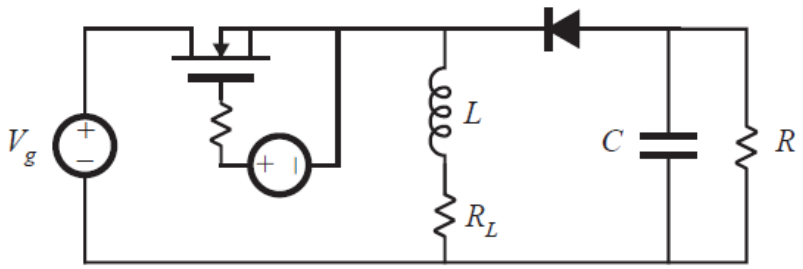
Problem 4.1 (50 points)

Do Textbook (Fundamentals of Power Electronics 2nd Edition) Problem 4.7 (pg. 105).

Problem 4.2 (50 points)

The buck-boost converter shown below is implemented with a MOSFET and a diode. The MOSFET can be modeled as ideal, but the diode exhibits "snappy" reverse-recovery characteristics, with reverse recovery time t_r and recovered charge Q_r. In addition, the inductor has winding resistance R_L. The converter operates with small inductor current ripple and small capacitor voltage ripple. Derive an equivalent circuit that models the dc components of the converter waveforms and that accounts for the loss elements described above.



Problem 4.3 (50 points) [Additional problem only for ECEN 5797 students]

Do Textbook (Fundamentals of Power Electronics 2nd Edition) Problem 4.8 (pg. 105).