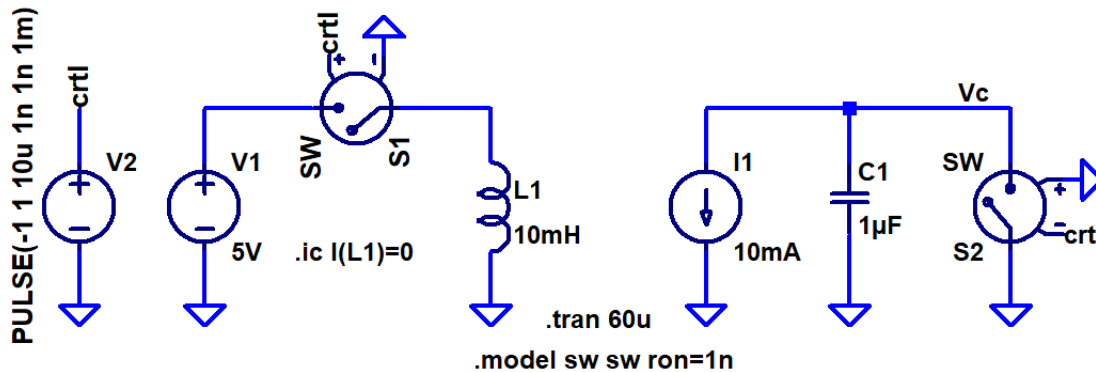


H.W. #3 EE 442/ECG 642 Fall 2022

Show your work for credit and follow the homework [guidelines](#).

1. Show how to determine the current in the inductor and the voltage across the capacitor in the following circuits. Use LTspice to verify your hand calculations. Note that the switch in the inductor circuit is open at the beginning of the simulation while the switch in the capacitor circuit is closed at the beginning of the simulation. (2 points)



2. Discuss how to experimentally determine a diode's junction capacitance, storage time, and reverse recovery time. Use LTspice and both the MURS120 (Silicon) and 1N5817 (Schottky) diodes to support your discussion. Note that your experimental setup, something you personally should be able to go into the lab and setup, should include no more than a pulse generator, a resistor, and the diode (and a scope). (2 points)
3. Work book problem 4-1 and verify your answers with LTspice (you will need to know how to determine average and RMS using LTspice [press ctrl while clicking on a trace], peak can be read off of a time-domain plot). (3 points)
4. Using the transformer model seen below, design a DC power supply using full-wave rectifiers that supplies both a first voltage greater than 7V (DC) and a second voltage less than -7V (DC) with no more than 10 mV of ripple when supply >100 mA of current from either DC voltage source. Show how you calculate the value of the filter capacitors (note that if your design has near 10 mV of ripple you will lose points because one *never* designs up to the edge of a specification). Use both a resistor and a current source to model the load. Verify the operation of your design using simulations. Note that if you only simulate at full load (> 100 mA) and don't show no load or other loads, you will lose points (try a parameter sweep in LTspice to vary the loads, for example). Assume the input is the AC mains that can vary from 110 to 130V RMS. (6 points)

