

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

**Paper ID : 199220**

Roll No. 

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**B. TECH.**

**Theory Examination (Semester-II) 2015-16**

**ENGINEERING PHYSICS-II**

**Time : 3 Hours**

**Max. Marks : 100**

**Note:** This question paper contains 3 sections. Attempt questions from each section. Take standard values wherever needed.

**Section-A**

**Q1.** Attempt all parts. All parts carry equal marks. Write answer of each part in short. (2×10=20)

- (a) What is primitive's cell ?
- (b) What is atomic radius of a simple cubic structure with a cube edge  $a$  ?
- (c) What is internal field in dielectric ?
- (d) What type of magnetic materials is used to make core of transformers ?

(e) What is displacement current ?

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(f) If a plane electromagnetic wave in free space has magnitude of  $H$  1 A/m. What is the magnitude of  $E$  ?

(g) Define the position of Fermi level in intrinsic semiconductor ?

(h) What do you understand by transition temperature ?

(i) What is the value of critical field of a super conductor at transition temperature ?

(j) What are the types of single walled nanotube ?

### Section-B

Q2. Attempt any five questions from this section. (5×10=50)

(a) Define crystal structure, crystal lattice and Bravais lattice.

(b) Explain lattice planes in crystal. Determine inter-planer spacing of a lattice plane in a simple cubic lattice with edge  $a$  which cuts the axis in intercepts ratio 3:4:5.

(c) What do you mean by polarization of substance? Write different mechanisms of polarization in a dielectric.

(d) Show that susceptibility of diamagnetic material is negative and independent of temperature.

- (e) Using Maxwell's equations, derive electromagnetic wave equations in vacuum and prove that waves propagate with speed of light.
- (f) What is Poynting vector? A 500 watt lamp radiates power uniformly in all directions. Calculate the electric and magnetic field intensities at 1 m distance from the lamp.
- (g) How the temperature affects the critical field of a superconductor? The critical fields for lead are  $1.8 \times 10^6$  A/m at 6 K and  $2.4 \times 10^6$  A/m at 0 K. Find the critical temperature of the material.
- (h) What are carbon nanotubes? Discuss its properties and applications.

### Section-C

**Note :** Attempt any two questions from this section. ( $2 \times 15 = 30$ )

- Q3. Explain the Braggs law. Describe Bragg's spectrometer and explain with example how it is used to study the crystal structure?
- Q4. (a) What is dielectric constant? Derive Clausius Mossotti equation for non polar solids having cubic structure.
- (b) Explain the behavior of dielectric in an alternating electric field. What is relaxation time?

5. (a) Define drift velocity, mobility and conductivity of a semiconductor. Derive an expression for the electrical conductivity of an intrinsic semiconductor.

- (b) Determine the number density of a donor atoms which has to be added to an intrinsic germanium semiconductor to produce a n-type semiconductor of conductivity  $5 \text{ ohm}^{-1} \text{ cm}^{-1}$ , given that the mobility of electron in n-type germanium is  $3900 \text{ cm}^2/(\text{V} \cdot \text{s})$ . Neglect the contribution of holes to conductivity.