

EE202: Circuit Analysis I

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Fall 2006

Computer Project

In this project you are asked to perform transient analysis of forced RC and RL circuits. Either PSPICE or Electronics Workbench can be used. *The project is due in class on Friday, December 8, 2006.* The EE computer lab can be used for the project. The EE computer lab will be reserved for EE202 use. Furthermore, the TAs will be holding some of their office hours at the EE computer lab. The schedule will be announced on the course web site.

Project Description

1. Create a forced RC circuit containing a 12V dc independent voltage source, a resistor and a capacitor in series. Select arbitrary but practical values for the resistor and capacitor.
2. Double click on the capacitor in the schematic and set "IC=0" for initial conditions to be zero. Select *Transient Analysis* under "Analysis-Setup". Set "Print step" as the simulation step size (in units of time) and "Final time" to be equal to five time constants e.g. if Final time = 0.05s and you need 100 steps, set Print step = 0.0005s. Simulate and plot the voltage of the capacitor as a function of time. Then, plot the voltage of the resistor as a function of time. Compare with the theoretical voltages (obtained by solving the corresponding differential equation). What are the steady state values of the voltages?
3. Create a forced RL circuit containing a 12V dc independent voltage source, a resistor and an inductor in series. Select values for R and L that would give twice the time constant that you had in the RC circuit in step 1.
4. Double click on the inductor in the schematic and set "IC=0" for initial conditions to be zero. Select *Transient Analysis* under "Analysis-Setup". Set "Print step" as the simulation step size (in units of time) and "Final time" to be equal to five time constants of the RL circuit e.g. if Final time = 0.05s and you need 100 steps, set Print step = 0.0005s. Plot the voltage of the inductor as a function of time. Then, plot the voltage of the resistor as a function of time. Compare with the theoretical voltages (obtained by solving the corresponding differential equation). What are the steady state values of the voltages?

Submit a report per group. Groups may consist of up to three people. Reports with more than three names will not be accepted. The report should contain the following:

- Six computer plots: A printout of the RC circuit schematic, a plot of the capacitor voltage versus time, a plot of the resistor voltage versus time, a printout of the RL circuit schematic, a plot of the inductor voltage versus time and a plot of the resistor voltage versus time.
- Theoretical derivations and plots of the transient response of the RC and the RL circuits.
- An explanation of the steady state values of the voltages you plotted. Show that you can find the steady state values by replacing the capacitor with an open circuit and the inductor with a short circuit.