

Example of report on lab partners name(s)

[Technology](#), [Development](#)



Group Number:

ABSTRACT

The RLC resonance in a circuit is a circuit in which the arrangements follow or consist of a resistor, inductor and capacitor. This lab report is not a confined order. It can take a different order, i. e. an inductor, a resistor and a capacitor thus LRC. This arrangement can be connected in series or parallel depending on the topic in question. In this circuit, RLC circuit resonance, form a harmonic oscillation for current in seen in the cathode ray tube, oscilloscope. This laboratory work or experiment tries to determine the behavior of an RLC resonance circuit in terms of the resonance frequency as displayed in the oscilloscope, the resistance offered by inductors and time taken for this oscillations.

Experiment's Title . 1

Abstract 1

Introduction . 3

Objective . 3

Methodology or procedure3

Results.. 8

Discussion and Analysis10

Conclusion11

Introduction

The whole idea of this laboratory experiment is to determine the behavior of LRC resonance circuit in respect to the resonance of this system. The system is connected in series with inductors, resistors and capacitors. The behavior

of this circuit to sign the wave at forced response of the circuit is keenly taken into account.

In this case the power that is transferred to the load resistor is maximized done at resonance frequency. The tendency or transient behavior of the circuit is analyzed in the digital waveform in estimation of resonance factor denoted as Q and time constant. These resonance circuits can be used in many applications such as television or radio transmitters. Higher frequencies are used in communication with satellite.

Objectives

The primary or core of this laboratory experiment was to determine the behavior of an LRC circuit in response to the resonance of the system. . i. e. the forced response of LRC circuit connected in series in regard to input sine wave. In experiment, the link to mechanical resonance and damped oscillation is also established. Another objective of this laboratory experiment is studying the transient behavior of LRC resonance circuit in order to estimate the resonance Q and the time constant t , from the digitized waveform.

Procedure or Methodology

The LCR circuit's connection is presented below. Note the connection of the system is in series. It can follow any order i. e. not necessarily be LCR; it can take a different order. i. e. RCL.

In the above connection, Kirchhoff's law is followed in the calculation of voltage and current.

The law states (sum of instantaneous voltage around a closed loop is zero)

$$\Sigma V = 0.$$

In this case, various parameters are studied; these parameters are;

frequency, decay time, impedance, resistance, the resonant frequency, and undamped frequency.

Using formulae, the required calculations can be done. For instance;

$R = V/I$ where R = resistance, V = voltage and I = current. This is done by using Ohm's law.

Equally the following connections are One for the experiment to be done.

For this experiment the following was done:

Before connection, internal resistance of the system was determined, this was done using the resistance measuring instrument i. e. digital multimeter(DMM). The after that the connections are made with the provided equipments, observe the waves as reflected in the oscilloscope and the multimeter readings. Adjust the multimeter to the input

The multimeter is again moved to the resistors; this is done to record the resonant frequency when the current is maximum. for this reading three readings must be made to avoid making errors

The current is measured against frequency while tuning the resonance frequency. In order to get the transient behavior changes must be made on

the inputs by squaring the frequency and show the damped sine wave. The output signal is increased from the current generator to until $\frac{3}{4}$ of maximum.

For this LRC resonance experiment, the following data were:

Results

After successfully carrying out this laboratory experiment, the resulting data were recorded and formatted to suit the requirement of the experiment.

These results include:

Voltage, current, frequency, resistance, resonance

The calculations involved the determination of angular frequency,

Resonance, resistance

The necessary equations for this experiment were.

$V = R/I$ where V represents the voltage, R represents the resistance and I represents current.

Voltage drop across the coils is given as; $V_{IN} = V_0 \sin \omega t$ where $\omega t =$ sine wave and $V_0 =$ constant amplitude. The capacitor $V_c = Q/C$.

Note that the amplitude depend on the frequency, this is given by Ohm's law; $I(\omega) = V_0 / Z$ LRC in this experiment the circuit was connected in series.

Therefore, $Z_{LRC} = [R^2 + (X_L - X_C)^2]^{1/2}$ resonance frequency, defined by $X_L = X_C$ is calculated as, $\omega_0 = 1/(LC)$ when the total impedance is minimized the current is maximized, therefore, change in $\omega = R/L$ and quality factor Q will be $Q = \omega_0 / \text{change in } \omega = \omega_0 \times L/R$

Finally, the decay time is given as; $t = 2L/R$.

The resonance frequency graph was drawn as shown figure 6.

Discussion and Analysis

The resonance quality factor, as denoted in this experiment as Q , was estimated with the use of transient behavior of LRC resonance circuit that was analyzed by digitized waveform. This is a factor that describes the degree of under-dampness of an oscillation or resonator. The higher the factor, the lower the rate of loss of energy stored in the resonator.

RLC circuits, this circuit contains the connections for resistors, capacitor and inductors, the order of their connection does not matter much . i. e. the connection can take any order. This connection can be in series or parallel. But for this case series connection of the system was adopted. For this individual voltage across each element in the circuit was measured and recorded, this is because the response of the circuit in LRC depends on the frequency.

The calculations for various parameters for this experiment were done. And the graphs plotted as shown the figures 4, 5 and six above.

In the case of analysis the Q factor is well fit in graph generated is a smooth curve with maximum value of angular frequency $\omega = 10805$ rad/s the error between the values of Q is about ± 0.5

Conclusion

The objective of the experiment was met and completed. This laboratory work or experiment tries to determine the behavior of an RLC resonance circuit in terms of the resonance frequency as displayed in the oscilloscope, the resistance offered by inductors and time taken for this oscillations. This is

because all the behavior of the LRC resonance circuit was observed carefully and the records or reading taken for analysis. Application of resonance in real life; resonance can be used in radio and television transmitters, as used in the microwave, used in nuclear magnetic as in the case of medical application To achieve the objective of the experiment, the circuit and connections should follow the guidelines and principles. With the data to be measured should be recorded either by digital recording equipment or apparatus such as stopwatch, cathode ray oscilloscope, multimeter and direct observation by the observer. The results and output are analyzed with graphs, charts and calculations for judgments purpose. The graph plotted for angular frequency against power showed a smooth curve with approximately $\omega = 10805$ rad/s as the peak angular frequency.