Date-27/11/19

Paper / Subject Code: 58605 / Applied Physics - I.

F.E.(All Branches)(CB)(Sem-I)

(2 Hours) [Total Marks:60]

N.B.: (1) Question. **1** is **compulsory.**
(2) Attempt any **three** questions from the remaining questions N0.**2** to **6.**
(3) **Assume** suitable **data** wherever required.
(4) **Figures** to the **right** indicate **marks.**

1. Attempt any **five** questions from the following- 15
   (a) Calculate atomic packing fraction of HCP unit cell.
   (b) Express de-Broglie wavelength in various forms.
   (c) Draw the energy band diagram for p-n junction diode in forward and reverse bias condition.
   (d) Define: persistent current, critical temperature, critical magnetic field.
   (e) What is reverberation time? Explain its formula.
   (f) With the help of diagram state direct and inverse piezoelectric effect.
   (g) The resistivity of intrinsic material at room temperature is 2×10^{-4} Ohm-cm. If the mobility of electron is 6 m^2/V-sec and mobility of hole is 0.2 m^2/V-sec. Calculate its intrinsic carrier density.

2 (a) Arrive at the statement that electron can not survive inside the nucleus. 8
An electron has a speed of 300m/s with uncertainty of 0.01% . Find the accuracy in its position.
(b) A sample of semiconductor is placed in uniform magnetic induction B with sample current I and thickness w then obtain the expression for (a) Hall voltage and (b) Hall coefficient. 7

3 (a) With neat diagram of unit cell explain the structure of diamond crystal. 8
(b) Explain variation of Fermi level with temperature in n-type semiconductor. 7
What is the probability of an electron being thermally excited to the conduction band in Si at 30^0C. The band gap energy is 1.12eV (k=1.38X 10^{-23} J/K)

4 (a) Distinguish between Type I and Type II superconductors. 5
(b) A class room has dimension of (20x15x10) m^3 ; the reverberation time is 3 sec. 5
Calculate the total absorption of its surfaces and average coefficient of absorption
(c) How ultrasonic waves are produced using quartz crystal in an oscillator? 5

5 (a) Show that for an intrinsic semiconductor, the Fermi level lies half way between conduction and valence band. 5
(b) State and explain principle of SQUID and explain its working to determine the strength of magnetic field. 5
(c) The lowest energy of an electron trapped in a one dimensional box is $3.2X10^{-18}$ J. Calculate the width of the box. Also calculate the next two energies in eV the particle can have? 5

6 (a) Define ligancy and critical radius ratio. Calculate critical radius ratio for ligancy 6. 5
(b) Obtain one dimensional time dependent Schrodinger equation 5
(c) Explain photovoltaic effect and write a note on solar cell. 5

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