LAB 2
MOSFET Amplifiers

Objective: This project will introduce you to the MOSFET common source and common drain amplifiers via PSPICE analysis.

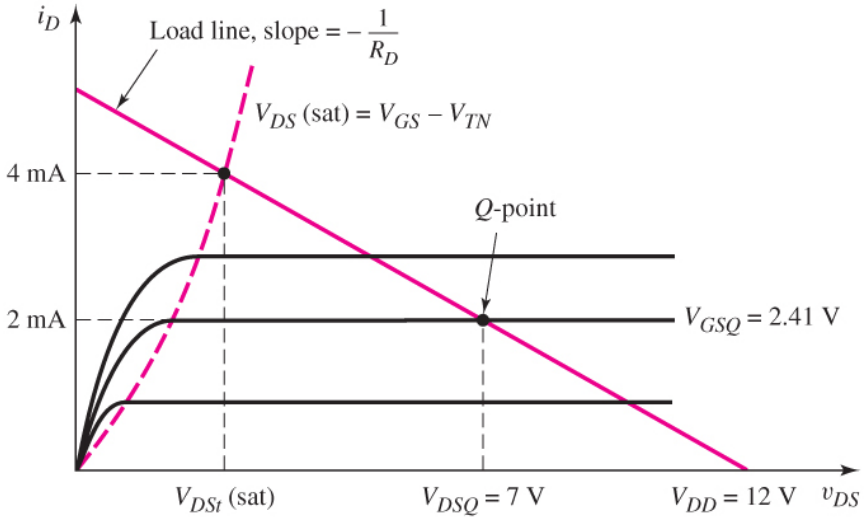
Introduction:

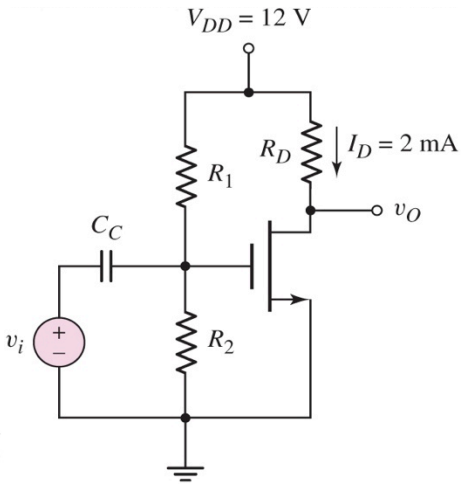
Two of the most popular configurations of small-signal MOSFET amplifiers are the common source (CS) and common drain (CD) configurations. The common source and common drain amplifiers, like all MOSFET amplifiers, have the characteristic of high input impedance. The value of the input impedance for both amplifiers is basically limited only by the biasing resistors RG1 and RG2. Values of RG1 and RG2 are usually chosen as high as possible to keep the input impedance high. High input impedance is desirable to keep the amplifier from loading the signal source. One popular biasing scheme for the CS and CD configurations consists of the voltage divider RG1 and RG2. This voltage divider supplies the MOSFET gate with a constant DC voltage. The main difference with the BJT biasing scheme is that ideally no current flows from the voltage divider into the MOSFET.

Procedure:

Given the following values and load line diagram, design and implement the following Common Source Circuit in PSPICE, and do AC analysis to calculate the small signal voltage gain A_v. Submit the output file along with waveforms in your report.

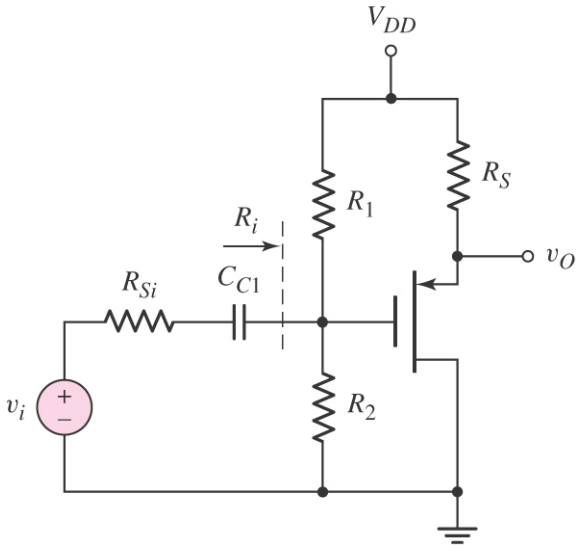
$V_{TN} = 1V$, $k'_n = 80\mu A/V^2$, $W/L = 25$, $\lambda = 0.015V^{-1}$





Given the following values solve for W/L, then design and implement the following Common Drain (Source-Follower) Circuit in PSPICE. Submit the output file along with waveforms in your report.

$V_{DD} = 20V$, $R_{Si} = 4k\Omega$, $I_{DQ} = 2.5mA$, $V_{TP} = -2V$, $k'_P = 40\mu A/V^2$, $R_i = 200k\Omega$, $\lambda = 0V^{-1}$, $A_v = 0.9$



Conclusions:

1. What differences did you observe between the gain of each circuit?
2. What are the benefits of each type of amplifier and how could these benefits be utilized?
3. Did you encounter any difficulties performing the simulations in PSPICE? Explain.