



FACULTY OF ENGINEERING AND TECHNOLOGY  
DEPARTMENT OF ELECTRICAL AND COMPUTER  
ENGINEERING

ENEE 2101

Circuits Laboratory

Experiment.6 Prelab

## **First Order Circuits**

Prepared by:

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**Supervised by:**

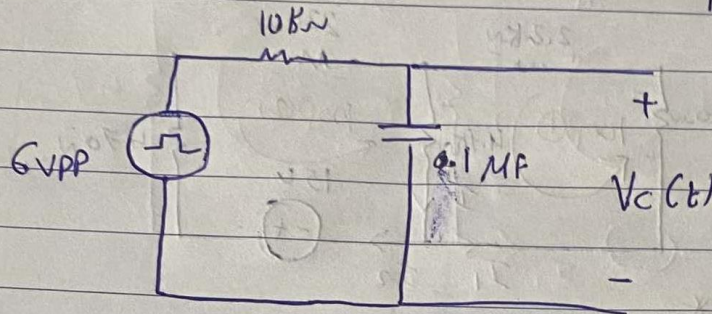
Dr. Jaser Sa'ed

**Teacher assistance:**

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October 21, 2024

## Part A: Step response of First-order RC circuit:

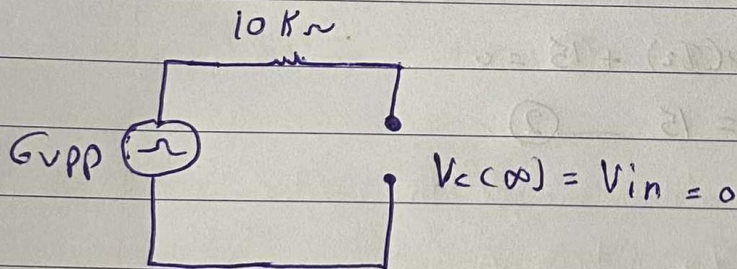


\* The general formula for  $V_c(t)$ :

$$V_c(t) = V_c(\infty) + [V_c(0^+) - V_c(\infty)] e^{-t/\tau}$$

→  $V_c(0^+) = V_c(0^-)$  The circuit is open

So  $V(-0) = V(+0) = 0$  at  $t = \infty$



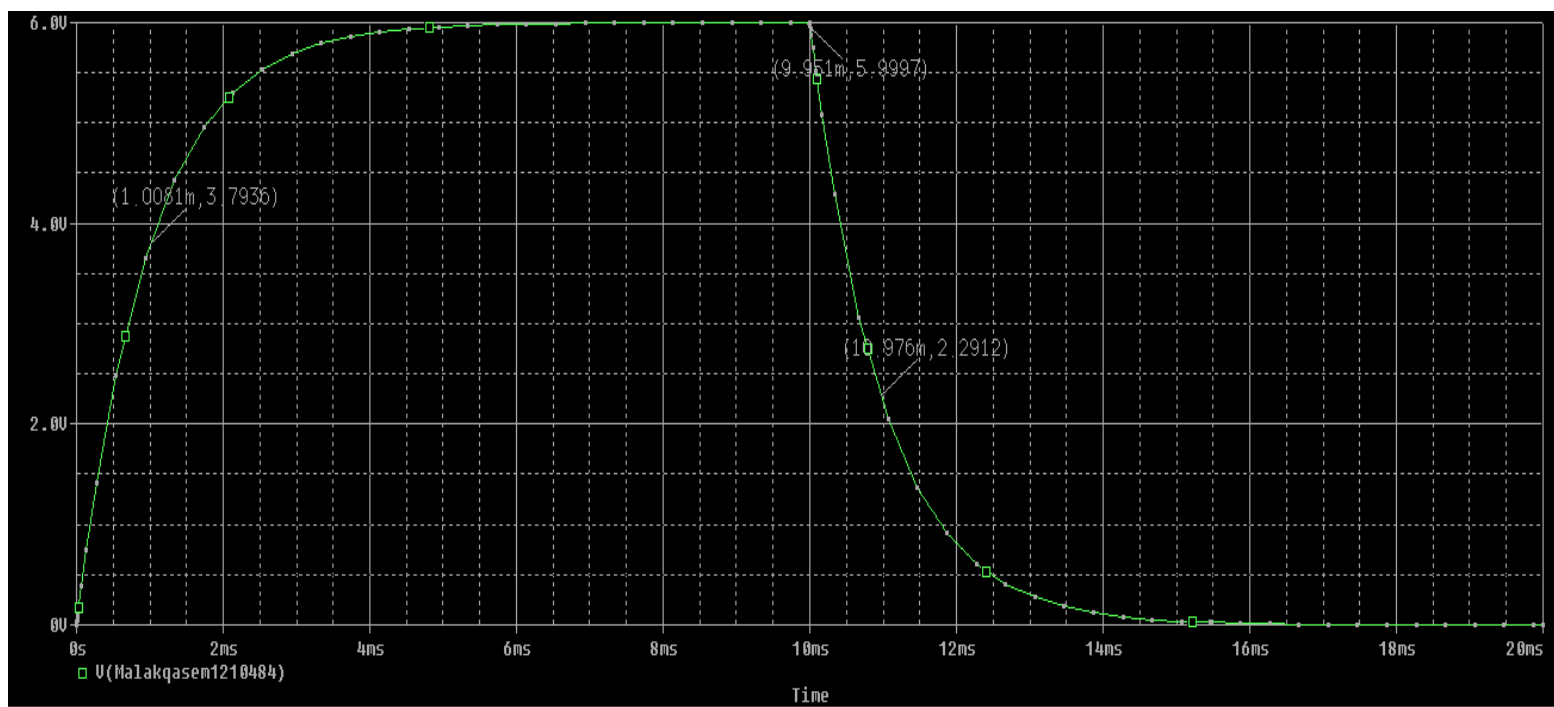
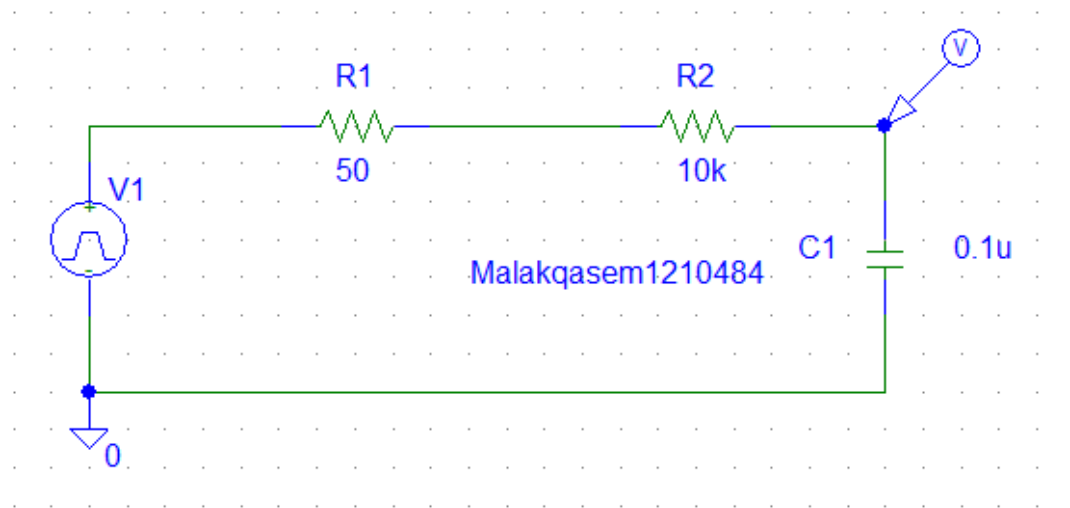
$$\tau = R \cdot C$$

$$= 10k\Omega \cdot 0.1\mu F = 1 \times 10^{-3} s = \underline{\underline{1ms}}$$

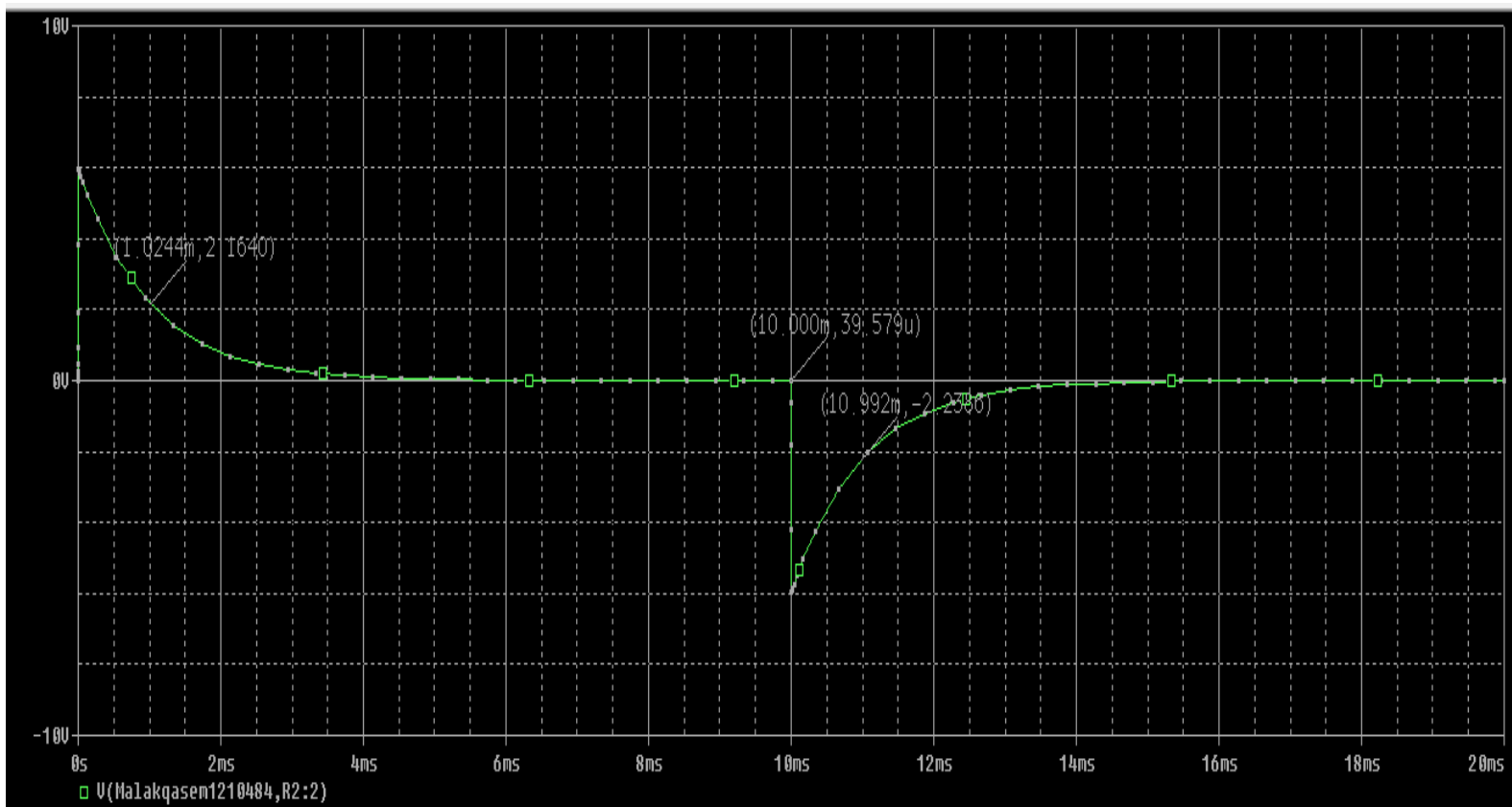
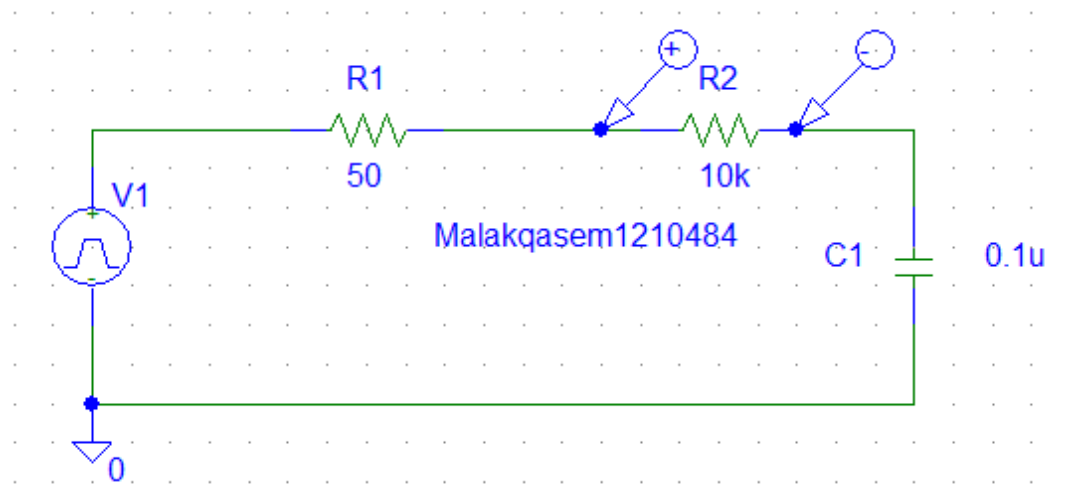
$$\rightarrow V_c(t) = -V_{in} e^{-\frac{t-t_0}{\tau}} + V_{in}$$

$$\therefore V_c(t) = -6 e^{-\frac{t-t_0}{\tau}} + 6$$

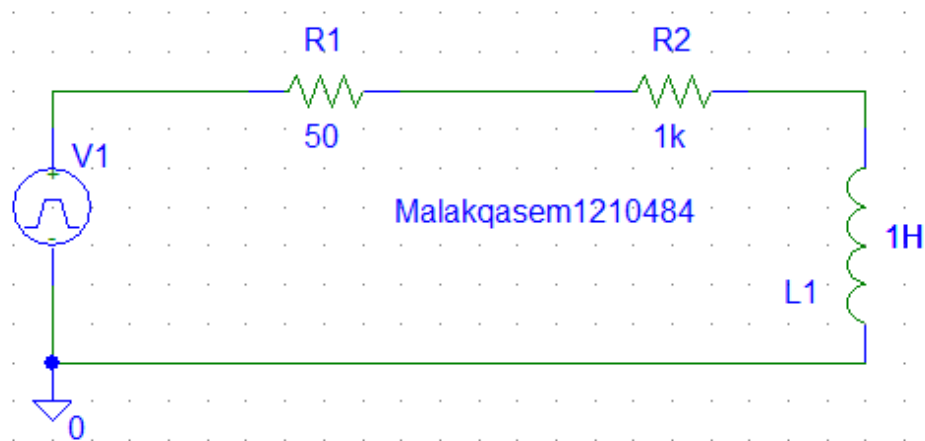
- The voltage over the Capacitor:



- The voltage over the Resistor:



## Part B: Step response of First-order RL circuit:



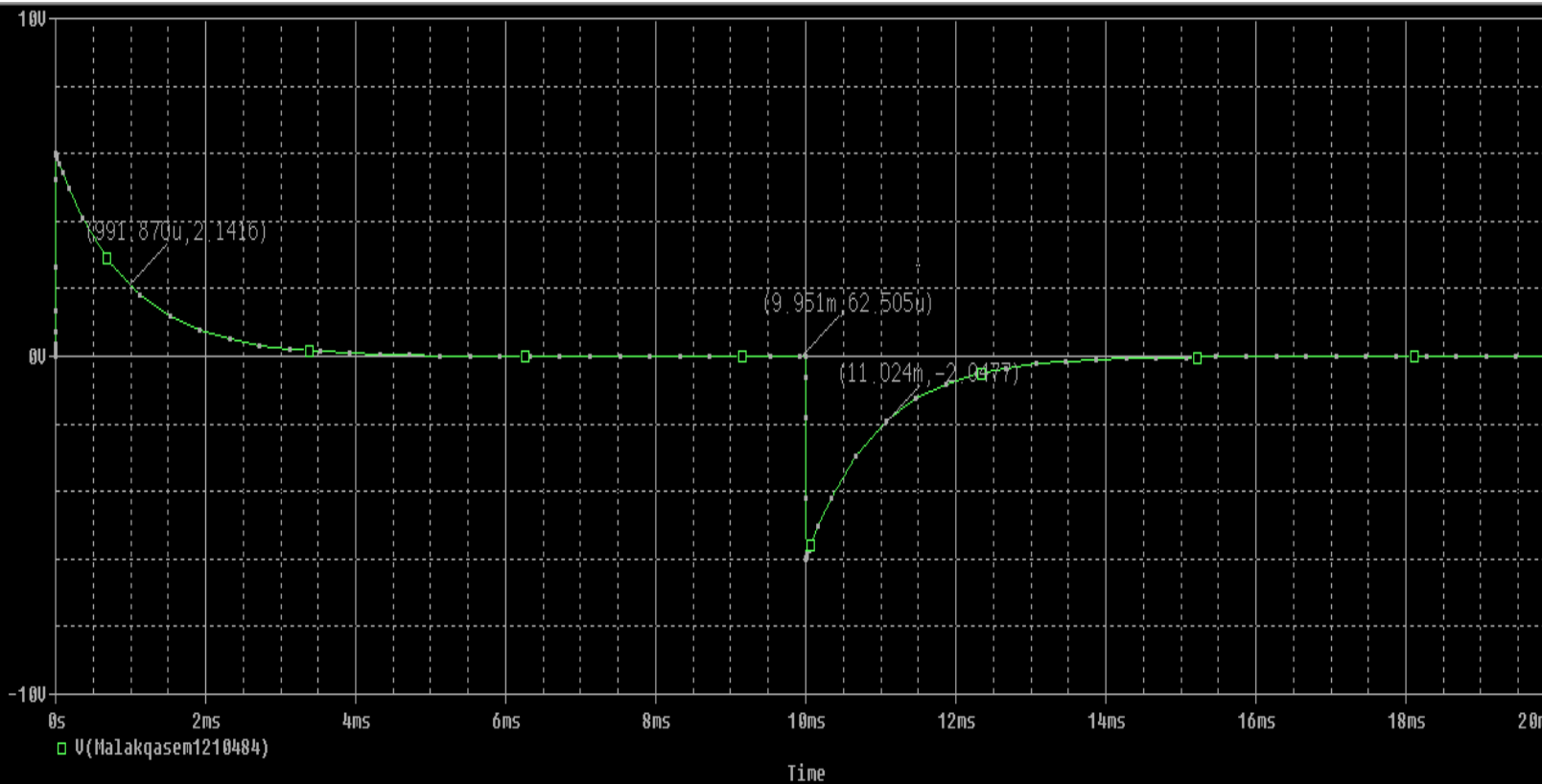
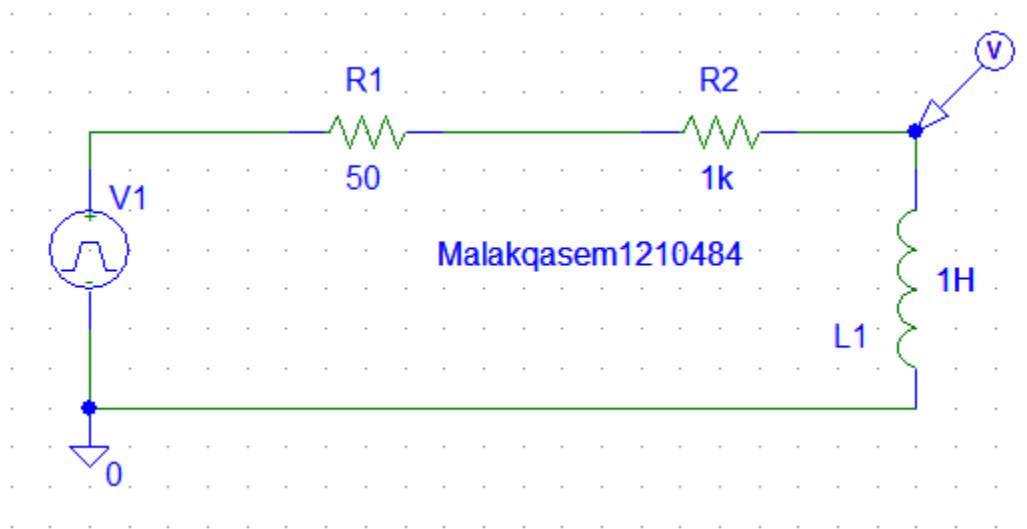
Handwritten notes on a spiral notebook showing the step response of an RL circuit. The circuit diagram shows a 6VPP voltage source connected in series with a 1KΩ resistor and a 1H inductor. The time constant is calculated as  $\tau = \frac{L}{R} = \frac{1}{1K}$ , resulting in  $\tau = 1ms$ .

The initial conditions are given as  $V(0^-) = V(0^+) = 6$  and  $V(\infty) = 0$ . The voltage across the inductor is given by  $V_L(t) = 6e^{-t/\tau}$ .

The voltage across the inductor is also given by  $V_L(t) = 6e^{\frac{-(t-t_0)}{\tau}}$  for  $V_{in} > 0$  and  $V_L(t) = 6e^{\frac{-(t-t_0)}{\tau}}$  for  $V_{in} < 0$ .

A box contains the name 'Malak Qasem' and the ID '1210484'.

- The voltage over the Inductor:





- The voltage over the Resistor:

