

Name: _____

EEE 202 Lab 4: Arduino

***** IMPORTANT NOTE REGARDING THE ARDUINO BOARDS*****

Never connect the USB cable to a computer and a battery or power supply to the board at the same time or you risk sending a charge in through the USB port and damaging the computer. Always keep any power supplies separate and distinct from the 5V or 3V pin of the Arduino***

Data Sheet

Part 1: SOS Code

Put Arduino SOS code here:

```
// C++ code
//
int led = 13;

void setup()
{
    pinMode(led, OUTPUT);
}

void loop()
{
    flash(200); flash(200); flash(200); // S

    flash(600); flash(600); flash(600); // O

    flash(200); flash(200); flash(200); // S

    delay(1000);
}

void flash(int duration)
{
    digitalWrite(led, HIGH);
    delay(duration);
    digitalWrite(led, LOW);
    delay(200);
}
```

Part 2: Digital Input with Switch

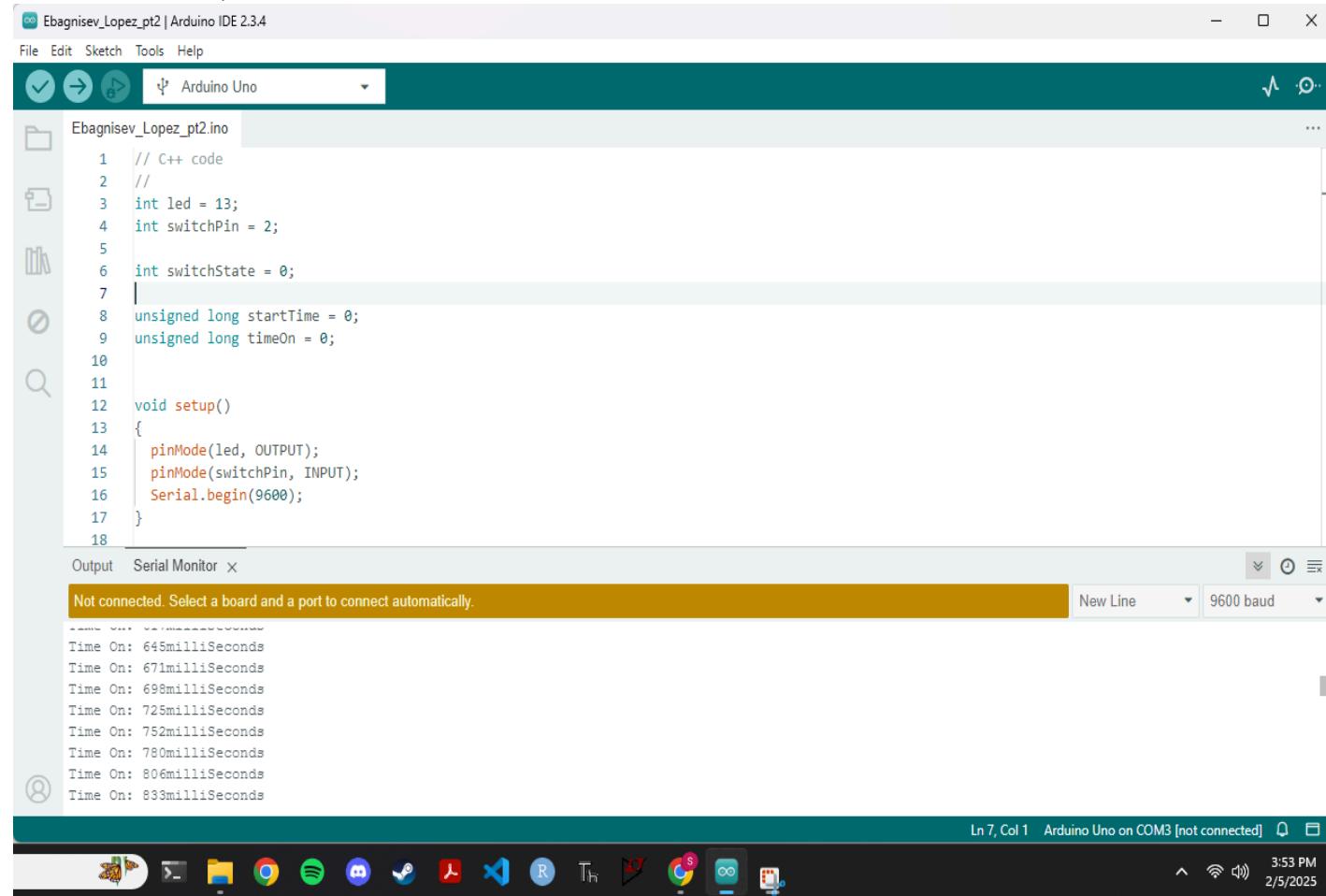
What did you observe with your physical circuit when you toggle the slide switch (when running the code on Page 12)?

Turns the switch on or off depending on the position.

What did you observe when monitoring the Serial port (when running the code on Page 13)?

The words “Time On: ---- milliseconds” appeared and the value counted up as long as the switch closed the circuit.

Provide a screenshot of your Serial Port window here (Have a look at an example screenshot at the end of this document):



```
1 // C++ code
2 //
3 int led = 13;
4 int switchPin = 2;
5
6 int switchState = 0;
7
8 unsigned long startTime = 0;
9 unsigned long timeOn = 0;
10
11
12 void setup()
13 {
14     pinMode(led, OUTPUT);
15     pinMode(switchPin, INPUT);
16     Serial.begin(9600);
17 }
18
```

Output Serial Monitor

Not connected. Select a board and a port to connect automatically.

Time On: 645milliseconds
Time On: 671milliseconds
Time On: 698milliseconds
Time On: 725milliseconds
Time On: 752milliseconds
Time On: 780milliseconds
Time On: 806milliseconds
Time On: 833milliseconds

Ln 7, Col 1 Arduino Uno on COM3 [not connected] 3:53 PM 2/5/2025

Update the code on page 13 to do the following:

- Add a variable to also determine the “off time”
- Send the “off time” output to the Serial Monitor to print with the “on time”

Record your entire updated Arduino Code here:

```
int led = 13;
int switchPin = 2;
int switchState = 0;
int lastSwitchState = LOW;

unsigned long startTime = 0;
unsigned long timeOn = 0;
unsigned long timeOff = 0;

void setup()
{
    pinMode(led, OUTPUT);
    pinMode(switchPin, INPUT);
    Serial.begin(9600);
}

void loop()
{
    unsigned long now = millis(); //running counter in milliseconds
    switchState = digitalRead(switchPin);
    if(switchState == HIGH)
    {
        if (lastSwitchState == LOW)
        {
            startTime = now;
        }
        digitalWrite(led,HIGH);
        timeOn = now - startTime; //in milliseconds
        Serial.print("Time On: ");
        Serial.print(timeOn);
        Serial.println("milliSeconds");
    }
    else
    {
        digitalWrite(led, LOW);
        timeOff = now - startTime;
        Serial.print("Time Off: ");
        Serial.print(timeOff);
        Serial.println("milliSeconds");

        if (lastSwitchState == HIGH)
        {
            startTime = now;
        }
    }
    lastSwitchState = switchState; // Update last state
}
```

Provide a screenshot of your Serial Port window here (Have a look at an example screenshot at the end of this document):

The screenshot shows the Arduino IDE interface. The top bar displays the title "Ebagnisev_Lopez_pt2 | Arduino IDE 2.3.4". The menu bar includes File, Edit, Sketch, Tools, and Help. The toolbar contains icons for back, forward, and search. The main code editor window shows the following C++ code:

```
1 // C++ code
2 //
3 int led = 13;
4 int switchPin = 2;
5
6 int switchState = 0;
7 int lastSwitchState = LOW;
8
9 unsigned long startTime = 0;
10 unsigned long timeOn = 0;
11 unsigned long timeOff = 0;
12
13 void setup()
14 {
15     pinMode(led, OUTPUT);
16     pinMode(switchPin, INPUT);
17     Serial.begin(9600);
18 }
```

The bottom tab bar shows "Output" and "Serial Monitor". The "Serial Monitor" tab is active, displaying the message "Not connected. Select a board and a port to connect automatically." Below this, the serial port output shows a series of time measurements:

```
Time Off: 175milliSeconds
Time Off: 1821milliSeconds
Time Off: 1851milliSeconds
Time Off: 1880milliSeconds
Time Off: 1910milliSeconds
Time Off: 1938milliSeconds
Time Off: 1968milliSeconds
Time Off: 1997milliSeconds
Time Off: 2025milliSeconds
```

The status bar at the bottom right indicates "Ln 1, Col 1" and "Arduino Uno on COM3 [not connected]". The system tray icons include a clock, battery, signal strength, and date/time (3:51 PM, 2/5/2025).

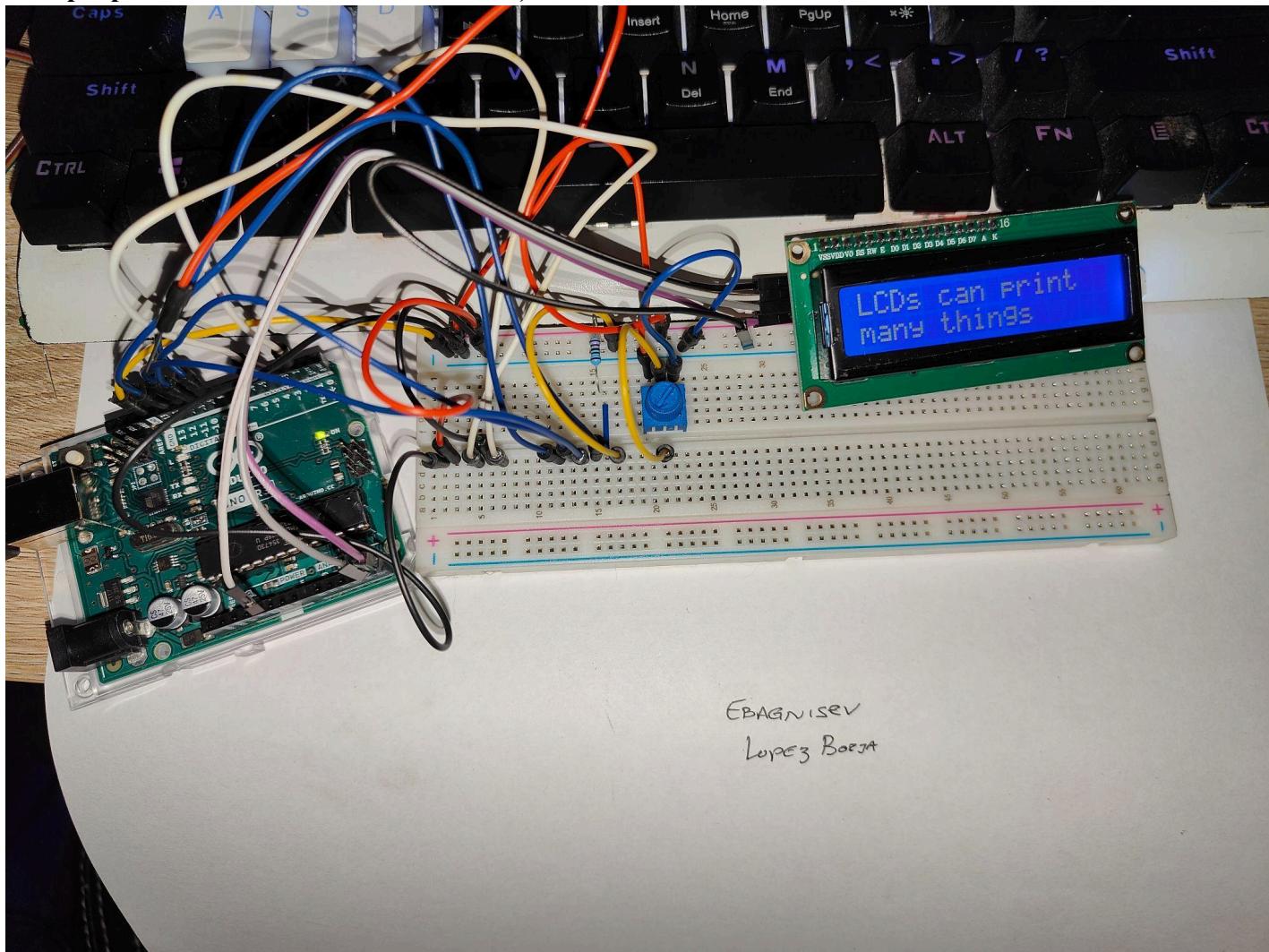
Part 3: Writing to the LCD Display

Note: if your LCD is not working, use the Serial Port instead for this (and the following) parts.

What did you observe when you run the LCD code that was provided (What are the display results)?

The LCD flashes on and displays Welcome and then changes to LCDs can print many things.

Provide a picture of your circuit while the LCD is displaying the message here (Have a look at an example photo at the end of this document):



What happens when you adjust the potentiometer? Mention any other observations you find, if any.

The characters and lighting change dimness/brightness.

Modify the code on page 15 to do the following:

- The LCD display initializes with:

Welcome to
EEE 202

- Set a variable for the time the system has been running (like you did in part two with the “now” variable) and then display:

Run time
(run time in milliseconds)

Record your entire updated Arduino Code here:

```
#include <LiquidCrystal.h>

const int rs = 2, en = 4, d4 = 9, d5 = 10, d6 = 11, d7 = 12;
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);

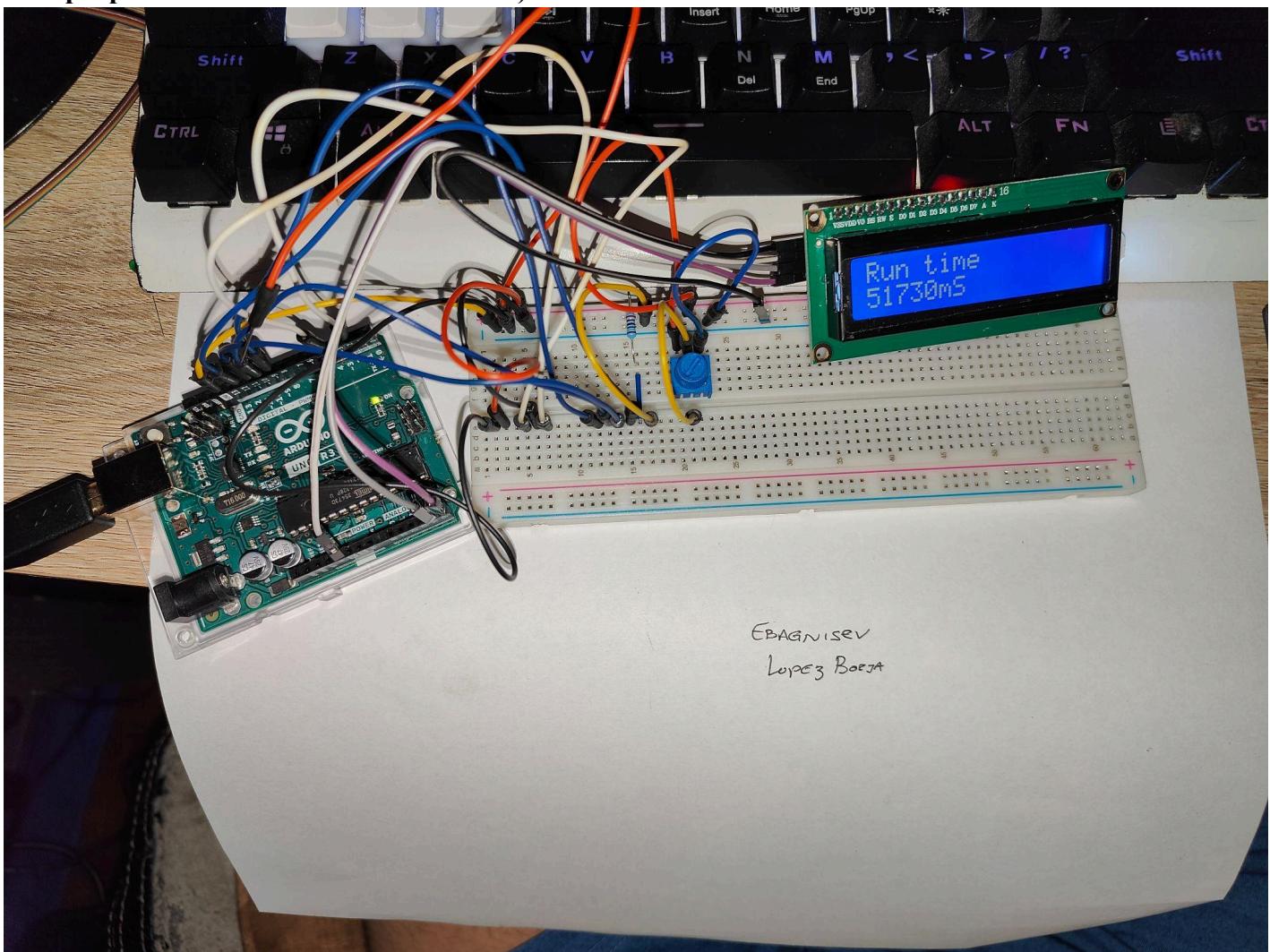
unsigned long startTime = 0;
unsigned long timeOn = 0;

void setup()
{
    lcd.begin(16,2);

    lcd.setCursor(0,0);
    lcd.print(" Welcome to ");
    lcd.setCursor(0,1);
    lcd.print(" EEE 202 ");
    delay(2000);
    lcd.clear();
}

void loop()
{
    unsigned long now = millis();
    lcd.setCursor(0,0);
    lcd.print("Run time");
    lcd.setCursor(0,1);
    timeOn = now - startTime;
    lcd.print(timeOn);
    lcd.print("mS");
    delay(2000);
}
```

Provide a picture of your circuit while the LCD is displaying the message here (Have a look at an example photo at the end of this document):



Part 4: Analog Inputs with Light Sensors and LCD Display

What did you observe in the Serial Monitor when you ran the photoresistor light sensor code?

Provide a screenshot of your Serial Port window here (Have a look at an example screenshot at the end of this document):

The screenshot shows the Arduino IDE interface. The top bar displays 'Ebagnisev_Lopez_pt4 | Arduino IDE 2.3.4'. The menu bar includes File, Edit, Sketch, Tools, and Help. The toolbar has icons for file operations like Open, Save, and Print. The main workspace shows the sketch 'Ebagnisev_Lopez_pt4.ino' with the following code:

```
4 // Initialize the I2C LCD (address 0x27 may vary; check your module)
5 LiquidCrystal_I2C lcd(0x27, 16, 2);
6
7 void setup() {
8     // Initialize the LCD and serial communication
9     lcd.init();          // Initialize the LCD
10    lcd.backlight();    // Turn on the backlight
11
12    Serial.begin(9600); // Initialize Serial Monitor for testing
13 }
14
15 void loop() {
16     int val = analogRead(A0); // Read the value from the photoresistor
17     Serial.print("Sensor Value: ");
18     Serial.println(val); // Print the value to the Serial Monitor for testing
19     delay(100); // Wait for 100ms before the next reading
20 }
```

The bottom section shows the Serial Monitor window with the title 'Serial Monitor'. It displays the message 'Message (Enter to send message to 'Arduino Uno' on 'COM3')' and the output 'Sensor Value: 2', 'Sensor Value: 0', 'Sensor Value: 0', 'Sensor Value: 0', 'Sensor Value: 2', 'Sensor Value: 0', 'Sensor Value: 0', and 'Sensor Value: 0'. The status bar at the bottom right indicates 'Ln 10, Col 49' and 'Arduino Uno on COM3'. The system tray at the bottom shows various icons and the date/time '5:59 PM 2/5/2025'.

What value is the analog pin 0 reading when the photoresistor is covered (dark)? 0

What value is the analog pin 0 reading when the photoresistor is uncovered (exposed to light)? 2

Write code to send the message “Day Time” when the photoresistor is exposed to light and “Nighttime” when the photoresistor is covered.

Record your updated Arduino Code here:

```
#include <Wire.h>
#include <LiquidCrystal_I2C.h>

// Initialize the I2C LCD
LiquidCrystal_I2C lcd(0x27, 16, 2);

void setup() {
    // Initialize the LCD and serial communication
    lcd.init();
    lcd.backlight();

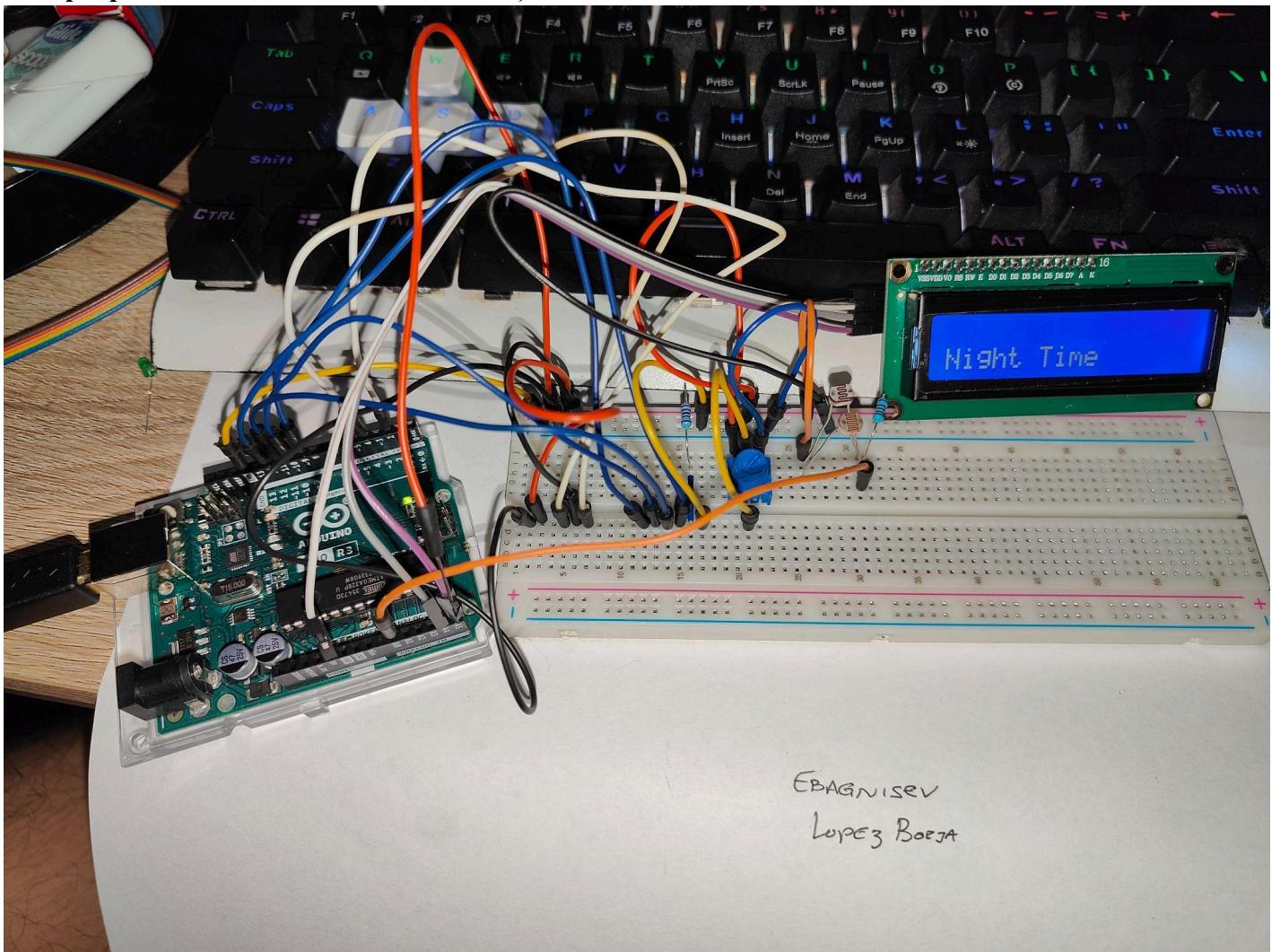
    Serial.begin(9600); // Initialize Serial Monitor for testing
}

void loop() {
    int val = analogRead(A0); // Read the value from the photoresistor
    Serial.print("Sensor Value: ");
    Serial.println(val); // Print the value to the Serial Monitor for testing

    lcd.setCursor(0, 1);
    if (val > 0) {
        lcd.print("Day Time   ");
    } else {
        lcd.print("Night Time   ");
    }

    delay(100); // Wait for 100ms before the next reading
}
```

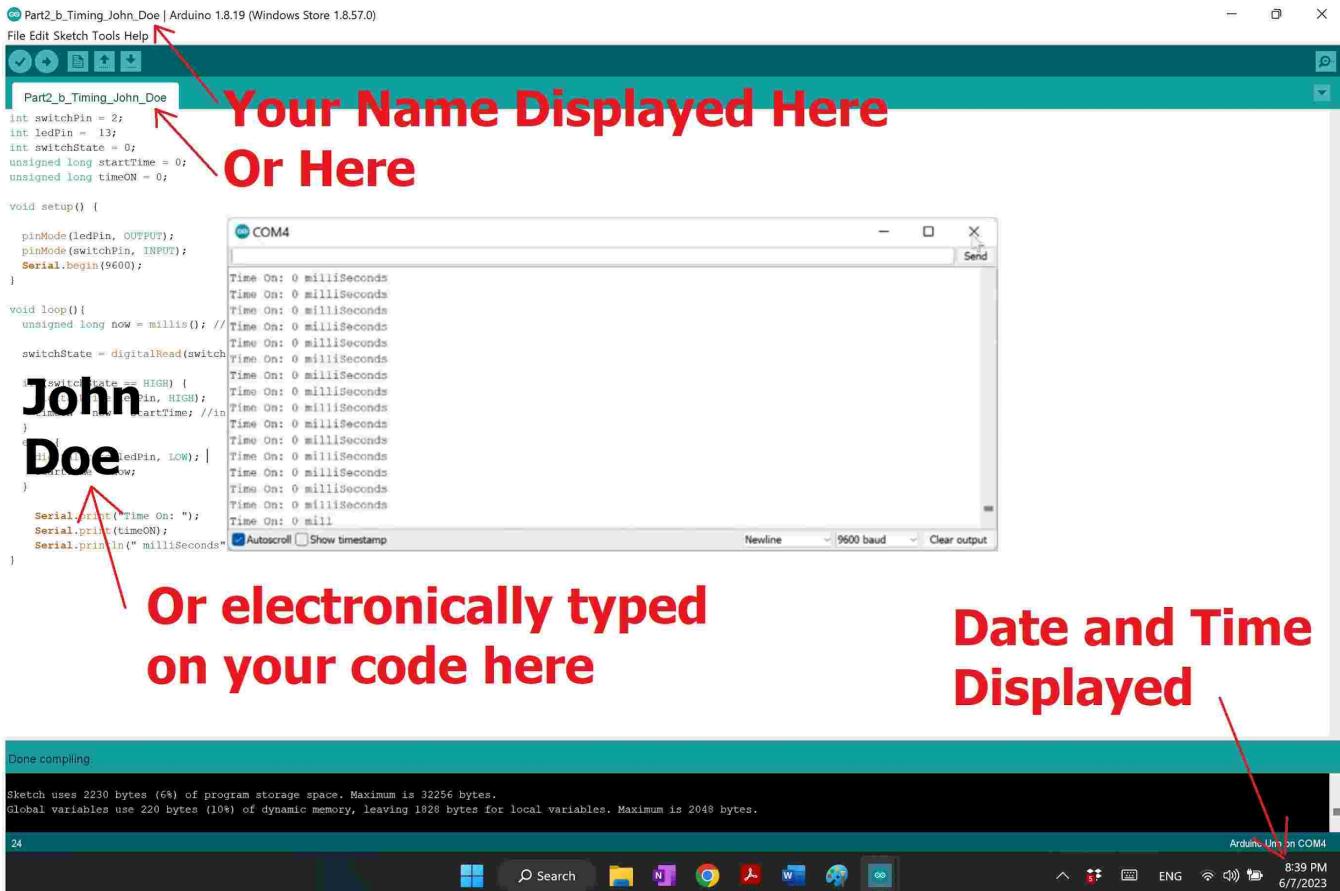
Provide a picture of your circuit while the LCD is displaying the message here (Have a look at an example photo at the end of this document):



Note: Maintaining a clean and organized lab space is a skill you are also expected to learn. Failure to clean up your space or put components where they belong could result in a 20% penalty at the discretion of the Lab TA

Serial Monitor Screenshot Example. Note your name, date and time, and readable COM4 output – screenshots might vary based on the operating system you are using). If your name is electronically

typed, then it must be typed on the code WITHOUT any “text background”. The code must show up in the background of your name.



Hardware Image Example. Note your name:

- 1- on a piece of paper; OR
- 2- typed electronically (must be typed on the breadboard WITHOUT any “text background”. Breadboard must show up in the background of your name.)

