ECE 3030 Spring 2025 HW 8 Hints

1. Use binomial theorem to solve net carrier density since both donors and acceptors present. Use Einstein relation to calculate mobilities and conductivity. Band gap of Ge = 0.67 eV. Use to calculate $E_F - E_i$.

2. Use Lecture 28, slide 8.

3. Put the ΔE_C or ΔE_V notch where the bent n-type or p-type E_C or E_V bands overlap.

4. Use S&B equations 8.1 and 8.3.

5. Use E (eV) = 1.24 (μm - eV) / λ (μm). Only photon energies that create electron-hole pairs are detectable.

6. (a) Gain requires carrier multiplication. (b) Speed depends on transit time. (c) See Problem 5. Band gaps in S&B Appendix III.

7. Use Lecture 30, slides 2 and 3. S&B Eqs. 8-1, 8-2, and 8-3. Use Einstein relation and $L = (D\tau)^{1/2}$