**LAB # 2**



**CSE-203L Circuit & Systems-II Lab**

**Fall 2022**

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“On my honor, as student of University of Engineering and Technology, I have neither given nor received unauthorized assistance on this academic work.”

Student Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Submitted to:

**Engr. Faiz Ullah**

20th October, 2022

Department of Computer Systems Engineering

**TITLE:**

**Capacitive Reactance**

**OBJECTIVES:**

* To learn the basic concept of capacitive reactance of a capacitor.
* To investigate the relationship capacitance and frequency.
* To plot a graph of capacitive reactance versus frequency.

**APPARATUS:**

* Oscilloscope
* AC Function Generator

**COMPONENTS:**

* 1 µF Capacitor
* 2.2 µF Capacitor
* 10k Ω Resistor

**CAPACITOR**:

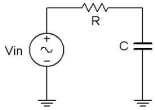
A capacitor is a device used to store electrical energy.

**CAPACITOR PROPERTIES:**

* The **Capacitance** of a capacitor determines the amount of charging a capacitor can achieve.
* The **Capacitive Reactance** is measure of the opposition to alternating current by the capacitor is called **Capacitive Reactance.**

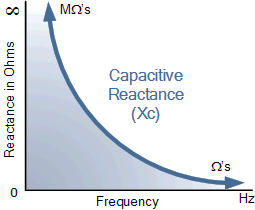
**MATHEMATICAL FORM:**.

**BASIC CIRCUIT:**



# PLOT AGAINST FREQUENCY:

Plot of Capacitive Reactance against Frequency is given below.

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By re-arranging the reactance formula above, we can also find at what frequency a capacitor will have a particular capacitive reactance ( XC ) value.

**PROCEDURE:**

1. First of all, I connected a resistor (10KΩ) in series with a capacitor of 1 µF and applied 10V across them.
2. Then I connected probe 1 and probe 2 of the oscilloscope with the resistor and capacitor respectively.
3. I theoretically calculated the value of Capacitive Reactance using the formula:
4. Then I calculated current in the circuit using Ohm’s Law.
5. After that, I set the input frequency at 200 Hz in function generator. I calculated VP-P from the oscilloscope by multiplying the **number of divisions between two peak values** with the **volts per division**.
6. Then I calculated experimental value of Xc using Ohm’s Law:

**OBSERVATIONS AND RESULTS:**

**For C = 1µF:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Frequency | Xc Theory | Vc(P-P) Exp | Xc Exp | %Dev |
| 200 | 795.77 Ω | 0.80 V | 800 Ω | 0.528% |
| 400 | 397.88 Ω | 0.40 V | 400 Ω | 0.530% |
| 600 | 265.26 Ω | 0.27 V | 270 Ω | 1.750% |
| 800 | 198.94 Ω | 0.20 V | 200 Ω | 0.530% |
| 1.0K | 159.15 Ω | 0.16 V | 160 Ω | 0.530% |
| 1.2K | 132.63 Ω | 0.135 V | 135 Ω | 1.750% |
| 1.4K | 113.68 Ω | 0.11 V | 110 Ω | 3.230% |
| 2.0K | 79.57 Ω | 0.08 V | 80 Ω | 0.530% |

**For C = 2.2µF:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Frequency | Xc Theory | Vc(P-P) Exp | Xc Exp | %Dev |
| 200 | 361.715 Ω | 0.350 V | 350 Ω | 3.23 % |
| 400 | 198.943 Ω | 0.190 V | 190 Ω | 4.49 % |
| 600 | 132.629 Ω | 0.128 V | 128 Ω | 3.49 % |
| 800 | 99.471 Ω | 0.096 V | 96 Ω | 3.49 % |
| 1.0K | 79.577 Ω | 0.078 V | 78 Ω | 1.98 % |
| 1.2K | 66.314 Ω | 0.066 V | 66 Ω | 0.47 % |
| 1.6K | 49.735 Ω | 0.048 V | 48 Ω | 3.48 % |
| 2.0K | 39.788 Ω | 0.039 V | 39 Ω | 1.98 % |

**CONCLUSION:**

From this experiment, we concluded that **Capacitive Reactance** is inversely proportional to the input **frequency of AC** **current** and **Capacitance** of the **Capacitor**.