ELEC 243: Electronic Measurement Systems

Lab Report #2 Template

Group \_\_\_\_: First A. Author and Second B. Author

# Summary

Provide a summary of what was accomplished and how it fits into the grand plan. What did you learn? What was the most surprising or unexpected result?

While it is not required, if you use this template Word file for creating your lab report, it will have the proper organization with the necessary styles predefined, and it will be easier to grade. Easier to grade usually means a better grade. In any case, use a format that is similar to this and follow the guidelines below. If you need to include diagrams, graphs, or tables that are difficult to incorporate electronically, you may use a separate page or glue or tape them in place. Remember to add group information in the footer on page 2 and to delete this and other instructions.

# Data & Analysis

This section you should present the data you collected in lab and the answers to the questions posed.

The data may be in the form of a table or a graph. Explain briefly what the data are, what they mean, and relevant details of how the data were acquired. Remark on whether the data were what you expected and discuss any significant discrepancies. Don't just say: "We did A, B, and C, and Ohm's Law works," tie it all together. Think of yourself as a Pulitzer prize winning journalist: you've gathered the news (doing the lab), now you're telling your readers what it means: "A, B, and C represent different techniques for measuring circuit variables, each having a different range of applicability:.... Ohm's law is handy if you're stranded on a desert island without an ammeter." Be concise; there is no need to repeat the lab instructions in the report. A sketch or circuit diagram is a compact way to provide information. If you do extra experiments or make additional measurements, be sure to include them with an explanation.

The instructions have questions interspersed with the steps of the experiments, some numbered, and you should answer these in this section. In addition, the report template may include additional questions or request particular conclusions or reflections on the laboratory activities. The questions don't always have a unique correct answer; sometimes they ask for your evaluation or comments. In either case, give some indication of why you chose the answer you did.

## Experiment 2.1: The Oscilloscope and Function Generator

### Part 1: Viewing Signals with the Oscilloscope

* What does pulling the red X1-X5 switch in the middle of the timebase's position knob do? What is the effect of changing the slope trigger control from "+" to "-"?
  + **Pulling the red x1-x5 switch (or in our case, changing the H position knob) caused the number of periods of the signal that appeared on the screen to increase or decrease (depending on counter clockwise or clockwise turn)**. Changing the slope trigger control from + to – effectively reflected the signal on the screen across the x-axis.
* Describe what happens when you change the vertical amplifier settings, or switch to uncalibrated mode.
  + The vertical amplifier settings would cause the scale of the vertical axis parameter of the oscilloscope to change, which caused the signal to appear larger (taller) or shorter (smaller) on the screen.
* Part 2: Quantitative Measurements with the Oscilloscope
* **Question 1**: Why would we want to use the oscilloscope to measure a "DC" voltage?
* How does your calculated frequency of the signal (using the formula f=1/T) compare with the nominal frequency?
* **Question 2:** The calibration output has no place for attaching the black ground (common) lead: why not?
* Sketch the calibration signal's waveform. What is its period? What is its frequency? Does your measurement of the waveform's amplitude correspond to the stated value?

# Experiment 2.2 Electroacoustic Transducers

### Part 1: Listening to a Signal

* What do you hear when you connect the output of the function generator to the speaker? dot_clear
* With the speaker still connected to the function generator (Step 3), is the voltage across the speaker still 5V (p-p)? dot_clear
* Describe the nature of the sound change as you changed the function generator parameters (Step 4).

### Part 3: Microphone

* Briefly describe the effects of the triggering and time sweep controls on the display of the microphone signal (Step 6).
* Sketch one or two of the more interesting waveshapes from speaking vowels (Step 8). What was the approximate frequency of your sustained vowel sound?
* Is the waveform on the oscilloscope from your whistle sinusoidal? dot_clear
* **Question 3:** Based on your measurements of the loudspeaker sensitivity and the output of the microphone, would it be possible to produce an audible sound in the loudspeaker by connecting it directly to the microphone?

## Experiment 2.3 Optoelectronic Transducers

### Part 1: The Photodiode

* Note the voltage produced by the photodiode in room light, when you cover the photodiode with your hand, when you illuminate it with (a) the under-shelf florescent lamp and (b) the incandescent lamp. Sketch the shape of the AC component of the waveform for each source. What is its amplitude and frequency?
* **Question 4:** Explain the waveforms you observed above.

### Part 2: Measuring Photocurrent

* Specify the voltage and photocurrent measured using the same three light sources as in Part 1.

### Part 3: Light Emitting Diode

* What is the voltage across the LED for supply voltages of 3, 4, and 5 volts. Comment on the relative LED brightness at each setting.
* At what excitation frequency does the appearance of steady glow from the LED stop and noticeable flicker begin? dot_clear
* **Question 5:** How does the number you measured in the previous step relate to the frame rate of television and motion pictures?

### Part 4: Optical Communication, Take 1

* Describe the waveform from the photodiode in response to the LED’s light. Is it what you would expect?
* Sketch the waveform from the photodiode for a triangle excitation of the LED. Is it what you expected? Can you explain it?
* What is the maximum separation of the LED and photodiode for which you can transmit a recognizable signal?

# Feedback

This section gives you an opportunity to give us feedback on the lab; provide any additional suggestions and comments you think will help us improve the laboratory.