



EE 203: Electronics I

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Examination: Second Major Exam

Date : April 17, 2013

Time: 6:30-8:00 PM

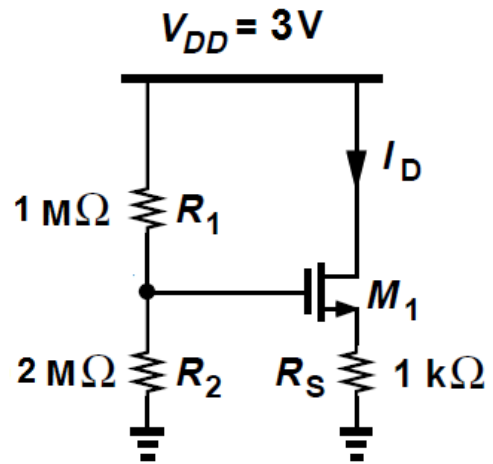
Student Name:	
Student Number:	
Section Number:	

Problem 1	20	
Problem 2	25	
Problem 3	15	
Total	60	

Answer all questions showing all steps. More than one answer for the same problem are given zero mark.

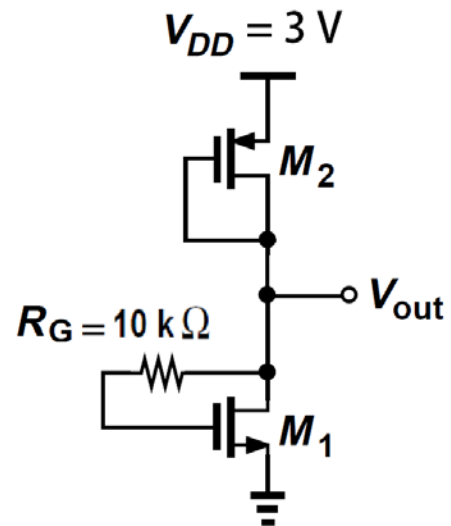
Problem (1) [20 points]

- A. Consider the circuit shown below, let $k'_n = 100\mu\text{A}/\text{V}^2$, $V_t = 1\text{V}$ and $\lambda = 0$.
Determine the transistor ratio (W/L) such that $I_D = 0.5\text{mA}$.



B. For the circuit shown below **Find I_{D1} , I_{D2} and V_{out}** assuming the following transistors parameters:

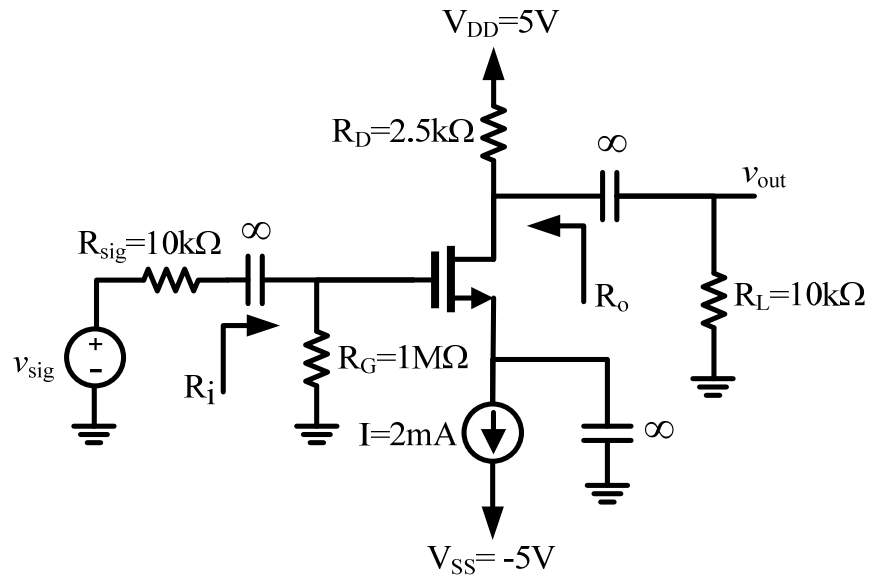
$$V_{tn} = -V_{tp} = 1V, \quad k'_p(W/L)_p = k'_n(W/L)_n = 300\mu A/V^2 \text{ and } \lambda = 0.$$



Problem (2) [25 points]

For the transistor used in the shown common source amplifier has $k'_n W/L = \mu_n C_{ox} W/L = 1 \text{ mA/V}^2$, $V_t = 1 \text{ V}$ and $\lambda = 0$.

- Draw the small signal circuit using the π -model.
- Calculate the **voltage gain** ($A_v = v_{out}/v_{sig}$), **input (Ri)** and **output (Ro)** resistances of the amplifier.
- Determine the **DC voltages** V_{DS} and V_{GS} and hence find the **maximum output signal swing**.
- Rearrange the circuit to get **common-drain amplifier** source follower (remove all unnecessary components).



Problem (3) [15 points]

For the given circuit, assume active mode

- Find the dc currents I_C , I_B and I_E and voltages V_B , V_C and V_E .
- Confirm your assumption** for the mode of operation.

