EE419/519 Homework Assignment #3 (v2)
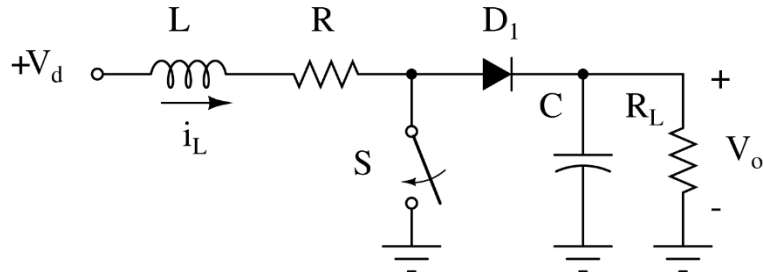
Due November 17, 2024

1. Consider the following Boost converter with V_d=12V, L=100µH, R=1Ω, D=0.5, T_s=40µs. The diode has a forward voltage drop of 0.8V when conducting. The capacitor C is sufficiently large so that the output ripple is negligible.

   i. In PSS, $i_L(0)$=0.1+mod(BilkentID,10)/10. Find the output voltage V_o. Note that the inductor current follows an exponential curve: $i_L(t)=i_{Lfinal}+(i_{Linitial}-i_{Lfinal})e^{-t/\tau}$ rather than a linear ramp.
   ii. Find the value of the load resistance R_L by finding the average value of the diode current.
   iii. Find the peak-to-peak ripple at the output if the capacitor, C, has an ESR of 0.01Ω.

2. A flyback converter has V_d=200V, D=0.05+mod(BilkentID,5)/20, T_s=40µs. The transformer has L_M=1200µH, L_L=100µH, and N_1/N_2=2+mod(BilkentID,5).
   a. Find the output voltage if Δ_2=0.7.
   b. Find the Zener diode voltage of the snubber network if Δ_1=0.02.
   c. Find the power dissipated in the snubber network.
   d. Find the value of the output load resistance.