Laboratory Application Assignment

In this lab application assignment you will use an oscilloscope to measure the amplitude, frequency, and period of a sine-wave ac voltage. You will also use a DMM to measure the voltage and current values in an ac circuit. As an aid in understanding the operation and use of the oscilloscope, refer to App. E. However, it is expected that your instructor will assist you with the operation of both the function generator and the oscilloscope when doing this experiment.

Equipment: Obtain the following items from your instructor.

- Function generator
- Assortment of carbon-film resistors
- Oscilloscope
- DMM

Using the Oscilloscope and Function Generator

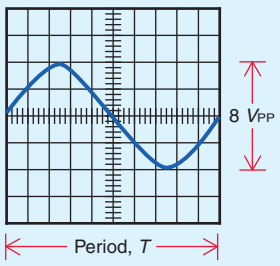
Connect the channel 1 probe of the oscilloscope to the output of the function generator. Set the function generator to produce a sine-wave output. Next, while viewing the oscilloscope, adjust the function generator and oscilloscope controls to view one cycle of a 100-Hz, 8-V_{pp} sine wave. The displayed waveform should be similar to the one shown in Fig. 15–35. Have your instructor check the displayed waveform. If it is correct, proceed as follows.

What is the Volts/div. setting of the oscilloscope? Volts/div. = _____ How many vertical divisions does the displayed waveform occupy? _____
From this information, what is the measured peak-to-peak value of the displayed waveform? V_{pp} = _____

What is the peak value of the displayed waveform? V_p = _____ Using this value, calculate and record the waveform's rms value. V_{rms} = _____ With your DMM set to measure ac voltage, measure and record the rms voltage at the output of the function generator. V_{rms} = _____ How does this value compare to the calculated value? _____

What is the Sec./div. setting of the oscilloscope? Sec./div. = _____ How many horizontal divisions does one cycle occupy? _____
From this information, what is the measured period, T, of the displayed waveform? T = _____
Calculate and record the period, T, of the 100-Hz waveform as $T = 1/f$. T = _____
How do the calculated and measured values compare? _____

Figure 15–35



Adjust the Sec./div control of the oscilloscope until two cycles are displayed on the screen. What is the Sec./div. setting with two cycles displayed? Sec./div. = _____

Have either your instructor or lab partner adjust the function generator controls to change the frequency and amplitude of the sine wave. Determine the period, T, frequency, f, and peak-to-peak value of the displayed waveform. Repeat this procedure several times until you become proficient in using the oscilloscope.

AC Circuit Measurements

Refer to Fig. 15–36. Calculate and record the following circuit values:
R_T = _____, I_{rms} = _____,
$V_{1(rms)}$ = _____, $V_{2(rms)}$ = _____

Construct the circuit in Fig. 15–36. Using your DMM, measure and record the following rms values: I_{rms} = _____,
$V_{1(rms)}$ = _____, $V_{2(rms)}$ = _____

Using the oscilloscope, measure and record the following peak-to-peak values. (You will need to use both channels and the math mode to measure V_1.)
$V_{T(pp)}$ = _____, $V_{1(pp)}$ = _____,
$V_{2(pp)}$ = _____

Convert the peak-to-peak values to rms values, and record your answers.
$V_{T(rms)}$ = _____, $V_{1(rms)}$ = _____,
$V_{2(rms)}$ = _____

How do these values compare to the values measured with the DMM? _____
_____

With your DMM set to measure dc voltage, measure and record the following values in Fig. 15–36:

$V_{T(DC)}$ = _____, $V_{1(DC)}$ = _____,
$V_{2(DC)}$ = _____

Are these measurements what you expected? _____

Figure 15–36