Homework 9

EE 362 Electronic, Magnetic, & Optical Properties of Materials (Spring 2026)

Monday, April 13, 2026

1) A silicon MOS capacitor has an n-type substrate at 300 K with $N_d = 10^{17}$ cm^{-3}. Find: a) V_t and ϕ_{fn}, b) the maximum depletion layer thickness x_{dT}, and c) the maximum space charge density $|Q'_{SD}(\text{max})|$.
2) 10.4 Part b) has typo, should be n^+ polysilicon. Hint: Read Example 10.2. Assume 300 K.
3) 10.10 Change doping to $N_a = 4 \times 10^{16}$ cm^{-3}. Also, find ϕ_{fp}, x_{dT}, $|Q_{SD}'(\text{max})|$, and C_{ox}.
4) 10.16 Change the oxide thickness to 24 nm and doping to $N_a = 6 \times 10^{15}$ cm^{-3}.
5) 10.23ac Change doping to $N_a = 10^{17}$ cm^{-3}. Assume $Q'_{SS} = 0$.
6) 10.24ac Change doping to $N_d = 10^{15}$ cm^{-3}. Assume $Q'_{SS} = 0$.

Due Friday, April 17, 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 the graph with work shown.
- Read **Note** at beginning of PROBLEMS section on page 433.