Name_____

EGR 2201 Lab 13
Effective Values in AC Circuits

OBJECTIVES

-Use Multisim to simulate AC circuits and obtain values for effective (rms) voltages and currents.

-Use the digital multimeter to measure effective voltages and currents in AC circuits on the breadboard.

-Compare the measured values to predictions based on theory.

EQUIPMENT

Digital multimeter, Trainer with power supply and breadboard

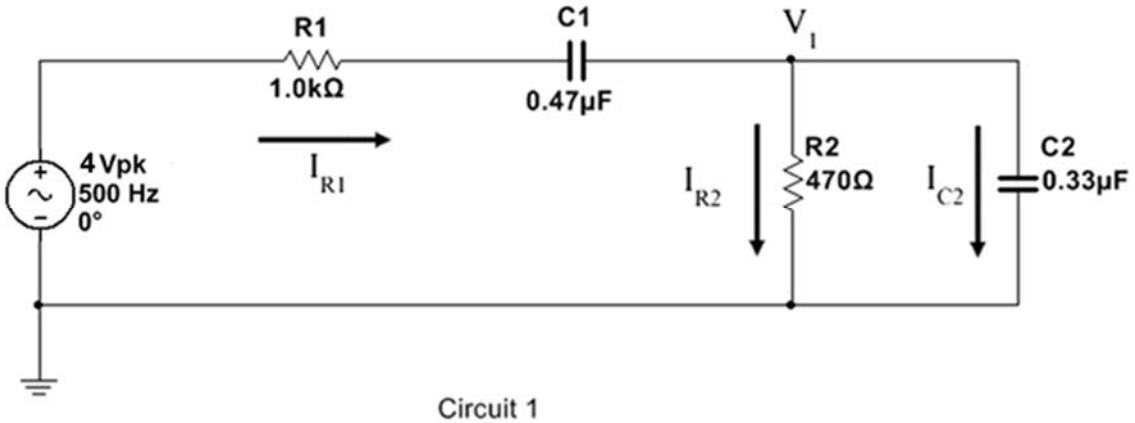
PROCEDURE:

1. Obtain the components listed in Data Table A. Measure and record their values. **Throughout this lab, round all predicted values, measured values, and percentage errors to three significant digits.**

Data Table A: Component Values

Component I.D.	Nominal Value	Actual Value
R_1	1 kΩ	
R_2	470 Ω	
C_1	0.47 μF	
C_2	0.33 μF	

2. Consider Circuit 1, shown below. The diagram identifies three currents I_{R1}, I_{R2}, I_{C2}, and one node voltage V_1 whose effective values you will compute and measure on the following pages.



Circuit 1

3. Compute and record the following quantities for this circuit. Show all of your work **on another sheet of paper that you will attach when you turn in this lab.**

   Angular frequency ω = _____ (Recall that $\omega = 2\pi f$.)

   C_1's impedance in polar form = _____

   C_2's impedance in polar form = _____

   Current $\mathbf{I}_{R1}$ in polar form = _____

   Current $\mathbf{I}_{R2}$ in polar form = _____

   Current $\mathbf{I}_{C2}$ in polar form = _____

   Voltage $\mathbf{V}_1$ in polar form = _____

4. Predict the effective value (also called the rms value) of each current and voltage listed above, recording your predictions in Data Table B. Recall that in sinusoidal circuits, a current's or voltage's effective value is equal to approximately 0.707 times its amplitude.

Data Table B: Effective Values in Circuit 1

Quantity	Predicted Value	Measured Value	Percentage Error
$I_{R1\ (eff)}$			
$I_{R2\ (eff)}$			
$I_{C2\ (eff)}$			
$V_{1\ (eff)}$			

5. Call me over to check your predictions. _____

6. Build the circuit in Multisim, inserting three correctly oriented ammeters and a voltmeter to measure the quantities listed above. By default, ammeters and voltmeters in Multisim are in DC mode, and therefore they display average values. If you want them to display effective values, you must change them to

AC mode. To do this, double-click a meter to open its Properties dialog box. Then, on the **Value** tab, select **AC** in the **Mode** drop-down box. Do the same for each of the other meters.

7. Run the simulation. The values displayed in the meters should agree with your predictions from above. If they do agree, get a printout of your circuit showing these values on the meters, and **attach this printout when you turn in the lab.**

8. Build the circuit on a breadboard. Use a multimeter to measure and record the quantities listed in Data Table B. Then compute percentage errors between your predicted and measured values.

9. Call me over to check your work. _____

LAB REPORT

For this lab will turn in a typed lab report, with your handwritten lab sheets stapled to the back. The course syllabus has instructions on how to format your lab report, along with a sample lab report.