

Fall 2008

EE 612: Nanoscale Transistors

HW4: DUE TUESDAY, SEPTEMBER 23

Miscellaneous MOS and MOSFET problems

- 1) Problem 2.5 in Taur and Ning
- 2) Problem 2.8 in Taur and Ning
- 3) The semiconductor capacitance at flat-band is given by

$$C_s(FB) = \frac{\epsilon_{Si}}{\sqrt{\epsilon_{Si} k_B T / q^2 N_A}} = \frac{\epsilon_{Si}}{L_D}.$$

Derive this expression. (Hint: refer to the handout “Notes on the Exact Solution of the Poisson-Boltzmann Equation”)

- 4) Problem 3.1 in Taur and Ning
- 5) Problem 3.3 in Taur and Ning
- 6) Clearly explain how eqns. (3.57) and (3.58) in Taur and Ning are derived. Explain how this discussion relates to our discussion in class about the gate capacitance, C_G , and the fact that $C_G < C_{ox}$.
- 7) Problem 3.7 in Taur and Ning
- 8) Problem 3.8 in Taur and Ning