

Laboratory Application Assignment

In this lab application assignment you will examine both series and parallel RC circuits. In the series RC circuit you will measure the individual component voltages as well the circuit current and phase angle. In the parallel RC circuit you will measure the individual branch currents, the total current, and the circuit phase angle.

Equipment: Obtain the following items from your instructor.

- Function generator
- Oscilloscope
- Assortment of carbon-film resistors and plastic-film capacitors
- DMM

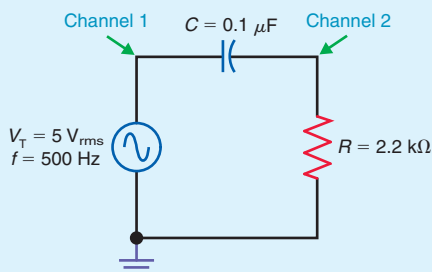
Series RC Circuit

Examine the series RC circuit in Fig. 18–37. Calculate and record the following circuit values:

$$X_C = \underline{\hspace{2cm}}, Z_T = \underline{\hspace{2cm}}, I = \underline{\hspace{2cm}},$$

$$V_C = \underline{\hspace{2cm}}, V_R = \underline{\hspace{2cm}}, \theta_Z = \underline{\hspace{2cm}}$$

Figure 18–37



Construct the circuit in Fig. 18–37. Set the total voltage, V_T , to 5 V rms and the frequency, f , to 500 Hz. Using a DMM, measure and record the following circuit values:

$$I = \underline{\hspace{2cm}}, V_C = \underline{\hspace{2cm}}, V_R = \underline{\hspace{2cm}}$$

Using the measured values of V_C and V_R , calculate the total voltage, V_T , as $V_T = \sqrt{V_R^2 + V_C^2}$. Does this value equal the applied voltage, V_T , of 5 V? $\underline{\hspace{2cm}}$. Using the measured values of voltage and current, calculate X_C as V_C/I and Z_T as V_T/I . $X_C = \underline{\hspace{2cm}}$, $Z_T = \underline{\hspace{2cm}}$. Using Formula (18–3), determine the phase angle, θ_Z . $\theta_Z = \underline{\hspace{2cm}}$. How do these values compare to those originally calculated? $\underline{\hspace{2cm}}$

In the space provided below, draw the phasor voltage triangle, including the phase angle, θ_V for the circuit of Fig. 18–37. Use measured values for V_R , V_C , and V_T .

Ask your instructor for assistance in using the oscilloscope to measure the phase angle, θ , in Fig. 18–37. Note the connections designated for channels 1 and 2 in the figure.

Parallel RC Circuit

Examine the parallel RC circuit in Fig. 18–38a. Calculate and record the following circuit values:

$$X_C = \underline{\hspace{2cm}}, I_C = \underline{\hspace{2cm}}, I_R = \underline{\hspace{2cm}},$$

$$I_T = \underline{\hspace{2cm}}, Z_{EQ} = \underline{\hspace{2cm}}, \theta_I = \underline{\hspace{2cm}}$$

Construct the circuit in Fig. 18–38a. Set the applied voltage, V_A , to 5 V rms and the frequency, f , to 500 Hz. Using a DMM, measure and record the following circuit values:

$$I_C = \underline{\hspace{2cm}}, I_R = \underline{\hspace{2cm}}, I_T = \underline{\hspace{2cm}}$$

Using the measured values of I_C and I_R , calculate the total current, I_T , as $I_T = \sqrt{I_R^2 + I_C^2}$.

Does this value agree with the measured value of total current? $\underline{\hspace{2cm}}$. Using the measured values of I_C and I_R , calculate the phase angle, θ_I , using Formula (18–6).

$\theta_I = \underline{\hspace{2cm}}$. Also, calculate X_C as V_A/I_C and Z_{EQ} as V_A/I_T using measured values. $X_C = \underline{\hspace{2cm}}$. $Z_{EQ} = \underline{\hspace{2cm}}$. How do these values compare to those originally calculated in Fig. 18–38a? $\underline{\hspace{2cm}}$

In the space provided below, draw the phasor current triangle, including the phase angle, θ_I , for the circuit of Fig. 18–38a. Use measured values for I_C , I_R , and I_T .

Ask your instructor for assistance in using the oscilloscope to measure the phase angle, θ_I , in Fig. 18–38b. Note the connections designated for channel 1 and channel 2 in the figure. (The voltage drop across the sensing resistor (R_{sense}) has the same phase as the total current, I_T .)

Figure 18–38

