Lab1 Potentiometers Part1

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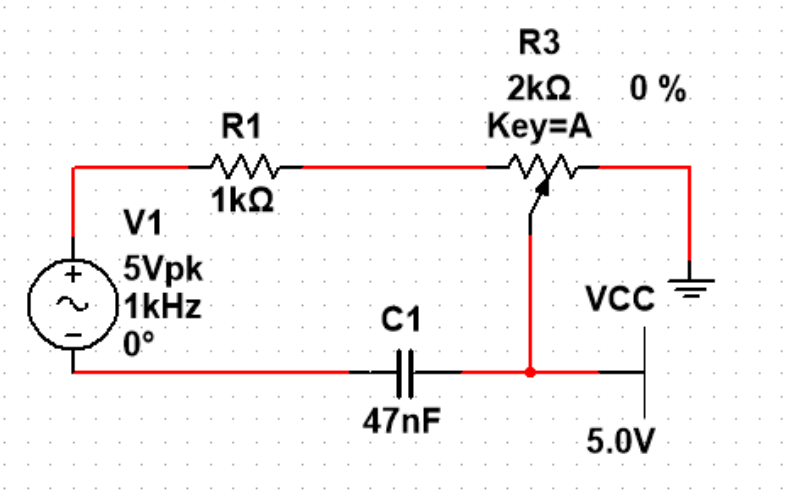
Introduction and Aim

This experiment explores the behaviour of a simple RC (Resistor-Capacitor) circuit and understand its response to changes in input voltage. To achieve this, we will use a linear poten@ometer as a variable resistor in the circuit. A potentiometer, oBen referred to as a pot, is a three-terminal resistor with an adjustable tap that allows us to change the resistance value along its length. In this experiment, we will u@lize a linear poten@ometer to vary the resistance in the RC circuit. By adjus@ng the poten@ometer, we can control the rate at which the capacitor charges and discharges, thus influencing the @me constant and the behaviour of the circuit.

Circuit Diagram

The circuit diagram is created in Multisim.



Data_Table

kHZ	Potentiometer perc	Vp	Vc	Vp/Vc
1kHZ	0%	4.43V	7.47V	0.59
1kHZ	20%	3.75V	7.90V	0.47
1kHZ	40%	2.97V	8.37V	0.35
1kHZ	60%	2.09V	8.82V	0.23
1kHZ	80%	1.09V	9.22V	0.11
1kHZ	100%	0.69V	9.58V	0.07
2kHZ	0%	5.80V	4.89V	1.18

kHZ	Potentiometer perc	Vp	Vc	Vp/Vc
2kHZ	20%	5.15V	5.43V	0.94
2kHZ	40%	4.33V	6.09V	0.35
2kHZ	60%	3.23V	6.82V	0.47
2kHZ	80%	1.82V	7.69V	0.23
2kHZ	100%	1.24V	8.60V	0.14
5kHZ	0%	6.50V	2.19V	2.96
5kHZ	20%	5.96V	2.51V	2.37
5kHZ	40%	5.21V	2.93V	1.77
5kHZ	60%	4.15V	3.50V	1.18
5kHZ	80%	2.57V	4.34V	0.59
5kHZ	100%	2.02V	5.59V	0.36
10kHZ	0%	6.61V	1.12V	5.90
10kHZ	20%	6.08V	1.28V	4.75
10kHZ	40%	5.37V	1.51V	3.55
10kHZ	60%	4.36V	1.84V	2.36
10kHZ	80%	2.78V	2.34V	1.18
10kHZ	100%	2.31V	3.19V	0.72
20kHZ	0%	6.66V	0.56V	11.8
20kHZ	20%	6.14V	0.64V	9.59
20kHZ	40%	5.44V	0.76V	7.15
20kHZ	60%	4.42V	0.93V	4.75
20kHZ	80%	2.83V	1.19V	2.37
20kHZ	100%	2.40V	1.66V	1.44
50kHZ	0%	6.66V	0.23V	28.9
50kHZ	20%	6.15V	0.26V	23.6
50kHZ	40%	5.45V	0.31V	17.6
50kHZ	60%	4.44V	0.38V	11.7
50kHZ	80%	2.85V	0.48V	5.93
50kHZ	100%	2.44V	0.67V	3.64
100kHZ	0%	6.66V	0.11V	60.5

kHZ	Potentiometer perc	Vp	Vc	Vp/Vc
100kHZ	20%	6.15V	0.13V	47.3
100kHZ	40%	5.45V	0.15V	36.3
100kHZ	60%	4.44V	0.18V	24.6
100kHZ	80%	2.86V	0.24V	11.9
100kHZ	100%	2.44V	0.34V	7.17

Discussion

From the data above, it can be observed that as the proportion of the potentiometer increases,Vp gradually decreases, Vc gradually increases, and the ratio of Vp to Vc continuously decreases. As the frequency of the signal generator increases, the Vp/Vc ratio at the same potentiometer proportion also increases. For instance, at 1 kHz with a potentiometer proportion of 20%, the Vp/Vc ratio is 0.47, whereas at 10 kHz with the same potentiometer proportion, the Vp/Vc ratio increases to 4.75, which is 100 times larger compared to 0.47. However, with further increases in the signal generator frequency, Vp no longer changes. From the data at 50 kHz and 100 kHz, it can be seen that Vp remains the same for each potentiometer proportion.

kHZ	Potentiometer perc	Vp	Vc	Vp/Vc
50kHZ	0%	6.66V	0.23V	28.9
50kHZ	20%	6.15V	0.26V	23.6
50kHZ	40%	5.45V	0.31V	17.6
50kHZ	60%	4.44V	0.38V	11.7
50kHZ	80%	2.85V	0.48V	5.93
50kHZ	100%	2.44V	0.67V	3.64
100kHZ	0%	6.66V	0.11V	60.5
100kHZ	20%	6.15V	0.13V	47.3
100kHZ	40%	5.45V	0.15V	36.3
100kHZ	60%	4.44V	0.18V	24.6
100kHZ	80%	2.86V	0.24V	11.9
100kHZ	100%	2.44V	0.34V	7.17