-ray diffraction in crystals. Explain how the formation of Laue's spot in x-rays diffraction was explained by Bragg.

- 7 (a) What do you mean by ultrasonic waves?
Discuss any one method of its production.
- (b) Describe the working of a 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	$c = 3 \times 10^8 \text{ m/s}$
Plank'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	$\mu_0 = 4\pi \times 10^{-7} \text{ H/m}$
Permittivity of free space	$\epsilon_0 = 8.854 \times 10^{-12} \text{ F/m}$
Avogadro 's number	$N = 6.023 \times 10^{23} \text{ per mole}$
