EECS312-HW8:

Semiconductors

1. What is the concentration of free electrons and holes [#/cm^3] of intrinsic silicon at 100K and 310K?

2. What is the conductivity and resistivity of intrinsic silicon at 100K and 310K?

3. A cylindrical resistor is constructed from intrinsic silicon at 310K having dimensions of radius=0.1cm and length 0.5cm. What is the value of the resistor?

4. Repeat 1-3 with doped silicon $N_D = 1x10^{16}$ [#/cm^3]. (just for 310K)

5. Repeat 1-3 with doped P-type silicon $N_A = 1x10^{16}$ [#/cm^3]. (just for 310K)

6. The distribution of free electrons in a N-type Silicon with at room temperature is given by the equation (use free electron mobility=2000 cm^2/Vs and V_T=0.025V).

   $$n(x)|_{t=0} = 1x10^{16}(\cos(2\pi 100x) + 1)\ [\#/cm^3]$$, where x is in units of cm.

   What is the diffusion current density as a function of position (x) at t=0?