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Module One Laboratory Report

Introduction to the Microprocessor

ME3902 - Project-Based Engineering Experimentation

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**Introduction:**

This set of lessons was designed to expose users to a microcontroller . . . Expand briefly 2-3 sentences

The objectives of the laboratory were to learn . . . What? 2-3 fundamental objectives

**Procedure:**

**PLEASE SHOW DETAILS OF YOUR SETUP IN THIS SECTION**

**RESULTS WILL GO IN THE NEXT SECTION**

A) Create a circuit containing a power source, an LED, and a resistor. Based on lab assignment, I selected \_\_\_\_\_\_ volt power source. Using this initial voltage the resistor had to be greater than \_\_\_\_\_ ohms to keep the current thru the LED below \_\_\_\_\_\_\_\_ milliAmps.

Figure 1 shows my circuit.

Insert Figure Here

Figure 1: Circuit Diagram for a Single LED Light Configuration

Table 1 shows my source code.

Insert Code Here

Table 1: Documented Source Code for a Single LED Configuration

B) Add more LED lights and resistors to your circuit. Have the lights sequentially turn on and off. Based on lab assignment, I selected \_\_\_ LEDs to sequentially illuminate. I used the same resistor size and source voltage for this task.

Figure 2 shows my circuit.

Insert Figure Here

Figure 2: Circuit Diagram for a Sequential LED Lights

Table 2 shows my source code.

Insert Code Here

Table 2: Documented Source Code for a Sequential LED Configuration

C) Configure a Fade Sequence using PWM. The PWM channel selected was pin \_\_\_\_\_. I used the same resistor and voltage as in previous tasks.

Figure 3 shows my circuit.

Insert Figure Here

Figure 3: Circuit Diagram for a PWM LED Fade Function

Table 3 shows my source code.

Insert Code Here

Table 3: Documented Source Code for a PWM LED Configuration

D) Introduce a button into your circuit. I used a pull-(Up/Down?) resistor of \_\_\_ ohms and voltage source and wiring as in previous tasks (A, B, or C).

Figure 4 shows my circuit. (These are just examples.)

A circuit board

Description automatically generated A circuit board

Description automatically generated

Insert Your Figure(s) Here

Figure 4: Circuit Diagram for a Button added to task (A, B, C) with a pull-XX resistor

Table 4 shows my source code.

A screenshot of a cell phone

Description automatically generated A screenshot of a cell phone

Description automatically generated

Insert Code Here

Table 4: Documented Source Code for a Button Configuration

(again, just an example)

E) Introduce a potentiometer into task A circuit in place of the 220 ohm resistor.

Figure 5 shows my circuit.

Insert Figure Here

Figure 5: Circuit Diagram for a Potentiometer replacing the series resistor to task A.

Table 5 shows my source code.

Insert Code Here

Table 5: Documented Source Code for a Potentiometer replacing the series resistor to task A.

**Facilities**:

The Raspberry Pi-4 is shown in Fig 1 [1].

4 assorted 5mm LED lights

4 resistors (465 ohms, 5% tolerance) > 40 ohms (given that the power source is 3.3V).

1 half-breadboard

6 jumper wires (female to male mostly), etc.

Add the components, you used in this module.

Be specific about the components. Example:

Analog to Digital Converter, 16-bit I2C ADC+PGA (ADS-1115)

**Results and Discussion**

**PLEASE PROVIDE YOUR RESULTS IN THIS SECTION (FIGURES AND TABLES)**

This first module used a microprocessor to control the behavior of LED lights. The direct extension of these exercises was to A) Initialize one to the microprocessor – its operation, basic instruction sets, available resources; B) to develop some programming skill such that one can control turning on and off devices as well as providing partial power to devices, such as thru a PWM operation and/or a potentiometer. Several input devices can be analog signals, hence we wired up an analog to digital converter for use in subsequent modules.

The procedure section shows the configurations, then the results show numerous graphs/figures of results for some general objective of the laboratory.

**Conclusions**

**PLEASE WRITE A BRIEF CONCLUSION HERE (WHAT DID YOU LEARN? WERE YOU SUCCESSFUL IN YOUR EXPERIMENTS)**

The microcontroller, a Raspberry Pi V4 in this situation, was used to illuminate LED lights with additional control provided by various timing periods, buttons, and potentiometers.

The intent (to demonstrate to the user) was to demonstrate that one can control when and how an LED will be illuminated. The “computer” software specified the sequence and process. However, there is little difference between writing a code to turn on an LED, and writing a code to turn on a DC motor to control some physical situation. The skills learned by the LED illumination can extend well beyond into having the microcontroller gather and control external physical situations.

**Be sure to answer whether or not the objectives of the exercise were satisfied.**

**References**

1. <https://www.seeedstudio.com/Raspberry-Pi-4-Computer-Model-B-4GB-p-4077.html>

2. See in Module 01, the description/documentation of the codes presented in this sample write-up.

**Appendix**

NA