**East West University**

**Lab Report**

**Semester:** Summer-2025

**Course Title:** Electronic Circuits **Course Code:** CSE209

**Sec:** 01

**Expt No: 7**

**Expt Name:** Experimental Study of Sinusoids and Their Characteristics

**Group No: 5**

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**Title:** Experimental Study of Sinusoids and Their Characteristics

**Objectives:**

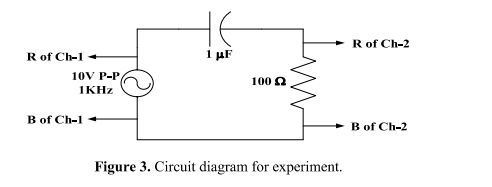
1. To observe the sinusoid in an oscilloscope using a simple RC circuit.

2. To read characteristics of the sinusoids from the oscilloscope and match the values with their corresponding measured values.

**Theory (Summary):**

The theory describes how repeating signals, like voltage and current, alternate between positive and negative. A sine wave's behavior is defined by its amplitude, frequency, and phase, and it can be represented mathematically. We can measure the effective (RMS) value of these signals using AC meters. An oscilloscope helps visualize the phase difference between two waves by showing the time delay between their peaks on different channels. Finally, the theory states that we can calculate a circuit's impedance if we know the voltage and current amplitudes and their phase difference.

**Circuit Diagram:**



**Pre-Lab:**

**1.** Theoretically calculate the amplitude of the current flowing through the circuit shown in the figure 3 and the phase difference between the current and the input voltage.

Ans: here,

W = 2 πf = 2\*π\*1000 = 2000π

Now,

v(t) = 5cos(200πt+0)

V = 5∠0

Z1 = 0+j(-1/2000π\*10-6) = -j159.155Ω

Z2 = 100Ω

Now,

i = Vs / z1+z2 = 5∠0 / (-j159.155 + 100) = 0.027∠57.858

i(t) = 0.027cos(2000π + 57.858)

v(t) = 5cos(200πt+0)

Thus, the difference between current and input voltage is 57.858.

**Experimental datasheet:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Measured**  **Value of**  **resistance (**Ω**)** | **Set peak to peak value of source voltage(v)** | **Set source frequency(KHz)** | **Measured**  **Peak value of current through resistance(mA)** | **Measured**  **Phase difference between voltage and current**  **(deg)** | **Which signal leading** |
| 99 | 10 | 1.0034 | 0.023 | 57.6 | Channel 2 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Measured**  **RMS Value of**  **Source voltage (**V**)** | **Measured**  **RMS Value of**  **Voltage across capacitor (V)** | **Measured**  **RMS Value of**  **Voltage across resistance(V)** | **Rms value current through resistance(mA)** |
| 3.53 | 1.89 | 1.64 | 0.016 |

**Post Lab:**

1. **Divide the amplitude of the signal generator voltage measured by the oscilloscope by √ 2 and compare it with the measured RMS value by voltmeter.**

**Ans:**

Peak to peak value of source voltage (V) is 5.00, and this is measured by oscilloscope. And if we divide it by √ 2 then the desired value will be,

5.00 /√ 2 = 3.54 V

The measured RMS value of source voltage (V) is 3.53 V

Difference = 3.54 - 3.53 – = 0.01V = 0.1% law

1. **Divide the amplitude of the current measured by the oscilloscope by √ 2 and**

**compare it with the measured RMS value.**

**Ans:**

Calculated RMS value = 0.023/ √ 2 = 0.016 A = 16.26 mA

Measured RMS value of current through resistance = 0.016 A = 16 mA

Difference = 0.00026A = 1.62% low

1. **Calculate the impedance by the measured values of voltage and current from the oscilloscope. Also calculate the impedance from Z = R-jX c.**

**Ans:**

**Xc = 1/2** = 158.62 **Ω**

**|Z|theorey = 186.98 Ω**

**|Z|measured = Vs/I = 3.53/0.016 = 220.63 Ω**

Impedance = V/I = 5.00/57.6 = 0.087 Ω

Xc = j/( ωc) = j160

Z = R - j Xc = (186.98 – j158.62) Ω

1. **Calculate the impedance angle from the expression tan-1 (Xc/R) and compare with the phase difference measured from the oscilloscope.**

**Ans:**

Impedance angle = tan −1( Xc / R ) = tan −1 ( 158.62 / 186.98)

= 40.3 degree

Measured phase difference = 57.6 degree

Phase Difference = (57.6 - 40.3 ) = 17.03 degree

**Discussion:**