Department of Electrical and Computer Engineering

UNIVERSITY OF MANITOBA

Name:

Student Number:

Lab Section:

Instructor:

Lab Partner:

Date:

ENG 1450 Introduction to Electrical and Computer Engineering
Lab 4 - RC Circuit

Required equipment:

The equipment required for this lab exercise includes:
- Project board
- Digital multimeters (DMM)
- Oscilliscope
- Function generator
- Capacitors: C1 = 1 µF and C2 = 470 nF
- Resistors: R1 = 1 kΩ and R2 = 2.2 kΩ

RC Circuit Waveforms

Build the circuit shown in Figure 1 for **R** = R1 = 1 KΩ and **C** = C1 = 1 µF. For the input voltage V_{in} use function generator to make a square wave with frequency of 100 Hz and minimum and maximum voltages of 0 V and 5 V, respectively. Use the oscilloscope to find the voltage of the capacitor and plot it on Table 1. Use the Ohm's law to find current **i**. Record your results in Table 1. Use the oscilloscope to find the voltage of the capacitor, V_c, and record your result in Table 1.
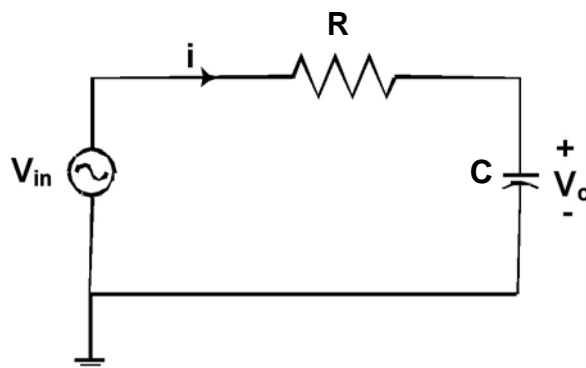

Figure 1: RC circuit.

Table 1: Case 1: **R** = R1 = 1 KΩ, **C** = C1 = 1 μF, and frequency = 100 Hz

Input					
V$_C$					
i					

Describe how you can find the time constant of the RC circuit based on your experimental results. What is the time constant?

$$\tau = \text{----------s}$$

What is the theoretical time constant of the circuit shown in Figure 1?

$$\tau = \text{----------s}$$

Repeat this experiment for the following cases and measure the capacitor voltage.

Table 2: Case 2: **R** = R1 = 1 KΩ, **C** = C2 = 470 nF, and frequency = 100Hz

Input					
V$_C$					

Table 3: Case 3: **R** = R2 = 2.2 KΩ, **C** = C1=1 μF, and frequency = 100Hz

Input					
V$_C$					

Table 4: Case 4: **R** = R2 = 2.2 KΩ, **C** = C1 = 470 nF, and frequency = 100 Hz
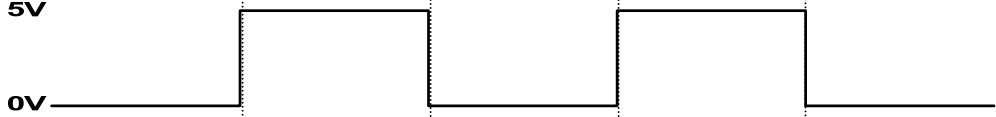
Input	
V$_C$	

Table 5: Case 5: **R** = R1 = 1 KΩ, **C** = C1 = 1 μF, and frequency = 50 Hz
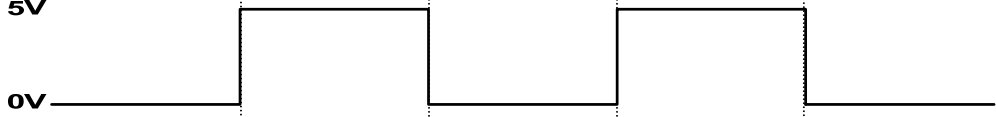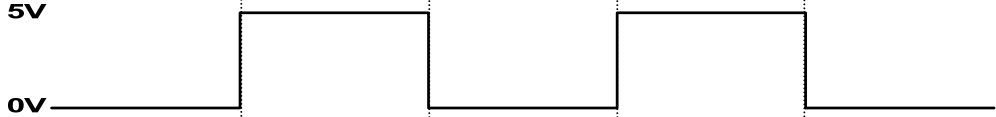
Input	
V$_C$	

Table 6: Case 6: **R** = R1 = 1 KΩ, **C** = C1 = 1 μF, and frequency = 200 Hz

Input	
V$_C$	

Compare the time constant in case 1 with that in cases 2 - 6 and complete the following table.

	Time constant has … (circle one)	By looking at the **V$_C$** curve, explain why the time constant has increased, decreased or remained the same.
Case 2	increased decreased remained the same	
Case 3	increased decreased remained the same	
Case 4	increased decreased remained the same	
Case 5	increased decreased remained the same	
Case 6	increased decreased remained the same	