ECE 230L - LAB 7

DEVICE NON-IDEALITIES

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1 Objectives of this Laboratory

The objectives of this laboratory session are as follows:

- To gain understanding of some of the less than ideal behavior of devices and circuits explored in previous laboratories.
- To explore methods for measuring these non-idealities in a less structured lab environment using the tools presented during the course of the semester.
- To work with a group in the course to explore these methods.
- To present group findings to fellow students in the course in a lab presentation.

2 Experimental Exploration Format

- This lab will be conducted in groups of two or three.
- Each group will be assigned an exploration
- Complete the exploration and form a brief presentation to share with the lab section—*you have one hour*
- Each group will present their findings to the entire lab

3 Experimental Explorations

There are five possible explorations:

3.1 Thermal Effects on PN-Junction Diode & MOSFET

To be completed in a group of 2 or 3.

PN-Junction Diode

1. Construct the following circuit on a breadboard:

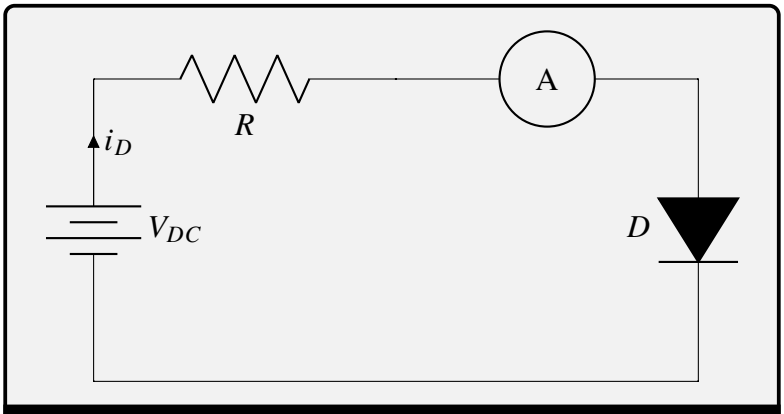


Figure 1: PN-Junction Diode Test Circuit

2. Run the `singleloop.vi` script from 0 to 6 V with 100 steps. This produces $I_D(V_D)$.
3. Repeat the above, but with a voltmeter over the diode, to measure V_{PN}. Combine the results to produce the graph $I_D(V_{PN})$.
4. Now, obtain thermal paste from your TA and apply it to the diode. Obtain a soldering iron and heat it to its lowest setting. Apply the soldering iron to the diode to allow it to heat it.
5. Repeat steps (1) – (3), and compare the results.

MOSFET

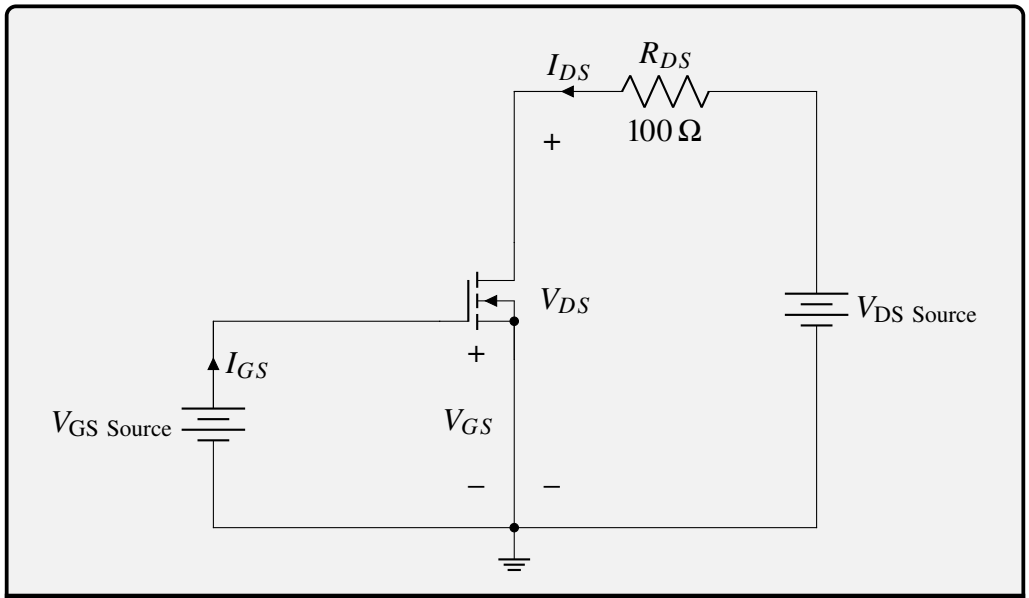
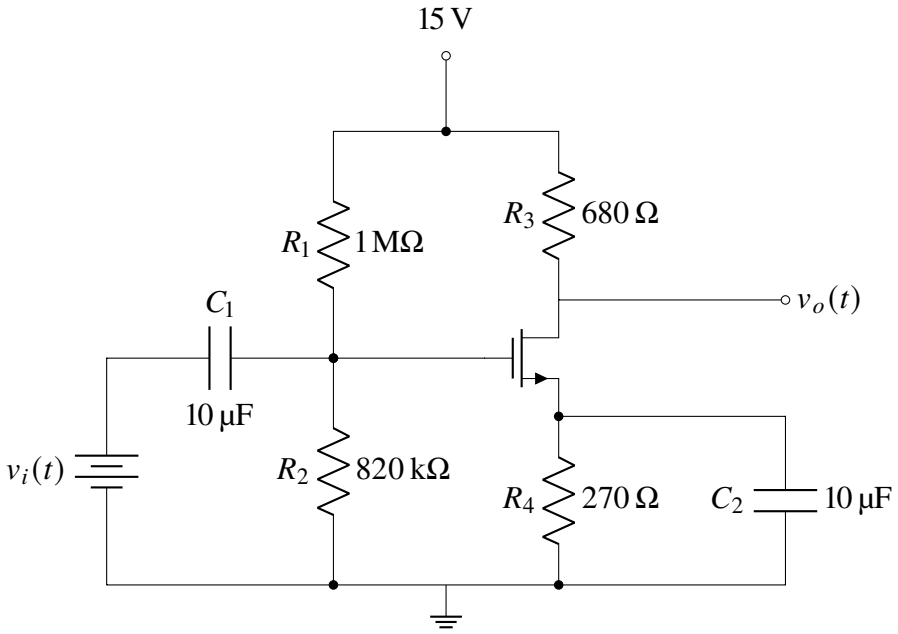
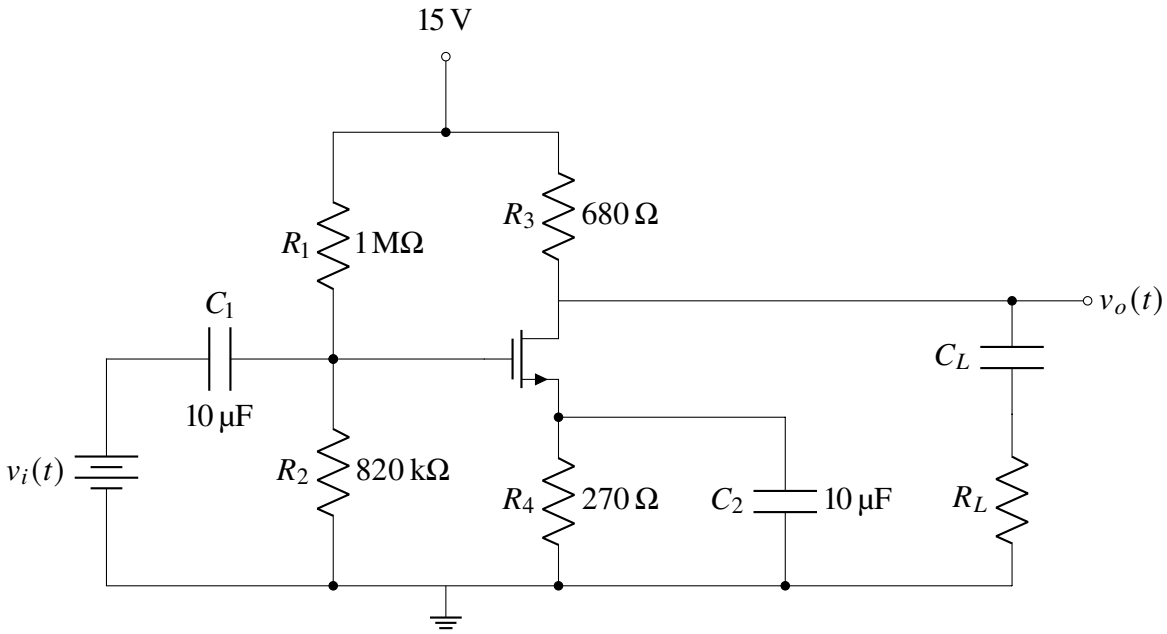


Figure 2: Circuit used to characterize an NMOSFET

3.2 MOSFET Amplifier Gain and Load Limits

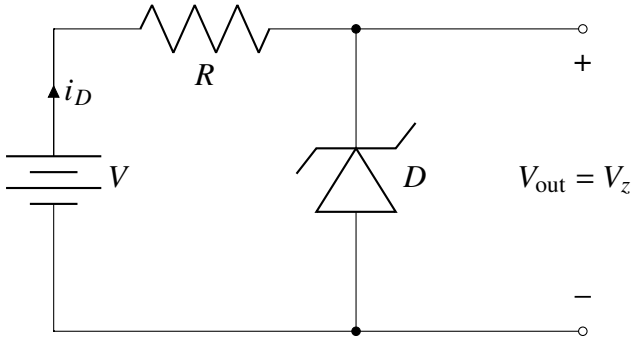




3.3 MOSFET Input and Output Resistance

3.4 MOSFET Inverter maximum clock frequency with external capacitive load

3.5 Zener diode (Reverse breakdown)



Grading Rubric