BOLD and Underline Word should be written with color pen. Use pencil margin, Page number with color pen, all drawing with pencil, table body with pencil but text will be ball pen, write both sides.

Experiment Name: Characteristics of RL circuit for the Square Wave as an Input Signal.

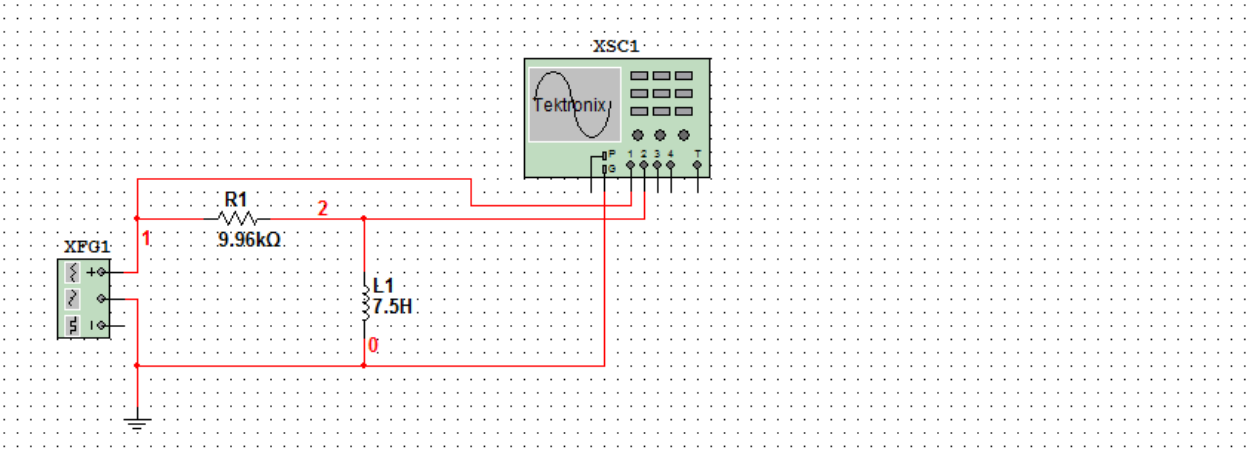
Objectives:

- To learn the use of Function Generator and Oscilloscope.
- Investigate the behavior of RL circuit.

Apparatus:

- Breadboard
- Resistors (1x 9.96 kΩ)
- Inductor (7.5 H)
- Digital Multimeter (DMM)
- Function Generators
- Oscilloscope
- Wires

Circuit Diagram:



Theoretical and Experimental Calculation:

In our RL Circuit:

Input Voltage, $V_p = 5\,V$ (Square Wave)

$\Rightarrow V_o = 10\,V$

Resisten, $R = 9.96\,k\Omega$

Inducton, $L = 7.5\,H$

Therefore,

Time constant, $\tau = \frac{L}{R}$

$= \frac{7.5}{9.96 \times 10^3}$

$= 0.753\,ms$

In OFF state, according to theory.

when, $t = 1\,\tau$

$V_L = -V_o\left(1 - e^{-t/\tau}\right)$

$= -10\left(1 - e^{-1}\right)$

$= -6.32\,V$

Therefore Voltage on Inductor is = (10 - 6.32)

= 3.68 V

In our experiment,

when, V_1 = 3.68 V

We found Δt = 800 μsec

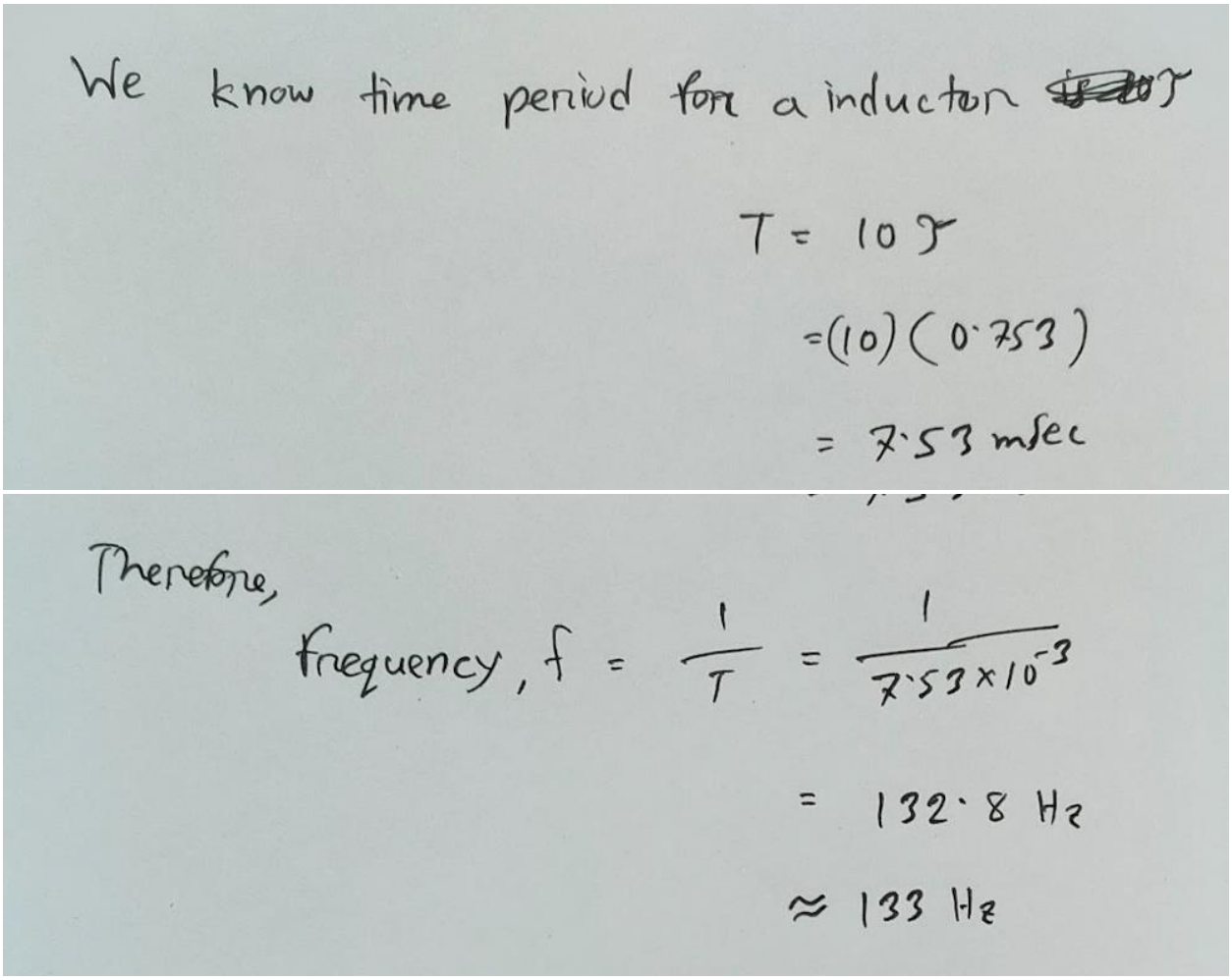
= 0.8 msec

Therefore experimental time constant during OFF State is 0.8 msec.

We also found the same time constant during ON State.

Therefore, $\text{error} = \left| \frac{0.753 - 0.8}{0.753} \right| \times 100\%$

= 6.24 %



Graph:
Simulation Attached.

Result Analysis:
According to theory Time constant is 0.753ms, that means capacitor can gain and lose voltage 63.2% within one time constant. In our experiments when V_L was 3.68V, we found that difference of time is 0.8ms. That means time constant is 0.8ms approximately same as theory. Therefore, our RL circuits were working perfectly.

Questions and Answers: N/A.

Discussion:

In this experiment we learned the usage of Signal Generators and Oscilloscope. We also observed the On State and OFF State behavior of RL circuits with changing time period. We found that in an RL circuits Inductor can gain 63% Voltage of its remaining capacity in every L/R time. That's why L/R is called the time constant of an RL Circuits. In this experiment we don't face any difficulties operating the Oscilloscope. We properly learn the usage of Oscilloscope. And completed the experiment in time.

Attachment:

01. Graph using Multisim.

02. Simulation using Multisim.