PROBLEM SET #12

Issued: Thursday, Apr. 25, 2013

Due (at 5 p.m.): Tuesday, May 7, 2013, in the EE 140/240A HW box near 125 Cory.

1. Using feedback techniques, determine the input and output impedance and current gain (I_{out}/I_{in}) of the circuit in Fig. PS12.1. Leave your answer in terms of variables (gm_1, R_1, r_o, etc.) and assume $\gamma = 0$.

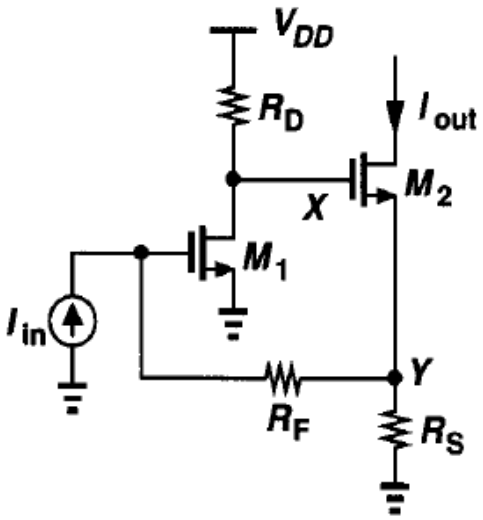

Figure PS12.1

2. Consider the circuit in Fig. PS12.2, where $(W/L)_{1\text{-}4} = 50/0.5$, $|I_{D1\text{-}4}| = 0.5$ mA, $V_{tn} = 0.7$ V, $V_{tp} = -0.8$ V, $k_n' = 134\ \mu A/V^2$, $kp' = 38\ \mu A/V^2$, $\lambda_n = 0.1\ V^{-1}$, $\lambda_p = 0.2\ V^{-1}$, and $R_2 = 3\ k\Omega$.

a. For what range of R_1 are the above currents established while M_2 remains in saturation? What is the corresponding range of V_{in}?

b. Calculate the closed-loop gain and output impedance for $R_1 = 805\ \Omega$.

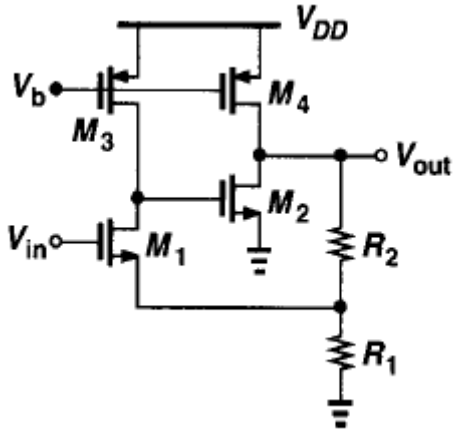

Figure PS12.2

3. In the circuit of Fig. PS12.3, suppose all resistors are equal to 2 kΩ and $g_{m1} = g_{m2} = 5$ mS. Assuming $\lambda = \gamma = 0$, calculate the closed-loop gain and output impedance.

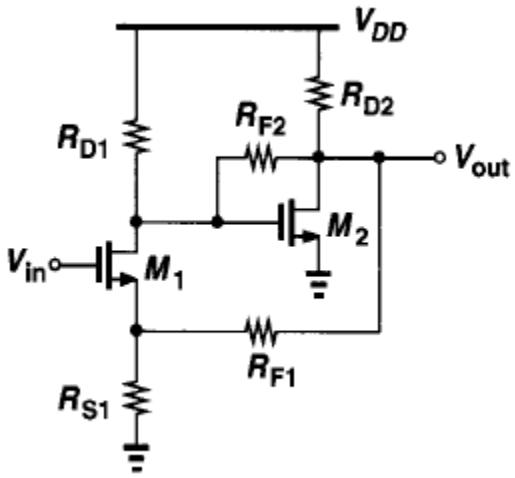

Figure PS12.3