Analog Circuit Design (ACD) – ECE520

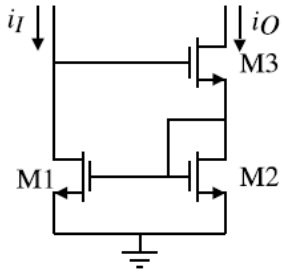
Home Assignment - 2

Total Marks: 10 Submission Deadline: 23.09.2013

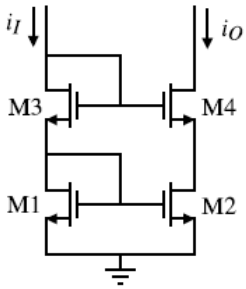
Instructions:

- **Answer all the questions.**
- **Please adhere to institute's plagiarism policy.**
- **Submit before 5:00pm on the submission day. No late submission allowed.**

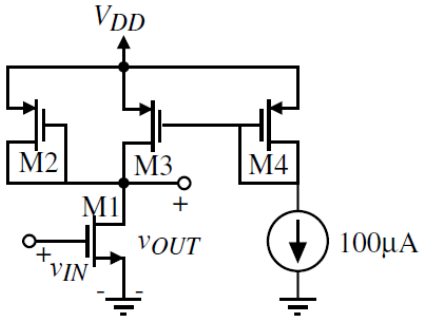
Q1. [3 marks] Determine the expression for input impedance (R_{in}) for the following circuit.



Q2. [2 marks] Determine the expression for input impedance (R_{in}) for the following circuit.

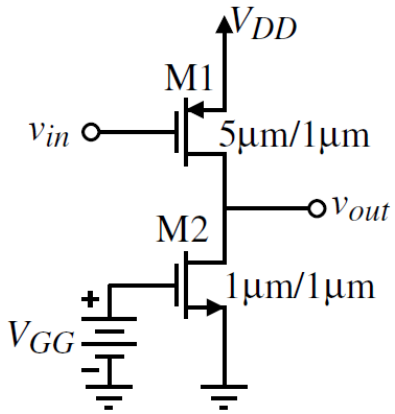


Q3. [2.5 marks] Assume that W/L ratios in the following circuit are: $(W/L)_1$=2µm/1µm; $(W/L)_2=(W/L)_3=(W/L)_4$= 1µm/1µm. Find the dc value of Vin that will give a dc current in M1 of 110µA. Calculate the small-signal voltage gain and output resistance.



Please use $\mu_n C_{ox}$ = 110µA/V^2, $\mu_p C_{ox}$ = 36µA/V^2, V_{TN} = 0.73V, V_{TP} = -0.88V, V_{DD} = 5V, C_{ox}= 2.5*10^{-15}F

Q4. [2.5 marks] A CMOS amplifier is shown below. Assume M1 and M2 operate in saturation. (a) what value of V_{GG} gives 100 μA through M_1 and M_2, (b) what is the dc value of V_{in}, (c) what is the small signal voltage gain (v_{in}/v_{out}) for this amplifier.



Please use $\mu_n C_{ox}$ = 110μA/V^2, $\mu_p C_{ox}$ = 36μA/V^2, V_{TN} = 0.73V, V_{TP} = -0.88V, V_{DD} = 5V, C_{ox}= 2.5*10^{-15}F