Homework 7
EE 362 Electronic, Magnetic, & Optical Properties of Materials (Spring 2026)
Monday, March 23, 2026

1) 7.2 Only for germanium (Ge).
2) 7.3a for a germanium (Ge) pn junction. Do both linear and semilog plots using Matlab. Include m-file.
3) 7.8a with '25 percent' replaced with 'a third'.
4) For a uniformly doped ($N_a = 8 \times 10^{15}$ cm^{-3} on the p-side and $N_d = 3 \times 10^{16}$ cm^{-3} on the n-side) Germanium pn junction at 300 K with cross-sectional area 40×10^{-9} m^2, calculate x_n, x_p, W, $|E_{max}|$, C', and C when: a) $V_R = 0$ and b) $V_R = 1$ V.
5) 7.17
6) a) For a one-sided pn$^+$ junction where $N_d >> N_a$, find approximate expressions for W, x_n, x_p, and C'. b) A silicon pn$^+$ junction at 300 K has a cross-sectional area 8×10^{-5} cm^2, $N_d = 8 \times 10^{16}$ cm^{-3}, and $N_a = 10^{15}$ cm^{-3}. Find *i*) V_{bi}, *ii*) W, x_n, x_p, & the junction capacitance with $V_R = 0$, and *iii*) W, x_n, x_p, & the junction capacitance with $V_R = 1$ V.

Due Friday, March 27, 2026.

Notes:

- Carry *at least* **6** significant figures on constants/parameters in calculations. Give answers with **4-5** significant figures.
- If a solution requires the use of a graph, include graph with work/markings shown.
- Assume 300 K unless otherwise specified.