



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

PAPER ID : 199240

Roll No.

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B. Tech.

(SEM. II) THEORY EXAMINATION, 2014-15
ENGINEERING PHYSICS-II (C)

(FOR CS/IT 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 do you mean by Hall Effect?
- (h) What is image processing?

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) An electron has a speed of 1.05×10^4 m/s within the accuracy of 0.01%. Calculate uncertainty in the position of the electron.
- (c) 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.
- (d) An iron rod of volume 10^{-3} m³ 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.
- (e) At what temperature can we expect a 10% probability that electrons in a metal will have an energy which is 1% above E_F . The Fermi energy of the metal is 5.5 eV.

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 is a solar cell? Describe its working with suitable diagram.
- (b) What do you mean by Fermi level? Show that the Fermi level of an intrinsic semiconductor lies half way between conduction and valance bands.
- 7 (a) What is a spatial light modulator? Explain the working of liquid spatial light modulator.
- (b) What do you understand by memories in computer? Describe various types of memories in detail.

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	$N = 6.023 \times 10^{23} \text{ per mole}$