ECE 3043 Summer 2018
Homework Problem Set No. 4 for Experiment No. 4

Due First Meeting Week of June 11

1. For the circuit shown below, use Mathcad, Matlab, National Instruments and LT SPICE (text editor mode) to plot the Bode plot as the frequency of the source varies from $1\,\text{MHz}$ to $10\,\text{MHz}$. Compare the simulation results with the theoretical results. The component values are $R_1 = 68\,\text{k}\Omega$, $R_2 = 33\,\text{k}\Omega$, $R_3 = 6.8\,\text{k}\Omega$, $L = 3\,\text{mH}$, and $C = 1\,\text{pF}$. Use Mathcad and Matlab to plot the magnitude and phase of the voltage $v_o(t)$; assume that the phase of the source $v_i(t)$ is zero with the orientation shown with the top terminal being plus. (Note that since the input is unity this is equivalent to finding the Bode plot.). For Multisim, Mathcad, and LTSpice use $2,000$ logarithmically spaced points. Compare the simulation with the theoretical value for the quality factor and resonant frequency.

2. For the circuit shown below, use Mathcad, Matlab, National Instruments and LT SPICE to plot the inductor current versus t as t varies from 0 to $3/f_o$. Compare the simulation results with the theoretical value for the attenuation factor for the envelope and the driven frequency using the current plot. The voltage source is $v_i(t) = 10u(t)\,\text{V}$. The component values are same as in problem 1.