EE394V Homework Assignment #5

Due date: 11/27/2013

For all questions elaborate some few conclusions or comments about the results. For all questions you are free to make further, but logical, assumptions you consider necessary

1)   Consider a buck-boost converter with L = 500 μH, C = 1 mF, R = 10 Ω, E = 30 V. Simulate an hysteresis control that achieves a voltage output of 40 V with a current ripple of 1 Amp. Plot the state variables in time domain and on a phase portrait.

2)   Now, try regulating the output with a PI controller. For the PI controller choose some suitable gains and simulate the resulting system. Plot the state variables in time domain and on a phase portrait.

3)   Consider a buck converter with L=500 μH, C= 1000 μF, E = 24V, and a resistive load with R = 12.96 Ω. Plot the state variables in time domain when a converter of the form

$$d = 0.7 + .1\int edt + 0.001e$$

is used to regulate the output voltage to 18 V. In the last equation, e is the error signal that results from the difference between the desired output voltage and the actual output voltage.

4)   Now replace the resistive load by a constant power load of 25 W and repeat the simulation showing the same plots. Finally, repeat once again the simulation but now add a differential term to the above controller with a gain kd=0.0001.