SET-C

[This question paper contains 2 printed pages] Roll No……

Name of the Course: B.Sc. (Prog.) Physics – DSE – 3B

Semester: VI –SEMSTER

Name of the Paper: Solid State Physics

Unique Paper Code: 42227637

Duration: 2 Hours Maximum Marks: 75

Instructions for Candidates:

1. Attempt any FOUR questions in all.
2. All questions carry Equal Marks.

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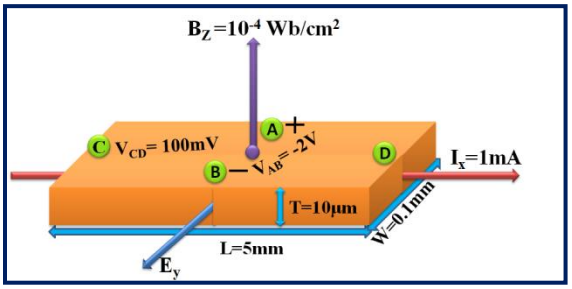
1. Define Brillouin zone for a lattice by considering simple cubic crystal. How would you construct the first Brillouin zone for BCC and FCC lattice?
2. Derive the dispersion relation for one dimensional diatomic Lattice. What are the optical and acoustical branches and why are they named so? Discuss the dispersion relation in the limits (i) M and m are equal, (ii) M approaches to infinity and (iii) m approaches to zero.
3. What are the essential differences between n-type and p-type semiconductors? Explain the Hall Effect in semiconductors and obtain the expression for mobility and Hall coefficient and give the physical significance of Hall coefficient. Considering a semiconducting bar (shown in Figure) of width =0.1mm, thickness=10μm and length =5mm. For a magnetic field of 10^{-4}Wb/cm^2 and current of 1mA, the potential developed across the bar are V_{AB}=-2V and V_{CD}= 100mV. Determine the type, concentration and mobility of charge carriers.



4. Define: Bohr Magneton and Magnetic Susceptibility. How are the magnetic materials classified based on the orientation of Dipoles with respect to each other? Explain the classical theory of Diamagnetism.

5. What do you understand by the terms Dielectric Constant and Depolarization Field? What is the effect of putting a dielectric between the plates of a capacitor? Derive the Clausius-Mossotti relation and give its significance.
6. Obtained the expression for electrical conductivity in intrinsic semiconductors and explain its variation with temperature. Describe the Meissner effect. Prove that the Meissner effect and the disappearance of resistivity in a super conductor are mutually consistent?