LAB # 02

Capacitive Reactance

SUBMITTED BY:

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REG NO:

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SECTION:

"A"

SUMITTED TO:

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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:

$$X_C = \frac{1}{2\pi f C}$$

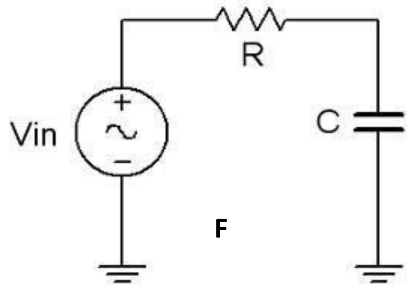
The magnitude of capacitive reactance may be determined experimentally by feeding a capacitor a known current, measuring the resulting voltage, and dividing the two, following Ohm's Law. This process may be repeated across a range of frequencies in order to obtain a plot of capacitive reactance versus 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

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

2. 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.
3. Calculate the theoretical value of X_c using the measured capacitor value and record in Table 2.
4. Record the peak-to-peak capacitor voltage and record in Table 2.
5. 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.
6. Repeat steps three through five for the remaining frequencies of Table 2.
7. Replace the 1 µF capacitor with the 2.2 µF unit and repeat steps two through six, recording results in Table 3.
8. Using the data of Tables 2 and 3, create plots of capacitive reactance versus frequency.

Table:1

Capacitance = 1μF

Frequency	Xc Theory	$V_{c(p\text{-}p)}$ 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	$V_{c(p\text{-}p)}$ 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.