**Resonance**

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PHY 134

SECTION 07

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**Aim:**

In this lab we will use the oscilloscope to monitor the input voltage applied to the series RLC circuit (channel 1) and to simultaneously observe the voltage across parts of the circuit on channel 2.

**Procedure:**

**1)** Connect the circuit as specified in the manual

**2)** Set the function generator to generate a 5KHz sin wave, Set the Resistance box to 50 ohm and capacitance to 0.1microF and adjust the frequency until R is maximum.

**3)** Keeping the frequency constant, realign the circuit as shown in the manual and measure the phase of the voltage across the capacitance. Repeat the same for the Inductor.

**4)** Reconnect the circuit as shown in part 1 and set the R to 50ohm and C to 0.1mF and plot the resonance curve. Repeat for 10ohm and 0.1 microF.

**Data Analysis:**

From our calculations, resonance should occur at 112KHz, however based on our measurement it takes place at 90KHz. This could be because of incorrect experimental setup or incorrect inductance.

**Q1) At what frequency should the maximum occur?**

Maximum voltage should be at

Hence,

**Q2) What is the phase of the capacitor voltage relative to the input voltage at resonance? What is the amplitude of the capacitor voltage at resonance? Is it larger than the input voltage?**

The phase of the capacitor is PI/2 radians ahead of the voltage.

The amplitude of the voltage is 15divs \* 0.2V/div = 7.5Volts

This is larger than input voltage.

**Q3)**  **What is the phase of the inductor voltage relative to the input voltage at resonance? What is the phase of the inductor voltage relative to the capacitor voltage at resonance? What is the amplitude of the inductor voltage at resonance? Is it larger than the input voltage?**

The phase of the inductor is PI/2 radians behind the voltage.

Relative to the capacitor, it is PI radiance behind.

The amplitude of the voltage is 15divs \* 0.2V/div = 7.5Volts

This is larger than input voltage.

**Q4)** **Explain how it is possible for the inductor and capacitor voltages to be larger than the input voltage.**

This is because energy builds up in the form of current flowing from inductor and capacitor and back and, on each cycle, the input signal supplies the same amount of energy that is dissipated by the resistive parts of the circuit.

**Q5) At resonance, what is the voltage and phase across the L-C combination relative to the input voltage?**

At resonance, this voltage is very large compared to input voltage



