EECS 277A HW 2 (revised)

Problem 1: Textbook 3.1

Problem 2: Calculate the capacitances of the MOSFET in problem 1 assuming Lgate = 1 micron,
W=10 microns. Do this for subthreshold, linear, and saturation.

Problem 3: A) Consider 109 MOSFET devices, all in the off state. Assume Vt =2 V, Vds = 5 V. Approximate the sub-threshold current by equation 3.40 from the text. Assume m=2, eff = 600 cm2/V-s. Calculate the power dissipated in the circuit. B) Now do the same for Vt =1 V, Vds = 4 V. Comment on the difference in power dissipated.

Problem 4: Velocity saturation: Find the length in terms of the mobility and saturation velocity that describes the cross-over from long channel to short channel behavior. Hint: Equate the formulas for the transconductance and solve for L.

Problem 5: CLM: given lambda = 0.1 V-1, find the maximum voltage gain of a MOSFET of problem 2. Assume Vgs-Vt = 4 V.