Basic Electricity – Unit 15: Inductance and AC

Lab 2

Objective

The purpose of this lab is to discover how parallel resonant RLC circuits behave. An important property of this circuit is its ability to resonate at a specific frequency. This is an important concept necessary when designing circuits which will be used for: band-pass filters, band-stop filters, low-pass filters or high-pass filters.

Safety

Care must be taken when working with electrical devices. If you are not familiar with electrical safety rules please go to that section NOW.

In the lab NO food or beverages are allowed.

Use all Hand Tools in a safe and proper way. If in doubt ask your instructor.

Possible hand tools needed for this lab:
1. Needle nose pliers
2. Small screwdriver
3. Large screwdriver
4. Wire strippers
5. Diagonal pliers
6. Soldering iron

Possible equipment needed for this lab:
1. DC power supply
2. AC signal generator

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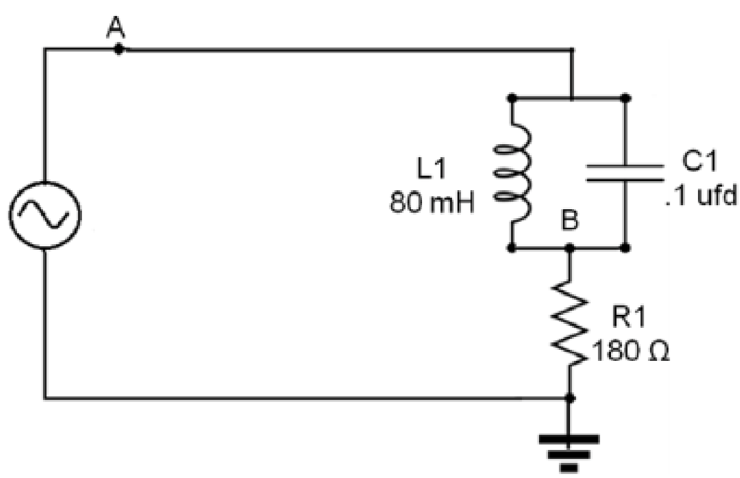
3. Oscilloscope
4. Multimeters
5. Breadboard
6. Computer
7. Test leads
8. Oscilloscope probes
9. hook up wire

Parts list required for this lab:

1. .1 ufd capacitor
2. 80 mH coil
3. 180 ohm resistor

1. Construct the following circuit.



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2. Set up the signal generator to 2.5 v p-p at 100 hz.. Make sure your signal generator is set to sine wave output. Monitor this with channel 1 of an oscilloscope. This can be accomplished by connecting channel 1 of the oscilloscope to point A in the circuit.

3. Place the oscilloscope probe at Point B once the signal generator is adjusted as in step 2. Measure the p-p voltage at Point B.

4. Record the p-p voltage measured in step 3 in data table 1. provided.

5. Adjust the signal generator frequency to the given values listed in data table 1. Each change in frequency will mean a change in voltage developed across the resistor of the circuit. Record the voltage measured across the resistor for each new frequency. Once again, this is the voltage at Point B.

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DATA TABLE 1.

FREQUENCY in HZ.	VOLTAGE p-p at POINT B	FREQUENCY in HZ.	VOLTAGE p-p at POINT B	FREQUENCY in HZ.	VOLTAGE p-p at POINT B
100		1,200		2,300	
200		1,300		2,400	
300		1,400		2,500	
400		1,500		2,700	
500		1,600		3,000	
600		1,700		4,000	
700		1,800		5,000	
800		1,900		8,000	
900		2,000		10,000	
1,000		2,100		15,000	
1,100		2,200		20,000	

5. On the provided semi-log graph paper plot the output p-p voltage vs. the frequency. You will need to put several sheets together to fit your results.

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6. Describe what your plotted data shows. Give a brief description in your own words what you have learned about parallel resonant RLC circuits.

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7. Note: The frequency at which the voltage across the 180 Ω resistor is minimum is called the parallel resonant frequency.

Another method of finding this value is using the following equation.

$$F_{Resonance} = \frac{1}{(2)\pi\sqrt{LC}}$$

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7. Use the formula and calculate your frequency of resonance.

   Calculated $F_{Resonance}$ = ______________________

8. Examine your graph and determine the actual value of $F_{Resonance}$
   (NOTE: This will be the Minimum value plotted on your graph)

   Actual $F_{Resonance}$ = ______________________

9. Use the following formula and determine the percent difference between your actual and calculated values of $F_{Resonance}$.

% Difference between actual and measured values =
{(FR actual - FR calculated) / FR actual } x 100

Your % Difference = _____________

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10. What will happen to the resonant frequency if a second .1 ufd capacitor were to be connected in parallel with the first capacitor?

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11. Connect a second .1 ufd capacitor and show results.

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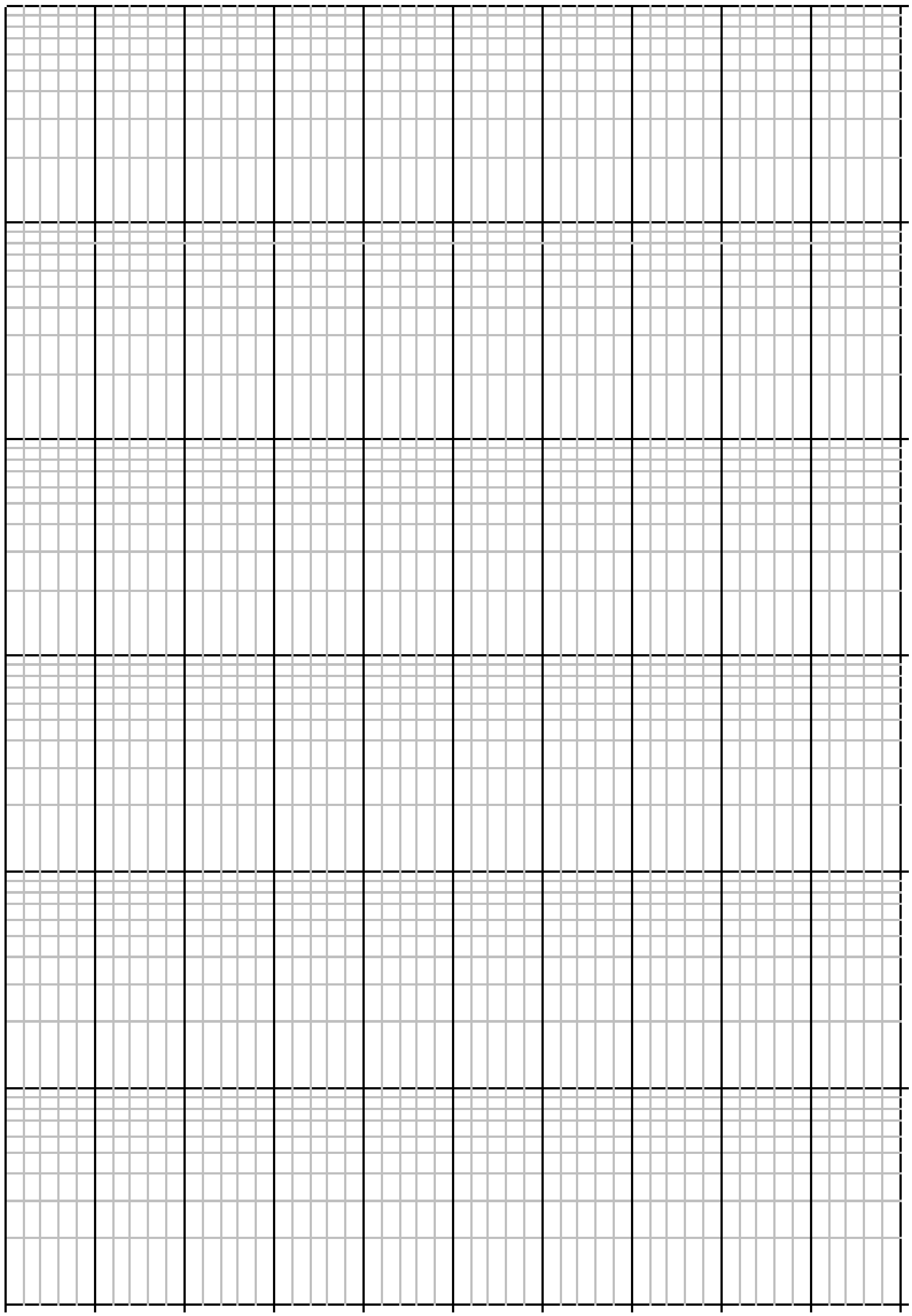

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