**ECE 211 Lab-A2 – Worksheet**

Name: .

**Exercise 1**

***Part 1A:*** Follow the instructions in the lesson *2.9 Ultrasonic Sensor Module* and run the code.

1. In the table below, fill in the measured distance as reported by the sensor versus the actual distance. If you do not have a ruler or a measuring tape you can use a standard sheet of U.S. letter sized paper that is 11 inches in height as a standard reference.

|  |  |  |  |
| --- | --- | --- | --- |
| Reference | Actual Distance | Reported Distance (cm) | % Relative error |
| 2× | 22” (56 cm) |  |  |
| 1× | 11” (28 cm) |  |  |
| ½ × | 5.5” (14 cm) |  |  |
| ¼ × | 2.25” ( 7 cm) |  |  |

1. **Ask your Scrum Master to verify** that your setup is working.
2. In the box below, comment on the accuracy of the sensor. Does the relative error change much as a function of the actual distance? Does the shape or hardness of the reflecting surface make any difference? Suggest a way you could compensate for the errors.

***Part 1B:*** Follow the instructions in the lesson *2.10 DHT11 Temperature and Humidity Sensor* and run the code.

1. **Ask your Scrum Master to verify** that your setup is working.
2. Question: Does the reported temperature seem reasonable for the room? What happens if you breath on the sensor? Write you answers in the box below.

**Exercise 2**

Follow the instructions in the lesson *2.11 Analog Joystick Module* and run the code.

1. **Ask your Scrum Master to verify** that your setup is working.

**Exercise 3**

1. First, do the lesson *2.12 IR Receiver Module* exactly as written to get a functioning IR circuit. Look the code over carefully to see how it works. You do not need your Scrum Master to verify this part.
2. Next, connect three LEDs of different colors to the Arduino. Remember to insert a 220 Ω resistor in series with each LED. When you press the number keys 1, 2, or 3 on the remote control’s keypad, its associated LED should light up, while the others remain off.
3. **Ask your Scrum Master to verify** that your setup is working.
4. Once you are done, upload your modified IR program (.ino) to D2L.

**Exercise 4**

1. First, do the lesson *2.13 LCD Display*. The wiring is fairly complicated, so take your time, be neat, and double-check your work. Do not connect the VDD power wire until you are ready. Examine the code carefully. You do not need your Scrum Master to verify this part.
2. Now connect the joystick to the circuit.
3. Edit the program so that the joystick’s current x and y values are displayed continuously on the LCD module instead of to the Serial Monitor screen on the host PC.
   * The reported x and y values normally have a range from 0 to 1023. The centered position of the joystick should be around x=512 and y=512 (i.e., mid-range).
   * Change the code so that a centered joystick displays x=0 and y=0 coordinates. This means other joystick positions can show either negative or positive numbers.
4. **Ask your Scrum Master to verify** that your setup is working.
5. Once you are done, upload your modified LCD program (.ino) to D2L.
6. **Upload this completed worksheet with your name and answers on D2L**
7. **Upload your Exercise 3 and 4 Arduino .ino programs to the Lab-A2 Submission Folder on D2L.**