

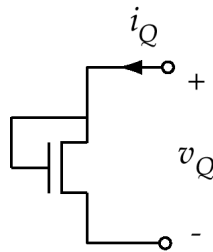
Inter American University of Puerto Rico
Bayamón Campus
School of Engineering
Department of Electrical Engineering

ELEN 3311 – Electronics I

Problem Set 5

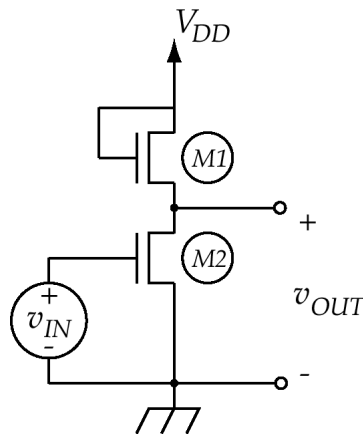
Due Wednesday, May 4.

Problem 1: Consider the two-terminal device shown below, in which the gate of a MOSFET is tied to its drain. The MOSFET is characterized by a threshold voltage V_{to} and a MOSFET parameter K .



- (A) Show that the MOSFET can never enter into its triode region of operation.
- (B) Find an algebraic expression and sketch the v_Q - i_Q characteristic of the circuit.

Problem 2: Consider the MOSFET amplifier shown below. MOSFETs $M1$ and $M2$ are characterized by their respective parameters $K_1 \neq K_2$ and the same threshold voltage V_{to} .



- (A) Sketch the v_{IN} - v_{OUT} characteristic of this amplifier using graphical analysis. Specifically, sketch the v_{OUT} - i_{D2} MOSFET characteristic for various values of v_{IN} on top of the v_{OUT} - i_{D2} constraint imposed by the rest of the circuit. Clearly identify related solution points in both sketches.
- (B) Find the exact algebraic relation between v_{IN} and v_{OUT} . Identify the gain of the amplifier in this expression.
- (C) Draw the small-signal circuit for the amplifier and find the gain. It should be the same as in the previous part.