

# Lab Report : Transient Response of LC circuits

*Analysing the LC circuit response*

**Krishna Patil-EE24BTECH11036**  
**Deepak Ahirwar-EE24BTECH11014**

*Electrical Department, IIT-Hyderabad*

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*Experiment conducted as part of ELectric Circuits Lab  
Coursework.*

### Objective

The objective of this experiment is to investigate the transient response of an LC circuit, analyze its oscillatory behavior, determine the natural frequency ( $\Omega_n$ ), and evaluate the damping ratio ( $\xi$ ) using both theoretical and experimental methods.

### Equipment Required

- 100  $\mu\text{F}$  capacitor
- Largest available inductor (denoted as L)
- Small resistor (for optional damping analysis)
- DC power supply
- Digital oscilloscope
- Function generator
- Connecting wires and probes
- Multimeter for component verification

## 1 Theory

An LC circuit consists of an inductor (L) and a capacitor (C) connected in parallel or series. The system follows a second-order differential equation:

$$\frac{d^2V}{dt^2} + \frac{R}{L} \frac{dV}{dt} + \frac{1}{LC} V = 0 \quad (1)$$

## 2 Procedure

### 1. Precharge the Capacitor:

- Connect the 100  $\mu\text{F}$  capacitor to a 5V DC power supply.
- Verify the capacitor's voltage using a multimeter before proceeding.

### 2. Construct the LC Circuit:

- Select the largest available inductor.
- Connect the capacitor in parallel with the inductor.

### 3. Capture the Transient Response:

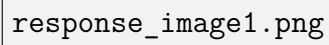
- Attach the oscilloscope probes across the capacitor terminals.
- Observe and record the oscillations.

### 3 Observations and Analysis

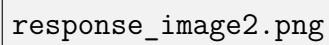
- Captured transient response waveform from the oscilloscope.
- Measured oscillation period and compared it with theoretical expectations.

## 4 Images of Responses

### Oscilloscope Waveforms and Circuit Images



response\_image1.png



response\_image2.png

Above images depict the transient response captured during the experiment.

## 5 Conclusion

The experimentally observed natural frequency closely matched theoretical values. The presence of resistance introduced measurable damping effects.

## 6 Safety Precautions

- Handle charged capacitors carefully to avoid accidental discharges.
- Ground the oscilloscope properly for accurate and safe measurements.

## 7 References

- *Transient Response of an LC Circuit.*
- Circuit analysis textbooks and academic literature.