MID-TERM EXAMINATION, ECE412 FALL SEMESTER 2011

Instructions

- Lecture notes allowed. Use additional sheets if necessary.
- There are three questions in this exam. Only one of the problems will be counted towards your grade. If you solve more than one problem, the answer with the maximum score will be counted.
- Partial credit will be provided if steps towards solving the problem are correct but the final answer is incorrect. Make sure that you indicate how you are approaching the problem. If the final result is not supported by intermediate steps and if the final result is incorrect, you might loose all the credit for that question.

Assumptions

- All transistors (pMOS and nMOS) have equal gate transconductance $g_m$ and drain transconductance $g_d$. The pMOS transistor is indicated by a circle at its gate.
- The wires in the diagrams are connected only where solder dots (black dots) are located.
Problem 1 (20 points)
Compute the following parameters for the circuit given below:
1. Small signal gain $A_{\text{diff}} = \Delta V_{\text{out}} / (\Delta V_{\text{in}}^+ - \Delta V_{\text{in}}^-)$ [10 points]
2. Output voltage swing. [5 points]
3. Power consumption [5 points]
Problem 2 (20 points)
For the circuit below, compute the following parameters:

1. Small signal gain \( A_{\text{diff}} = \frac{\Delta V_{\text{out}}}{(\Delta V_{\text{in}}^+ - \Delta V_{\text{in}}^-)} \) [10 points]

2. Output voltage swing. [5 points]

3. Power consumption [5 points]
Problem 3 (20 points)

Compute the following parameters for the circuit given below:

1. Small signal gain $A_{diff} = \Delta V_{out} / (\Delta V_{in}^+ - \Delta V_{in}^-)$ [10 points]
2. Output voltage swing [5 points]
3. Power consumption [5 points]