**15B11PH211 (Physics 2-2020) Tutorial Sheet-10**

1. What will be the electron concentration in a P-type Si sample whose hole concentration is 2.25 × 1015/𝑐𝑚3. The intrinsic carrier concentration is 1.5 × 1010/𝑐𝑚3.
2. An intrinsic semiconductor whose charge carrier concentration at 300K is 2.29 × 1018/𝑚3. If the effective mass of the electron is 0.07m and that of hole is 0.4m, determine the energy gap of the semiconductor.
3. In an n-type semiconductor, the Fermi level lies 0.44eV below the conduction band at room temperature (~ 300 K). If the concentration of donor atoms becomes five times, determine the new position of the Fermi level.
4. The density of intrinsic charge carries at room temperature in silicon is 1.5 × 1016/𝑚3 and the mobilities of electrons and holes are 0.13 and 0.05 m2V-1s-1, respectively. Determine the intrinsic conductivity in silicon. Also, if the donor impurity is added to the extent of 1 impurity atom per 108 silicon atoms, determine its extrinsic conductivity.
5. An electric field of 100 V/m is applied to a sample of n-type semiconductor whose Hall coefficient is -0.0125 m3. Determine the current density in the sample, assuming the electron mobility to be 0.36 m2 V-1s-1.
6. In Hall effect experiment, a germanium crystal of length 0.2cm, breadth 0.12cm and thickness 0.02cm is used. When a potential of 1.0V is applied, a current of 2.5mA flows along the x-direction. When a magnetic field of 0.5Tesla is applied along z-direction, a Hall voltage of 10.0mV is found to develop. Calculate charge carrier concentration, conductivity and mobility