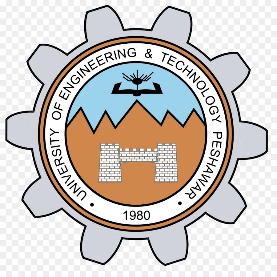
**LAB # 02**

**Capacitive Reactance**

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**SUBMITTED BY:**

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**SECTION:**

“A”

**SUMITTED TO:**

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**UNIVERSITY OF ENGINEERING AND TECHNOLOGY PESHAWAR**

**COMPUTER SYSTEM ENGINEERING**

**ASSESSMENT RUBRICS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | LAB REPORT ASSESSMENT | | | | |
|  | Criteria | Excellent | Average | Nil | Marks Obtained |
| 1. | Objectives of Lab | All objectives of lab are properly covered [Marks 1] | Objectives of lab are partially covered [Marks 0.5] | Objectives of lab are  not shown  [Marks 0] |  |
| 2. | Procedure | All experimental steps are shown. [Marks 2] | Some of the experimental steps are shown.  [Marks 1] | Experimental steps  not shown [Marks 0] |  |
| 3. | Demonstration of Concepts | The student demonstrated a clear understanding of the assignment concepts  [Marks 2] | The student demonstrated a clear understanding of some of the assignment concepts [Marks 1] | The student failed to demonstrate a clear understanding of the assignment concepts  [Marks 0] |  |
| 4. | Experimental  Results | All experimental results are completely shown in  form of table [Marks 3] | Experimental results are partially shown and some of the observations are missing [Marks 1.5] | No experimental results are shown  [Marks 0] |  |
| 5. | conclusion | Conclusion of the lab is properly written  [Marks 2] | Conclusion of the lab is partially written  [Marks 1] | Conclusion of lab is not written [Marks 0] |  |
|  | Total Marks Obtained: \_\_\_\_\_\_\_\_\_\_    Instructor Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | | | |

**Lab 2**

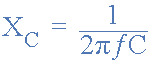
**Capacitive Reactance**

**Objective:**

Capacitive reactance will be examined in this exercise. In particular, its relationship to capacitance and frequency will be investigated, including a plot of capacitive reactance versus frequency.

**Theory Overview**

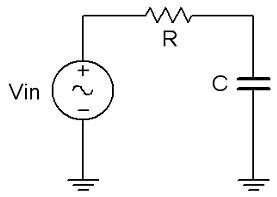
The current – voltage characteristic of a capacitor is unlike that of typical resistors. While resistors show a constant resistance value over a wide range of frequencies, the equivalent ohmic value for a capacitor, known as capacitive reactance, is inversely proportional to frequency. The capacitive reactance may be computed via the formula:



The magnitude of capacitive reactance may be determined experimentally by feeding a capacitor a known current, measuring the resulting voltage, and dividing the two, following Ohm’s Law. This process may be repeated across a range of frequencies in order to obtain a plot of capacitive reactance versus frequency. An AC current source may be approximated by placing a large resistance in series with an AC voltage, the resistance being considerably larger than the maximum reactance expected.

**Equipment**

1. AC Function Generator
2. Oscilloscope



**F**



**Components**

1. 1 µF actual: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. 2.2 µF actual: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. 10 kΩ actual: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Procedure**

**Current Source**

1. Using Figure 1 with Vin=10Vp-p and R=10kΩ, and assuming that the reactance of the capacitor is much smaller than 10k and can be ignored, determine the circulating current using measured component values and record in Table 1.

**Measuring Reactance**

1. Build the circuit of Figure 1 using R=10kΩ, and C=1 µF. Place one probe across the generator and another across the capacitor. Set the generator to a 200 Hz sine wave and 10Vp-p. Make sure that the Bandwidth Limit of the oscilloscope is engaged for both channels. This will reduce the signal noise and make for more accurate readings.
2. Calculate the theoretical value of Xc using the measured capacitor value and record in Table 2.
3. Record the peak-to-peak capacitor voltage and record in Table 2.
4. Using the source current from Table 1 and the measured capacitor voltage, determine the experimental reactance and record it in Table 2. Also compute and record the deviation.
5. Repeat steps three through five for the remaining frequencies of Table 2.
6. Replace the 1 µF capacitor with the 2.2 µF unit and repeat steps two through six, recording results in Table 3.
7. Using the data of Tables 2 and 3, create plots of capacitive reactance versus frequency.

Table:1

**Capacitance = 1µF**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Frequency | Xc Theory | Vc(p-p) Exp | Xc Exp | %Dev |
| 200 | 796.17Ω | 0.8V | 800 | 0.45% |
| 400 | 398.08 Ω | 0.4V | 400 | 0.48% |
| 600 | 265.39 Ω | 0.25V | 250 | 2.15% |
| 800 | 199.04 Ω | 0.2V | 200 | 0.48% |
| 1.0k | 159.23 Ω | 0.16V | 160 | 0.481% |
| 1.2k | 132.696 Ω | 0.13V | 130 | 2.07% |
| 1.6k | 99.52 Ω | 0.1V | 100 | 0.48% |
| 2.0k | 79.61 Ω | 0.08V | 80 | 0.487% |

Table:2

**Capacitance = 2.2µF**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Frequency | Xc Theory | Vc(p-p) Exp | Xc Exp | %Dev |
| 200 | 361.72 Ω | 0.36V | 360 | 0.47% |
| 400 | 180.86Ω | 0.18V | 180 | 0.487% |
| 600 | 120.57Ω | 0.12V | 120 | 0.42% |
| 800 | 90.43 Ω | 0.09V | 90 | 0.47% |
| 1.0k | 72.34Ω | 0.07V | 70 | 3.3% |
| 1.2k | 60.29Ω | 0.06V | 60 | 0.48% |
| 1.6k | 45.21Ω | 0.044V | 44 | 2.75% |
| 2.0k | 36.17Ω | 0.034V | 34 | 5.2% |

Conclusion:

I learn that capacitive reactance will be work proper in proteus. In particular, its relationship to capacitance and frequency will be investigated, including a plot of capacitive reactance versus frequency.