HW10

MTLE-6120: Spring 2018

Due: Apr 23, 2018

1. **Kasap 5.29: Seebeck coefficient and thermal drift in semiconductor devices**

2. **Kasap 6.2: The Si *pn* junction** (estimating recombination and diffusion currents)

   In answering, 'what is your conclusion', include your expectation for the diode ideality factor η.

   Hint: you will need the diffusion constants for the carriers. Assume $D_e = 34.9$ cm^2/s and $D_h = 11.6$ cm^2/s. (Diffusion constants are related to mobilities by the Einstein relation $D_{e/h} = (k_B T/e)\mu_{e/h}$) Besides that, the only other Si-specific properties you should need are $n_i = 10^{10}$ cm^{-3} and $\epsilon_r = 11.7$.

3. **Kasap 6.15: Ultimate limits to device performance** (of an n-channel FET)

   Note: for part (c), assume and justify reasonable values for the barriers. Consider tunneling to become important when tunneling probabilities $\sim 10^{-6}$.

   Also, there might be a typo in the example number referenced by some editions of the book. (In mine, it says 3.10, but it should be 3.12.)