

ECE 3041

Spring 2012 Homework Problem Set 7 for Experiment No. 9

Due Week of March 12

1. For the circuit shown below, use SPICE to plot the magnitude and phase of the voltage, $v(t)$ as a function of frequency (frequency log, mag lin, phase lin) as the frequency of the voltage source, $e(t)$, varies from 1 kHz to 10 kHz. Use the cursors to obtain the resonant frequency, quality factor, and half-power bandwidth from the SPICE simulation for the capacitor voltage. Compare the simulation results with the theoretical results. Assume that the voltage source $e(t)$ is a sine wave with an rms value of 10 V. The component values are $R_1 = 10 \text{ k}\Omega$, $R_2 = 240 \text{ k}\Omega$, $R_3 = 5 \text{ k}\Omega$, $R_4 = 1 \text{ k}\Omega$, $L = 2 \text{ H}$ and $C = 1.5 \text{ nF}$. Use Mathcad to plot the magnitude and phase of the voltage $v(t)$; assume that the phase of the source $e(t)$ is zero with the orientation shown.
2. Use SPICE to plot the voltage, $v(t)$, as a function of time as t varies from 0 to 1 ms for the circuit shown below. Use the cursors to determine the decay factor of the envelope and the driven frequency for the capacitor current and compare these with the theoretical values. The source voltage is $e(t) = 20u(t) \text{ V}$. Use Mathcad to make the same plot. The component values for both problems are the same as for Problem 1.

