Printed Pages : 3

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NAS201

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

PAPER ID : 199220

Roll No.

B. Tech.

(SEM. II) THEORY EXAMINATION, 2014-15

ENGINEERING PHYSICS - II

Time : 2 Hours] [Total Marks : 50

Note: Attempt All Section's Question as per the given instruction.

Section - A

Attempt all parts of this question. Each part carries 2 marks :

1 (a) What are Miller indices? How are they calculated?

(b) What are polar and non polar molecules?

(c) What is hysteresis loss ?

(d) What is Fermi level?

(e) Explain the concept of displacement current.

Section - B

Attempt any three parts of this question. Each part carries 5 marks :

2 (a) A superconducting tin has a critical temperature of 3.7 K at zero magnetic field and a critical magnetic field 0.0306 tesla at 0 K. Find the critical magnetic field at 2 K.

(b) Calculate the change in magnetic moment of a circulating electron in an applied field of 2 tesla acting perpendicular to the plane of the orbit. Given $r = 5.29 \times 10^{-11}$ m for the radius of the orbit.

(c) Calculate the magnitude of Poynting vector at the surface of the Sun. Given that power radiated by sun = 3.8×10^{26} watts and radius of the sun = 7×10^{8} m.

(d) In a p-type semiconductor the Fermi level is 0.3 eV above the valence band at temperature 300 K. Determine the new position of Fermi level for temperature 400 K.

(e) Copper has a density of 8.96 gm/cm^3 and an atomic weight of 63.5. Calculate the distance between two nearest copper atoms in BCC structure. (Avogadro's number = 6.023×10^{23} per kg-mole)

Section - C

Attempt all question of this section. Each question carries 5 marks.

3 Attempt any one part of the following :

(a) What are Miller indices? How they are calculated?

(b) Define atomic packing factor. Calculate APF in case of SC, BCC and FCC.

4 Attempt any one part of the following :

(a) Discuss the frequency dependence of dielectric constant.

(b) What is the hysteresis curve? Explain residual magnetism and coercive force?

5 Attempt any one part of the following :

(a) Deduce the wave equation for EM waves in conducting medium.

(b) Using Maxwell equation Curl $B = \mu_0 \left[J + \frac{\partial D}{\partial t} \right]$. Prove that div D = ρ

6 Attempt any one part of the following :

(a) Derive an expression for the conductivity of a semiconductor containing both free electrons and holes in terms of the concentration n and p and the mobility μ_e and μ_h.

(b) What are type I and type II superconductors? Explain.

7 Attempt any one part of the following :

(a) What do you mean by Meissner effect? Explain how Meissner effect proves the superconductor is a perfect diamagnetic material.

(b) Show that a Fermi level in an intrinsic semiconductor lies half way between the top of valence band and bottom of conduction band.
