ECE/PHY 235: Introduction to Solid State Electronics, Fall 2024
University of Wisconsin, Madison
Homework #9, Instructor Ying Wang
Due Sunday, Dec 15th , 11:59 PM, by electronic upload

PN junction IV curve

A silicon p-n junction diode is fabricated with the following parameters: $N_A = 10^{16}cm^{-3}$, $N_D = 10^{15}cm^{-3}$. the intrinsic carrier concentration is $n_i = 1.5 \times 10^{10}cm^{-3}$ at 300K. and the electron and hole mobility are $\mu_n = 1350cm^2/V \cdot s$, $\mu_p = 480cm^2/V \cdot s$ respectively. Junction across area is 0.01 cm^2; the electron lifetime in the p-region: $\tau_n = 1\mu s$, the hole lifetime in the n-region: $\tau_p = 2\ \mu s$.

a) calculation the diffusion coefficient for electron and hole (based on Einstein relationship)
b) calculate the building voltage across the depletion region.
c) calculate the current at biases including: -0.1V, 0.3V and 0.7V

Please upload a write-up of your solution as a single PDF file. Name the file "Lastname_HW9.pdf"