Faculty of Information Technology

Electrical and Computer Engineering Department

CIRCUITS AND ELECTRONICS LABORATORY (ENEE2103)

Prelab Experiment#3

“First and Second Order Circuit”

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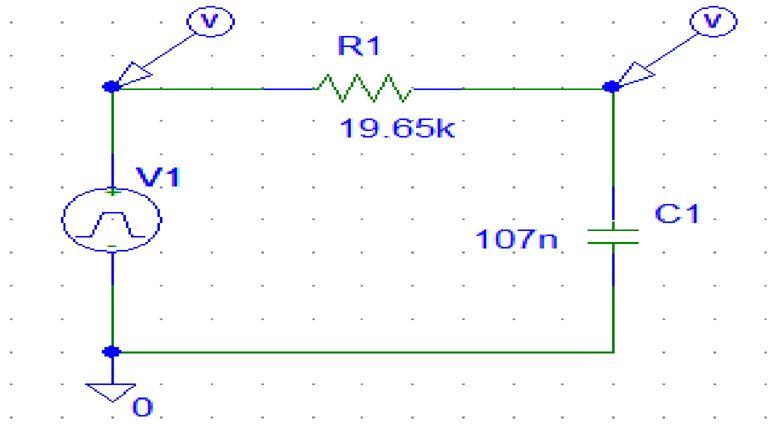
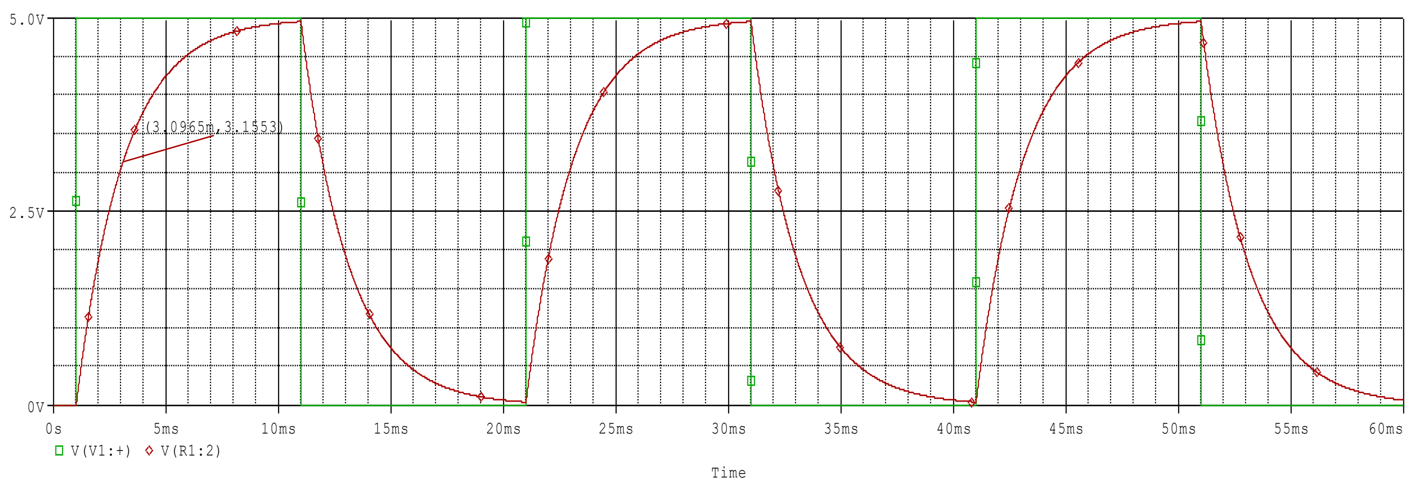
Section 3

Due to:25-2-2019

Part A. <u>RC Circuit</u>:

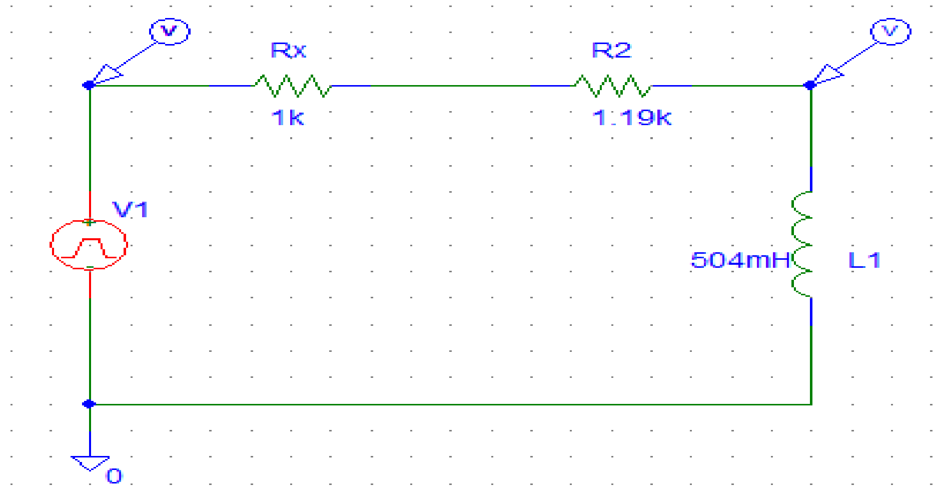




Steady state voltage value on the capacitor = 5 volt. To calculate time constant, we use the assumption that it is at charging when V(t) = 0.63*V max = 0.63*5 = 3.15v

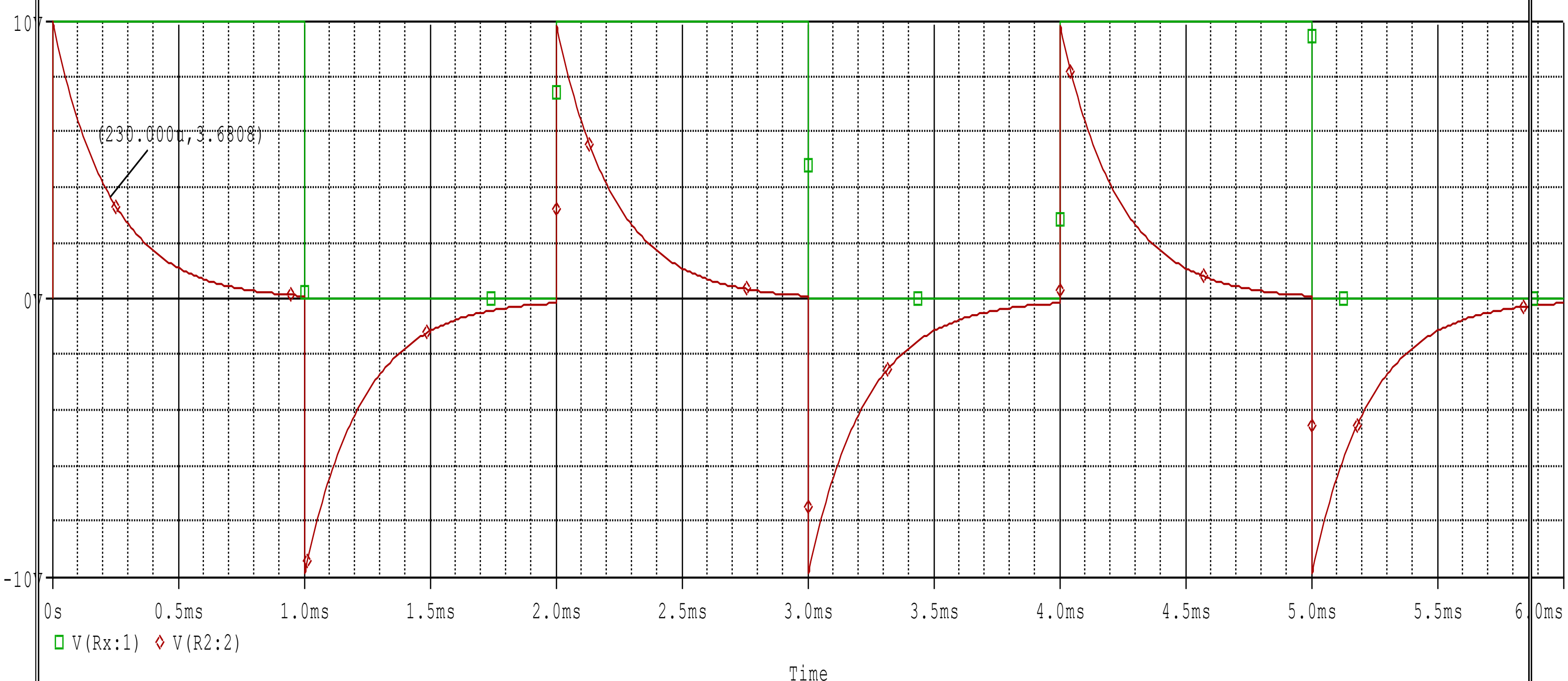
- Time constant from Simulation =~ 3.0965 ms.
- Time Constant time from calculation (τ) = RC = (19.65k) (107nF) = 2.103 ms.

Part B. RL Circuit:



- When frequency = 500Hz.

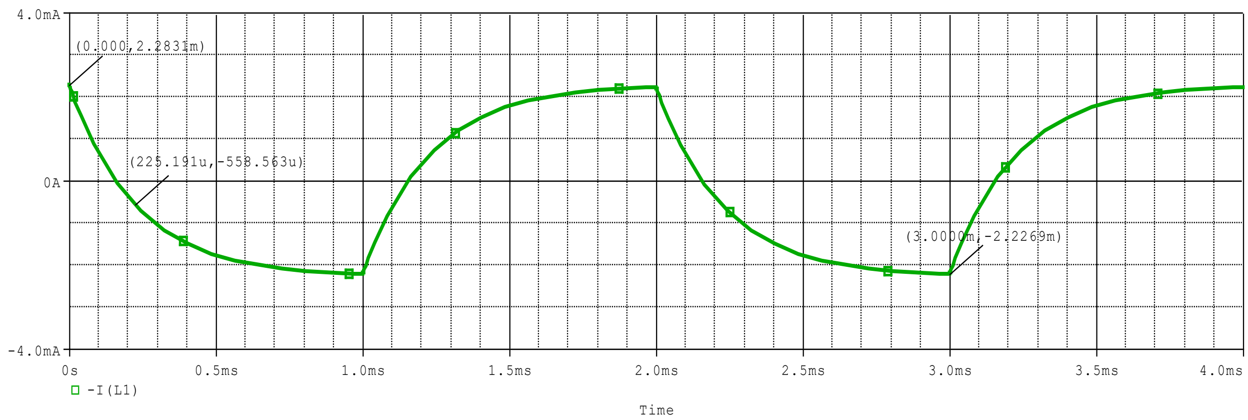
Voltage response



To calculate time constant, we use the assumption that it is at discharging when V(t) = 0.37 V max = 0.37*10 = 3.7 volt

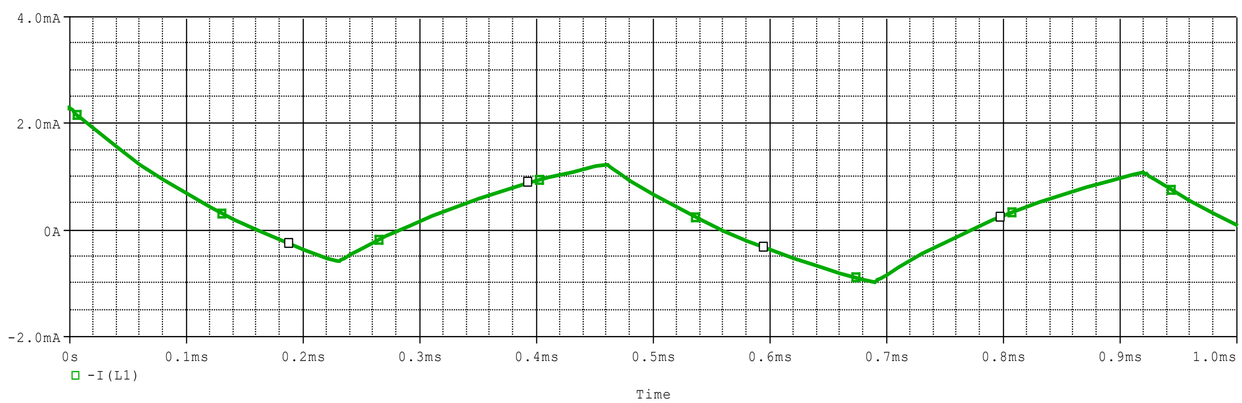
- Time constant from Simulation =~ 230.0 us.
- Time Constant from calculation = L/R = (504mH) / (2.19k) = 230.137 us.

Current response

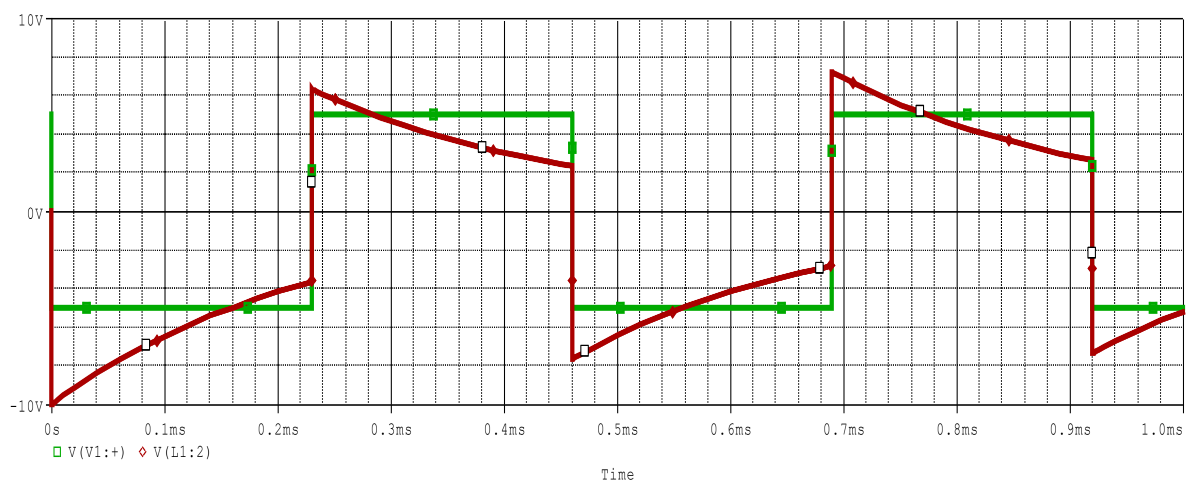


- When T= 2*Time constant.
  - Period T = 2*230.137 =~ 460 us.
  - Frequency = 1/T = 2.17 mHz.

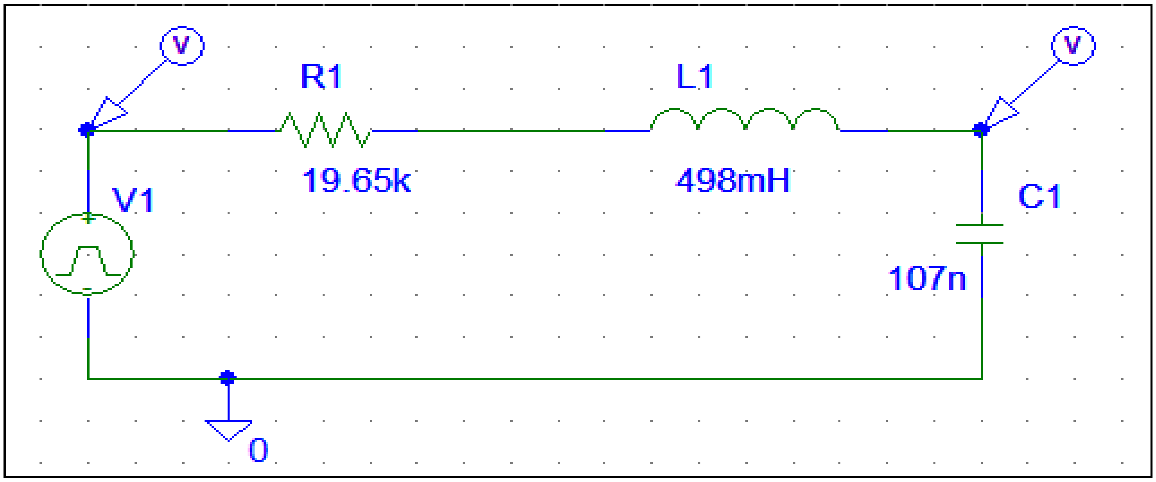
Current response

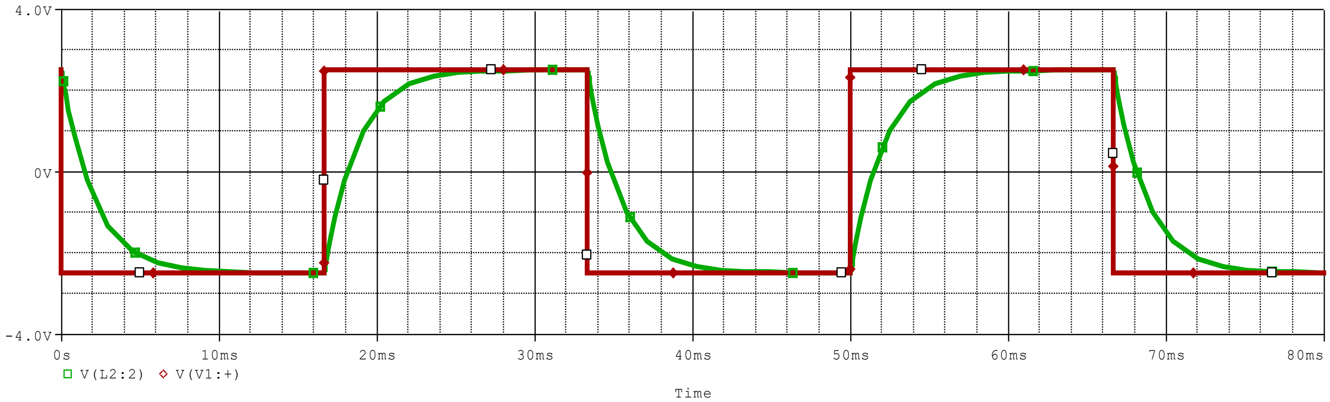


Voltage Response



C. ***RLC Circuit:***





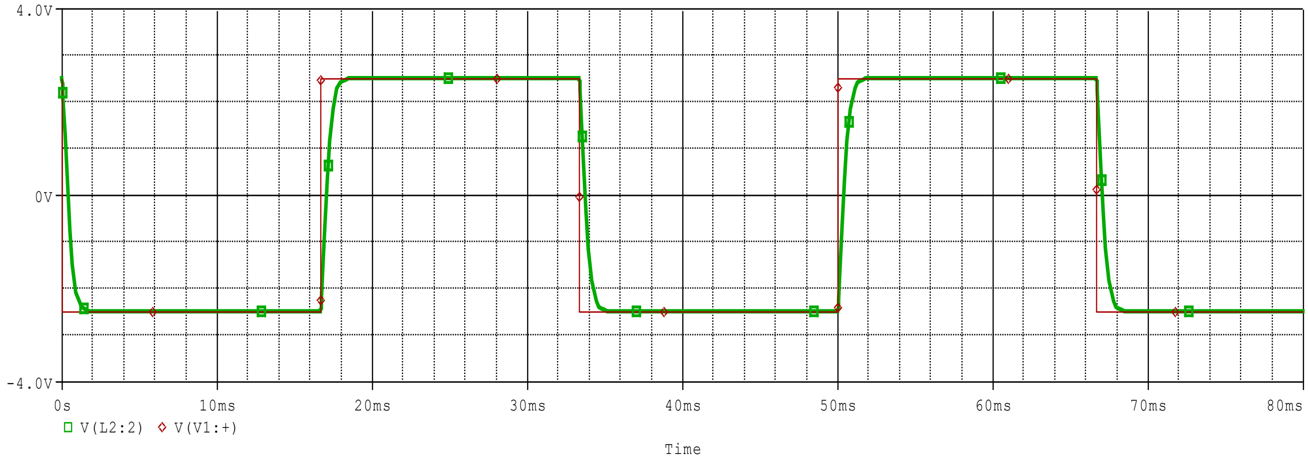
- Type of response is overdamping.

To find R that causes critical damping numerically:

Neper frequency (a) = R/2L, W_o = 1/sqrt (LC).

Critical damping when $a^2 = w_o^2$ → R = 2 sqrt(L/C) = 4314.7216 Ohm

- Critical Damping:



- Underdamping (R=500 Ohm)