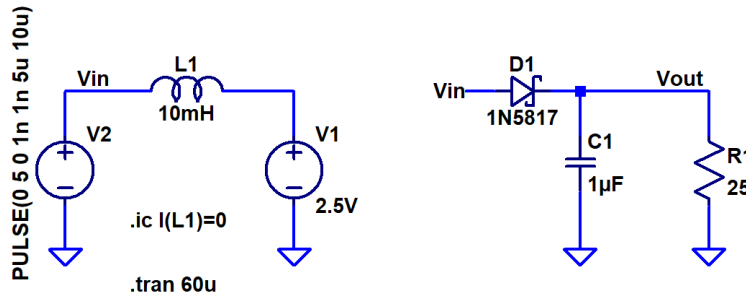H.W. #4 EE 442/ECG 642 Fall 2022

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. (4 points)

2. Noting that the initial current in the inductor seen below is zero, determine the current flowing in the inductor over time from 1 to 1us prior to the switch opening. Then comment on the voltage Vbang after the switch opens. Use LTspice to verify your hand calculations. (2 points)
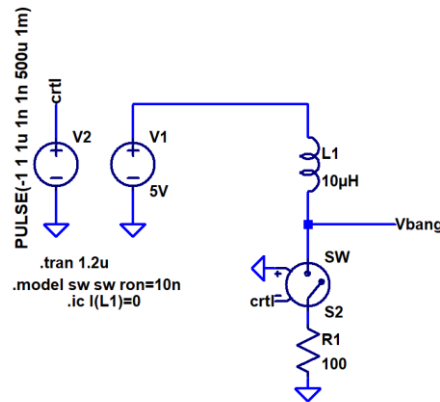
3. A 1.5V AAA battery has a capacity of 1500 mAh. How much energy does this full capacity AAA battery store? How low long can this battery supply energy to a 1k resistor? When the battery is supplying energy to the resistor what is the instantaneous power? (2 points)

4. In problem 2, show using LTspice, that adding a snubber diode (aka commutating, freewheeling, suppressor, clamp, catch diode...important to know all of these terms so you know what somebody is talking about) will limit the voltage Vbang. (1 point)

5. Redo Example 32.5 in the Buck.pdf handout using a 200 uH inductor. Show your hand calculations match simulation results. What are the drawbacks and benefits of increasing this inductor value? (2 points)

6. Redo Example 32.7 in the Boost.pdf handout to supply 12.5V at up to 10 mA. Use simulations to verify your hand calculations. (2 points)