Test -I Question Paper

Answer all the questions

1. (a). Define density of states and deduce an expression for density of states.   (3 M)

   (b). Calculate the free electron concentration, mobility and drift velocity of an electron in aluminium wire of length of 5 m and resistance 0.06 ohm carrying a current of 15 amperes. Assume that each aluminium atom contributes 3 free electrons for conduction. (2 M)

2. (a). Define fermi function and describe the significance of the fermi function.   (3 M)

   (b). Find the temperature at which there is 1% probability of a state with an energy 0.5 eV above Fermi energy.   (2 M)

3. (a).   Describe compensated semiconductors and deduce an expression for electron concentration   in   a   compensated   semiconductor. (3 M)

   (b). Calculate the thermal equilibrium hole concentration in silicon at 400 K.   (2 M)

   (Effective density of states function in valance band is $1.04 \times 10^{9}/cm^{3}$ at 300 K)

4. (a). Define Hall effect and deduce an expression for carrier concentration using Hall effect phenomenon.   (3 M)

   (b). A current of 50 amperes is established in a slab of copper having 0.5 cm thick and 2 cm wide. The slab is placed in a magnetic field of 1.5 Tesla. The magnetic field is perpendicular to the plane of the slab and to the current. The free electron concentration in copper is 8.48×10^{28} electron/m^{3}. What will be the magnitude of Hall voltage across the width of the slab?   (2 M)

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