

**ECE 2C Homework #4 Due: Thursday 10/29/09 at 5 PM**

**Relevant readings:**

S&S 4.1-4.3, 4.5-4.6

S&S 4.7, 6.3.1, 6.3.2, 6.5

4 problems

- (1) [10 pt.] S&S Problem 4.42 (a): (i) with  $\lambda_n = 0.02 \text{ V}^{-1}$  and (ii)  $\gamma_n = 0.4 \text{ V}^{0.5}$  and  $2\phi_n = 0.6 \text{ V}$ ;  
S&S Problem 4.42 (d): (i) with  $\lambda_p = -0.02 \text{ V}^{-1}$  and (ii)  $\gamma_p = -0.5 \text{ V}^{0.5}$  and  $2\phi_p = -0.75 \text{ V}$ .  
{DC analysis with NMOS and PMOS devices with channel length modulation and body effects}
- (2) [10 pt.] S&S Problem 4.75. {Gate-to-drain resistive feedback, negative bias. Hint: study Section 4.5.3 and Example 4.10.}
- (3) [10 pt.] S&S Problem 4.90.  
{High-frequency small-signal model parameters of MOSFET}
- (4) [10 pt.] The MOSFET has a  $V_t = 2\text{V}$ , a  $K_n = 200 \text{ mA/V}^2$  and a  $|V_A| = \infty$ .  $I_d = 10\text{mA}$ . Use the method of open-circuit time constant (MOTC) to calculate the lower corner frequency and the upper corner frequency. Then sketch the bode plots. You only need to consider  $C_{gs} = 12.3 \text{ pF}$  and  $C_{gd} = 33.4 \text{ pF}$  in our high-frequency ac small-signal model.

