

### EE394J10 Homework Assignment #3

Due date: 10/29/2010

For all questions elaborate some few conclusions or comments about the results. For all questions with simulations include a graph with the used model. State all the assumptions considered in the simulations. Also for all simulations, the results should focus on the steady state, so the transient period may or may not be shown. You are free to do as many assumptions you consider appropriate.

- 1) Write down both the switched and fast-average dynamic equations for a Ćuk converter. Simulate both conditions assuming a switching frequency of 20 kHz, an input voltage of 24 V, an output voltage of 48 V, the load is a  $2\ \Omega$  resistor, the output capacitance is  $1500\ \mu\text{F}$ , the center capacitance is  $50\ \mu\text{F}$ , and all inductances are  $800\ \mu\text{H}$ . Plot all the state variables (inductor currents and capacitor voltages). Calculate the input power factor.
- 2) Simulate the multiple-input converter in the figure and plot the output voltage and input currents, assuming a switching frequency of 20 kHz, input voltages of 24 V and 16 V, an output voltage of 48 V, the load is a  $2\ \Omega$  resistor, the output capacitance is  $1500\ \mu\text{F}$ , the center capacitance is  $100\ \mu\text{F}$ , and all inductances are  $300\ \mu\text{H}$ . Calculate the input power factor. Now repeat the simulation and calculations adding an input current conditioning filter with  $L = 500\ \mu\text{H}$  and  $C = 100\ \mu\text{F}$ .

