ECE 281

Electrical Circuits and Instrumentation + Laboratory

Fall 2016/2017

LAB # 9

5.12.2016

Different Waveforms, Corresponding RMS values

Objective:

1. **To observe peak and RMS values of different Waveforms.**
2. **To compare DC and AC value.**

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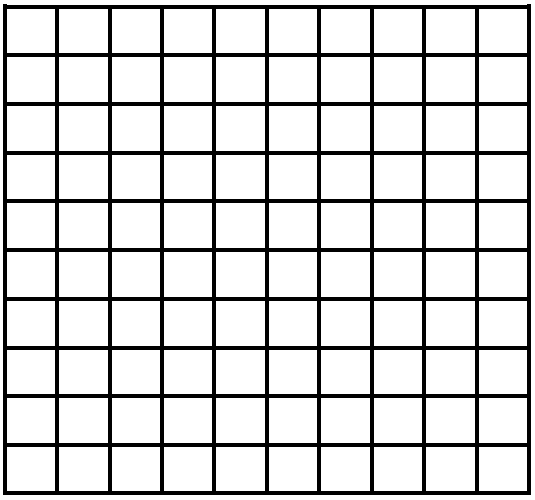
1. Peak and RMS Values of AC Signals (60 Points)

Procedure:

1. Using signal generator generate a 250 Hz; 6 Volt peak-to-peak **Sine wave** (where f=250 Hz). Observe the waveform on Oscilloscope (on CH1) when Volt/Div=1 Volt and Time/Div=1 msec (millisecond).

2. Draw the signal observed on the Oscilloscope on Figure 1.

Volt/Div=1 Volt



Time/Div=1 msec

Figure 1: Plot of sinusoidal waveforms.

3. Increase the frequency to 500 Hz. Plot the new signal over the first plot (Figure 1).

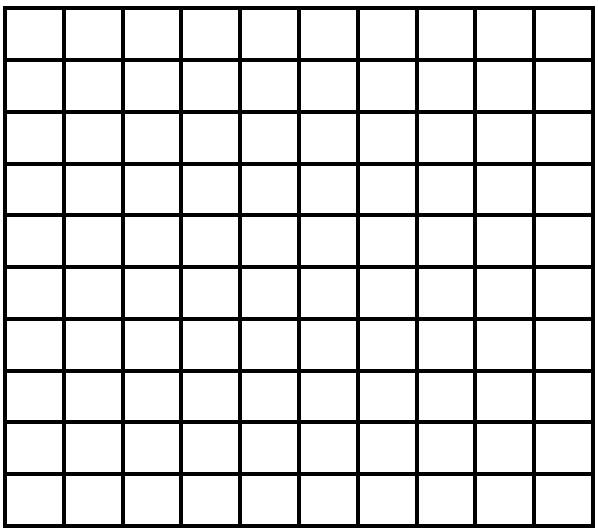
4. Using a multi meter (in AC voltage measurements) find the RMS value for the Sine waves for both cases. (In AC measurements, the multi meter shows the RMS value for the signal)

V_{RMS} (first signal) = V_{RMS} (second signal) =

5. Using signal generator generate a 250 Hz; 6 Volt peak-to-peak **triangular wave**. Observe the waveform on Oscilloscope (on CH1) when Volt/Div=1 Volt and Time/Div=1 msec.

6. Draw the signal observed on the Oscilloscope on Figure 2.

Volt/Div=1 Volt



Time/Div=1 msec

Figure 2: Plot of triangular waveforms.

7. Now increase the frequency to 500 Hz. Plot the new signal over the first plot (Figure 2).

8. Using multi meter (in AC voltage measurements) find the RMS value for the triangular waves for both cases. (In AC measurements, the multi meter shows the RMS value for the signal)

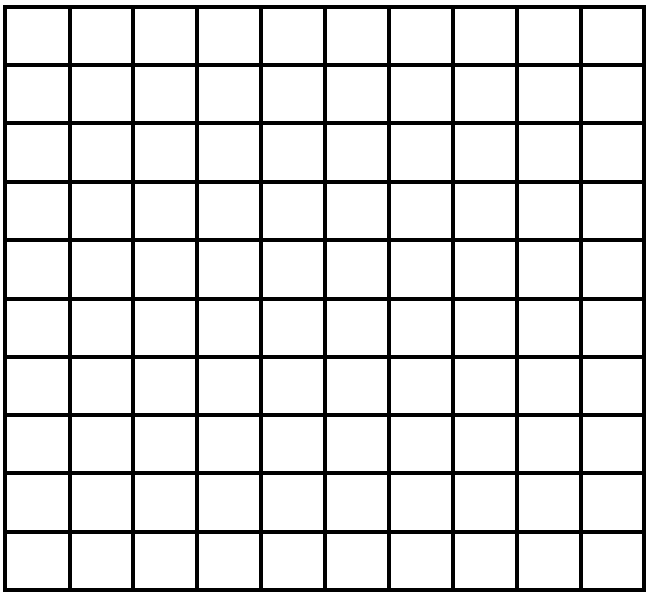
V_{RMS} (first signal) = V_{RMS} (second signal) =

9. Using signal generator give a 250 Hz; 6 Volt peak-to-peak **square wave**. Observe the waveform on Oscilloscope (on CH1) when Volt/Div=1 Volt and Time/Div=1 msec (milisecond).

10. Draw the signal observed on the Oscilloscope on Figure 3.

11. Now increase the frequency to 500 Hz. Draw the signal over the first plot (Figure 3).

Volt/Div=1 Volt



Time/Div=1 msec

Figure 3: Plot of Square waveforms.

12. Using multimeter (in AC voltage measurements) find the RMS value for the square waves for both cases. (In AC measurements, the multi meter shows the RMS value for the signal)

V_{RMS} (first signal)= V_{RMS} (second signal)=

Questions:

- Explain the difference (if any) between RMS values of different signals.

2. Comparison of DC and AC mode of multi meters (40 Points)

Procedure:

1. Set up the circuit in the Figure 4.

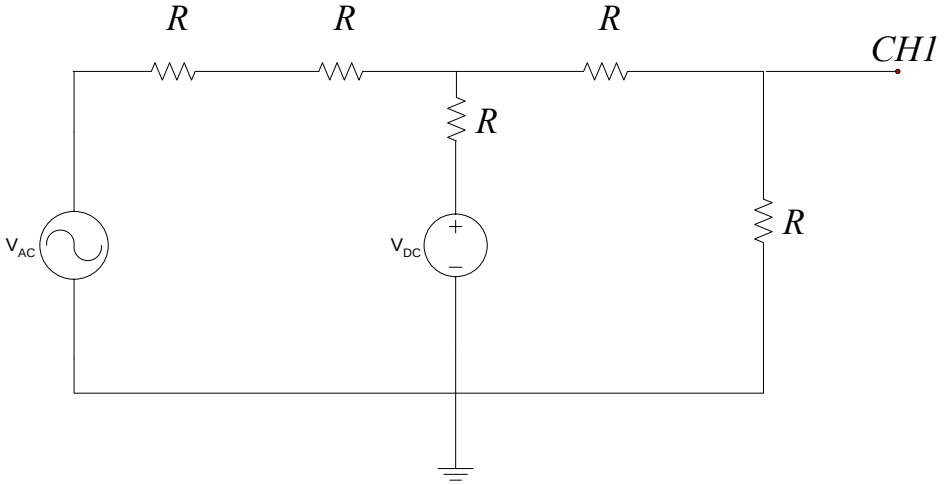


Figure 4: The circuit diagram.

Equipment list: 5×1kΩ

2. Adjust $V_{AC}(t) = 2Sin(2\pi ft)$ Volt, where f=1000 Hz (V_{AC}(t) will be provided using the AC Function Generator) and $V_{DC} = 2$ Volt DC (V_{DC} will be provided using DC power supply).
3. Connect CH 1 of the Oscilloscope as in the Figure 4.
4. Draw the waveforms observed over CH 1 (on the Oscilloscope) in DC and AC mode at Figure 5 and Figure 6 respectively. For your observations over the oscilloscope select Volt/Div=0.5 Volt, Time/Div= 0.5 msec (milisecond).

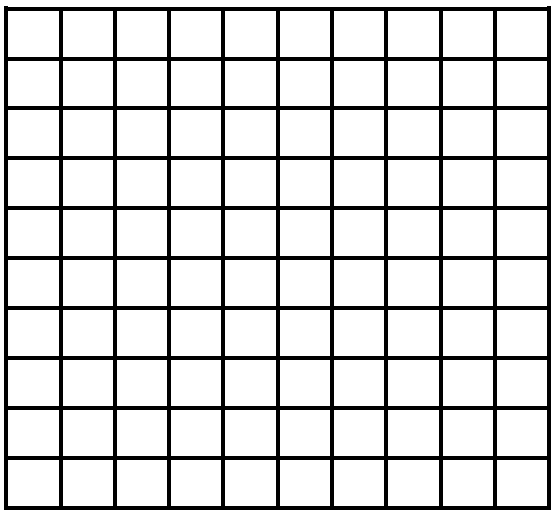


Figure 5: CH1 in DC mode.

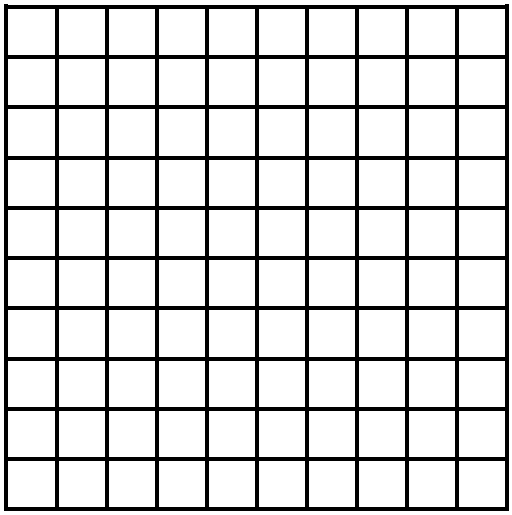


Figure 6: CH1 in AC mode.

5. Change the Volt/Div= 0.2 Volt and Time/Div= 0.2 msec.

6. Draw the waveforms observed over CH 1 (on the Oscilloscope) in DC mode and AC mode at Figures 7 and 8 respectively.

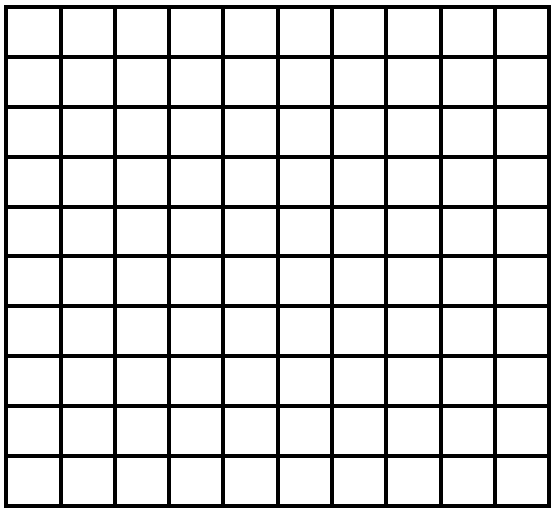


Figure 7: CH1 in DC mode.

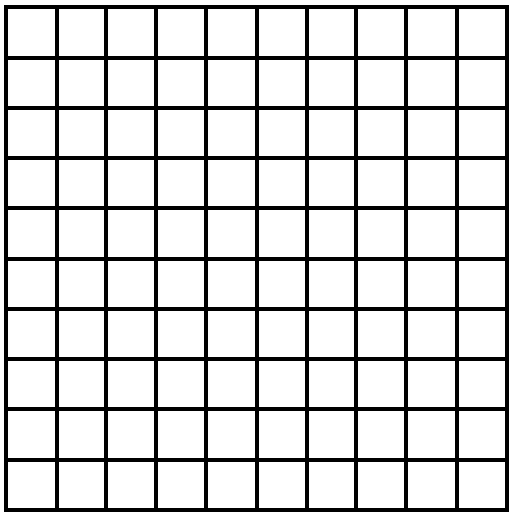


Figure 8: CH1 in AC mode.

7. Change the $V_{AC}(t) = 4Sin(2\pi ft)$ Volt by keeping $V_{DC} = 2$ Volt DC (choose Volt/Div= 0.5 Volt and Time/Div= 0.5 msec.)

8. Draw the waveforms observed over CH 1 (on the Oscilloscope) in DC mode and AC mode respectively at Figures 9 and 10.

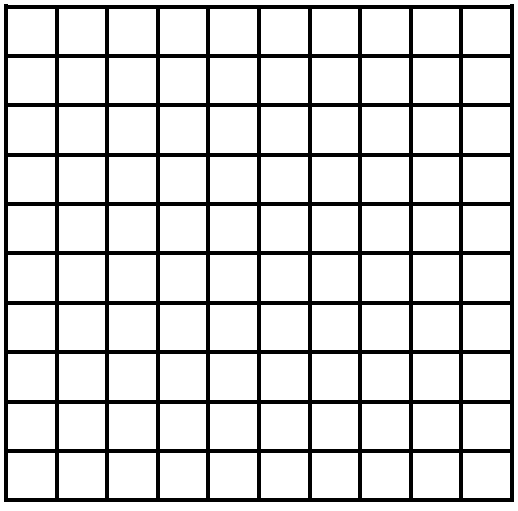


Figure 9: CH1 in DC mode.

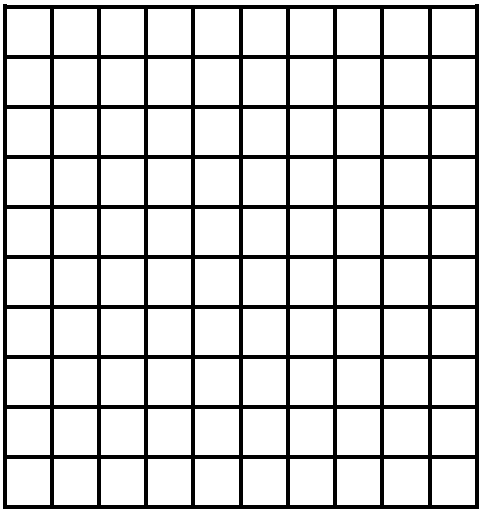


Figure 10: CH1 in AC mode.

Questions:

- Explain the difference (if any) between DC and AC mode values.