ET 304a
Laboratory 10
Computer-aided Ac Circuit Analysis

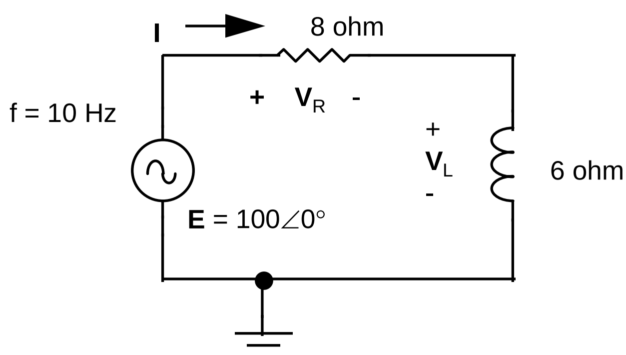
Purpose: To use a commercially available computer-aided circuit analysis tool to solve for the voltages and currents in series, parallel, and series-parallel ac circuits. To lean the basic skills necessary to run a Pspice-based circuit analysis program and get the desired output.

Objectives: Enter sinusoidal sources into a circuit analysis program that reflect given phasor values. Convert from inductive and capacitive reactance values to values of inductance and capacitances given an operating frequency for the circuit. Run transient and operating point analysis to solve simple ac circuits. Use the results display tools to view time plots and get rms and phase values for simple ac circuits.

Procedure

1.) Review the Circuitmaker tutorial on Transient and Frequency analysis provided. The laboratory instructor should also give a demonstration of program usage.

2.) Using the schematic drawing tools in the Circuitmaker program, construct the circuit shown below. This circuit was solved in problem 7 of chapter 15 in the Boylestad text. Assuming a source frequency of 10 Hz, find the inductance of the 6 ohm inductor for use in the circuit simulator.

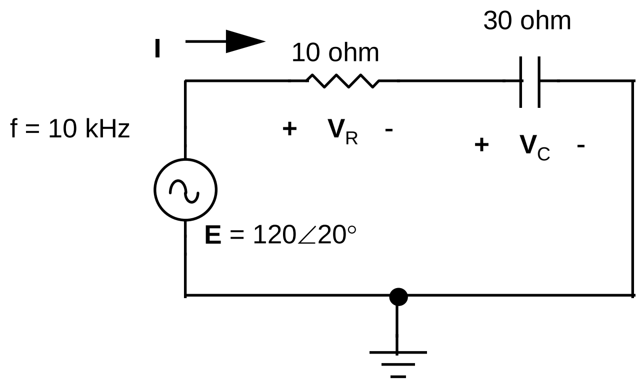


Convert the phasor source voltage **E** to a peak value with the appropriate phase shift for use in the simulator.

3.) Use the simulation program to plot the time functions of i(t), $V_L(t)$ and $V_R(t)$. Compute the phasor values of **I**, $\mathbf{V}_L$, and $\mathbf{V}_R$ from the time functions.

4.) Compare the simulator values to theoretical calculations made in the homework solutions.

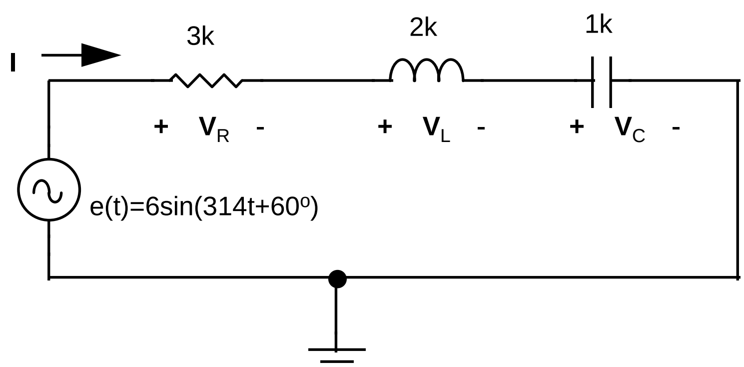
5.) Construct the circuit shown below using the schematic drawing tool. This is problem 8 in chapter 15 of the lecture text. For a source frequency of 10 kHz, find the value of capacitance for use in the Circuitmaker simulator. Convert the source voltage phasor **E** to a peak value with the appropriate phase shift for use in the simulator.



6.) Use the simulation program to plot the time functions of i(t), $V_C(t)$ and $V_R(t)$. Compute the phasor values of **I**, $\mathbf{V}_C$, and $\mathbf{V}_R$ from the time functions.

7.) Compare the simulator values to theoretical calculations made in the homework solutions.

8.) Using the schematic drawing tools in the Circuitmaker program, construct the circuit shown below. This circuit was solved in problem 11 of chapter 15 in the Boylestad text. Compute the values of L and C in the circuit from the frequency of the given sine source, e(t).

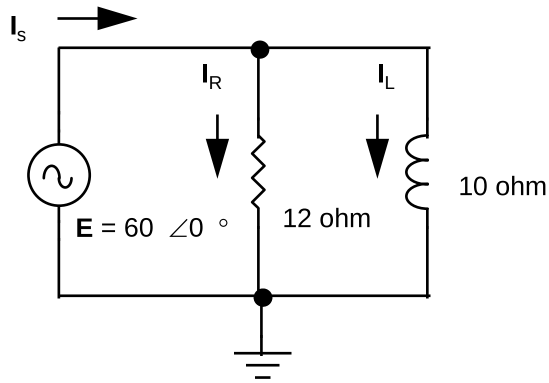


9.) Use the simulation program to plot the time functions of i(t), $V_L(t)$, $V_C(t)$ and $V_R(t)$. Compute the phasor values of **I**, $\mathbf{V}_L$, $\mathbf{V}_C$, and $\mathbf{V}_R$ from the time functions.

10.) Compare the simulator values to theoretical calculations made in the homework solutions.

11.) Using the schematic drawing tools in the Circuitmaker program, construct the circuit shown below. This circuit was solved in problem 29 of chapter 15 in the Boylestad text.

Find the inductance of the 10 ohm inductor assuming that the source frequency is 20 Hz. Convert the source voltage phasor **E** to a peak value with the appropriate phase shift for use in the simulator.



12.) Use the simulation program to plot the time functions of $i_s(t)$, $i_L(t)$, and $i_R(t)$. Compute the phasor values of $\mathbf{I_s}$, $\mathbf{I}_L$, and $\mathbf{I}_R$ from the time functions.

13.) Compare the simulator values to theoretical calculations made in the homework solutions.

Report

1.) Use the standard report format for the document.

2.) Put the homework and simulation results in tables. Compute the percent error between the homework theoretical calculations and the simulation results.

3.) Attach printouts of each circuit time functions from the Circuitmaker program.