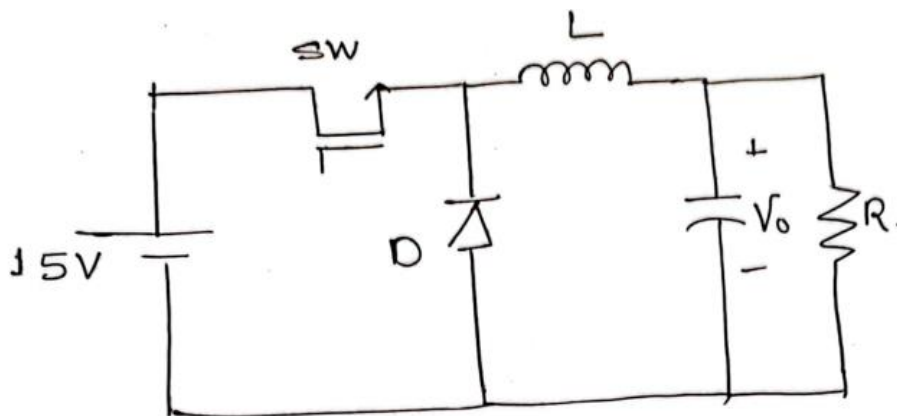


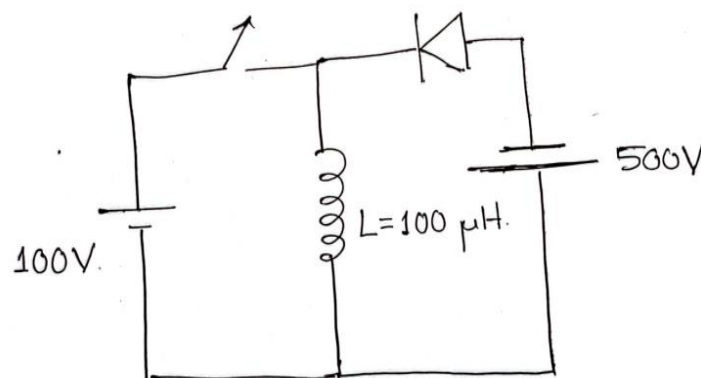
## Assignment 2 (EE 238)

1. Design a buck converter with a source voltage of 50 V and duty ratio of 0.6. The load resistance is  $20\ \Omega$ . The maximum voltage ripple in the capacitor is 1% of the average capacitor voltage and the maximum ripple current is 5% of the average output current. Assume the converter is operating in CCM (Continuous Conduction Mode). The switching frequency is 2 kHz.
2. Find the output voltage of the following circuit considering the forward voltage drop of the MOSFET as 1 V and the forward voltage drop of the diode as 0.7 V. The switch is ON for 40% of the time in a switching cycle. The switching frequency is 5 kHz and assume CCM.



To get the output voltage in a circuit, try to write the voltage across the inductor in terms of the input and output voltage and then apply the voltage second balance.

3. Consider the following circuit. The  $f_s=10\text{ kHz}$  of the switch.



The minimum current of the inductor is zero but never for a finite duration at the steady state. Find the peak value of the inductor current and also the duty ratio.

4. For a buck converter, the source voltage is 100 V, the duty ratio is 0.4 and the output voltage is 50 V. Given  $L=200\text{ }\mu\text{H}$  and  $f_s=20\text{ kHz}$ , find
  - a) the peak value of the current.
  - b) The average output current.
5. Assuming CCM, draw the waveforms of the switch current, diode current, inductor current and the capacitor current for both Boost and Buck-Boost converters.