

Printed Pages: 02

Paper Id: 

1	9	9	2	0	1
---	---	---	---	---	---

Sub Code: NAS201

Roll No. 

--	--	--	--	--	--	--	--	--	--

**B TECH**  
**(SEM II) THEORY EXAMINATION 2017-18**  
**ENGINEERING PHYSICS-II**

**Time: 3 Hours****Total Marks: 100****Note:** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A**

- 1. Attempt all questions in brief. 2 x 10 = 20**
- a. What are Miller indices? How they are calculated?
  - b. Define basis and unit cells.
  - c. What is dielectric loss?
  - d. What is piezo-electric effect in crystals?
  - e. What is displacement current?
  - f. If a plane electromagnetic wave in free space has magnitude of  $H = 2 \text{ A/m}$ . What is magnitude of  $E$ ?
  - g. Define Fermi level.
  - h. What is Meissner effect?
  - i. Define mobility and drift velocity.
  - j. What is nanoscience and nanotechnology?

**SECTION B**

- 2. Attempt any three of the following: 10 x 3 = 30**
- a. Explain the structure of diamond crystal. Find out number of atoms per unit cell, atomic radius and atomic packing factor for this structure.
  - b. What is internal field in solids? A solid elemental dielectric with density of  $3 \times 10^{28} \text{ atoms/m}^3$  shows an electronic polarizability of  $10^{-40} \text{ Fm}^2$ . Assuming Lorentz field, calculate dielectric constant of the material.
  - c. What is skin depth? Discuss the depth of penetration depth of wave in a conducting and non conducting medium.
  - d. Define Fermi Dirac distribution function. Show that the probability of its occupancy by an electron is unity if  $E < E_f$ , and is zero if  $E > E_f$  at 0 K
  - e. Define critical magnetic field. A superconductor has critical temperature of 4.2 K in zero magnetic field and a critical field of 0.0306 T at 0 K. Find the critical field at 2.1 K.

**SECTION C**

- 3. Attempt any one part of the following: 10 x 1 = 10**
- (a) Describe simple cubic (sc), body centered cubic (bcc) and face centered cubic (fcc) system. Calculate co-ordination number, nearest neighbour distance and atomic packing factor (APF) for these above systems.
  - (b) Derive Bragg's law for the diffraction of X-rays by crystals. Describe Bragg's spectrometer explain how it is used to study the structure of crystal.

4. Attempt any *one* part of the following: 10 x 1 = 10
- What are polar and non-polar molecules? Deduce the Clausius-Mossotti equation. In which type of solids this relation can be used?
  - Describe the Langevin theory of diamagnetism. Show that magnetic susceptibility is negative and independent of temperature.
5. Attempt any *one* part of the following: 10 x 1 = 10
- Derive the wave equation of electric and magnetic fields in free space and show that electromagnetic wave travels in free space with the velocity of light. Also show that electromagnetic wave is transverse in nature.
  - What is Poynting vector? State and derive Poynting theorem for the flow of energy in an electromagnetic field.
6. Attempt any *one* part of the following: 10 x 1 = 10
- Define conductivity of a semiconductor. Find the expression for conductivity of intrinsic semiconductor, n-type semiconductor and p-type semiconductor.
  - Show that a Fermi level in an intrinsic semiconductor lies half way between the top of valence band and bottom of conduction band.
7. Attempt any *one* part of the following: 10 x 1 = 10
- Give salient features of BCS theory of superconductivity. Describe briefly the formation of Cooper pairs.
  - What are carbon nanotubes? Discuss its properties and applications.

**Physical constants:**

Boltzmann's constant:  $1.38 \times 10^{-23}$  J/K

Permittivity in free space:  $\epsilon_0 = 8.85 \times 10^{-12} \text{C}^2 \text{N}^{-1} \text{m}^{-2}$

Permeability in free space:  $\mu_0 = 4\pi \times 10^{-7} \text{NA}^{-2}$ .