Faculty of Computing

Year 1 Semester 1 (2024)

IT1140 – Fundamental of Computing Lab Sheet 07

Objectives:

This practical enables students to learn how an Arduino microcontroller can be used to read the value from a potentiometer and control LEDs.

Activity 1

a. Design the circuit diagram given in figure 7.1 in Wokwi. Use the below items to design your circuit diagram.
    - Arduino Uno
    - Breadboard
    - potentiometer
    - LEDs – 5

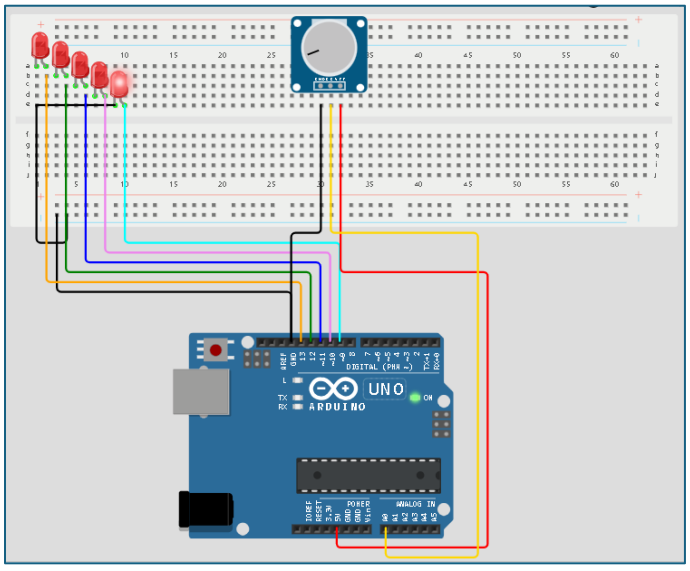
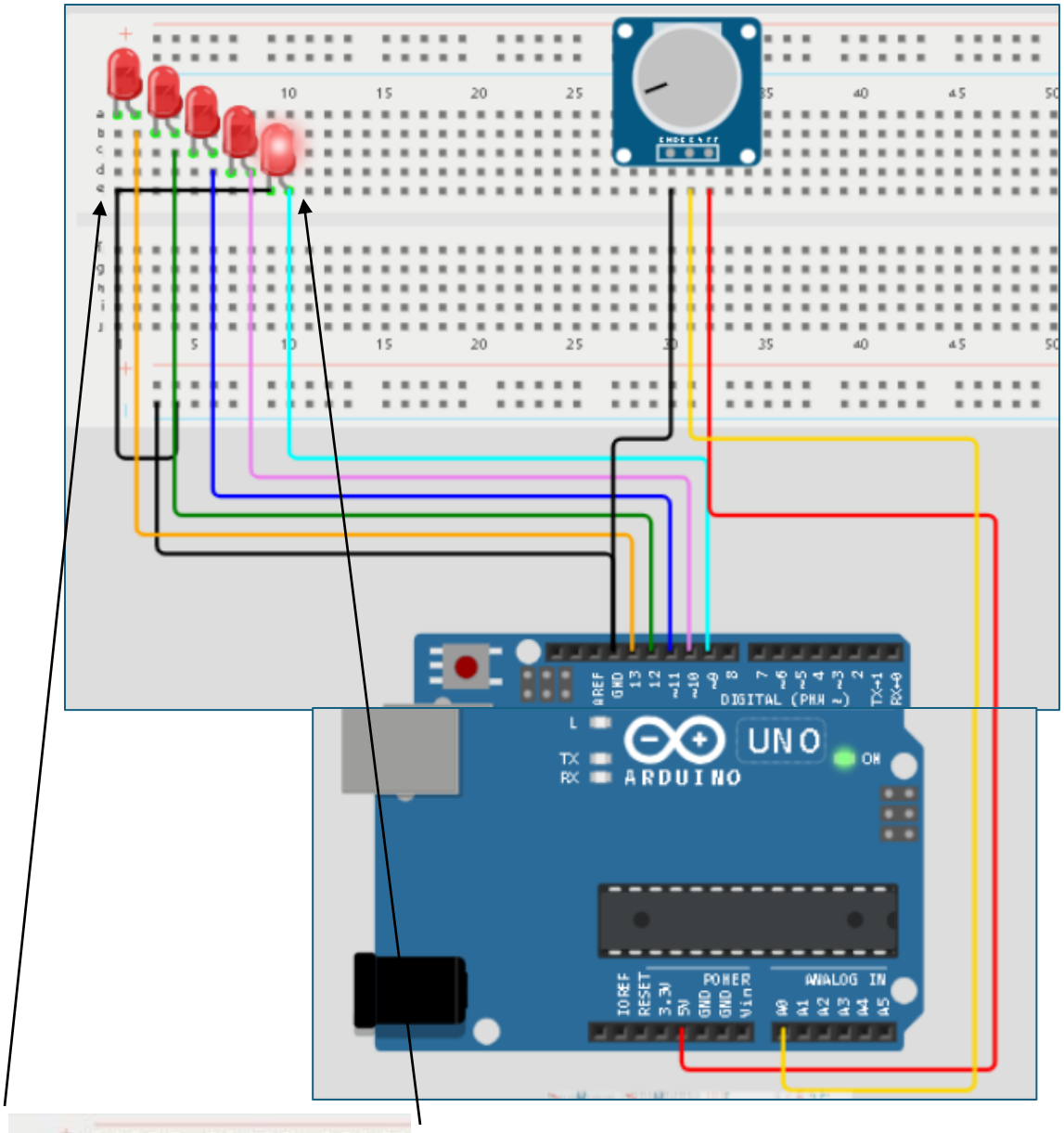
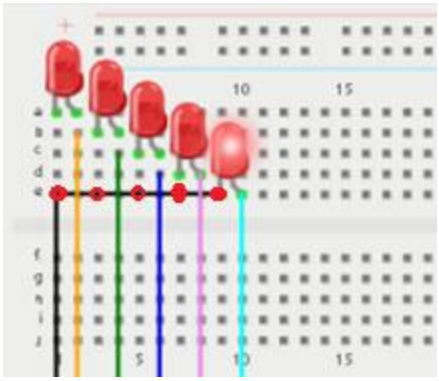


Figure 7.1

Refer the figure 7.2 to understand the connections.





The ground connection must be connected to the cathode of every LED as shown in here.

Figure 7.2

The value range of a potentiometer is from **0 to 1023**. This range is determined by the `analogRead()` function in the Arduino.

b) Develop a C++ program to perform the following.

- The pin number 9 – 13 in Arduino are used to connect the LEDs to the circuit. Add a C++ code to set up it in your project. *(Hint: add the pinMode ( ) function in the void setup() function.)*

```
pinMode(9, OUTPUT);
```

- Add a C++ code to read the value of the potentiometer using the `analogRead()` function. *(Hint: add the below code statement in the `void loop()` function.)*

```
int potentiometerValue = analogRead(A0);
```

- Add a code to read the potentiometer values 50, 200, 400, 800, and 1000 to control the LEDs as given in the below table.

Potentiometer Reading	**Action**
50	Light 1 LED
200	Light 2 LEDs
400	Light 3 LEDs
800	Light 4 LEDs
1000	Light 5 LEDs

(Hint: You can use selection statements where necessary)

c) Then, start simulation and turn the potentiometer knob to get the output shown in figure 7.3.

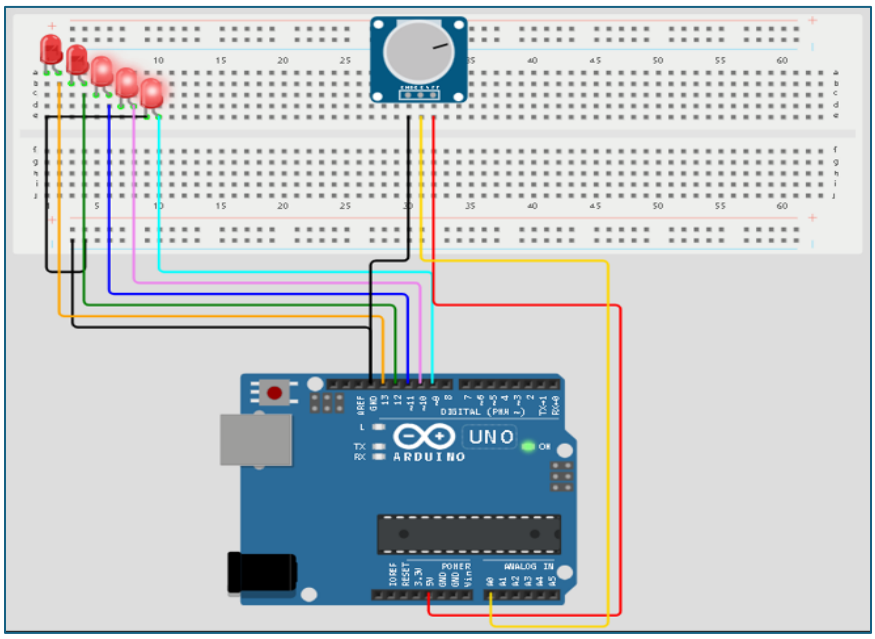


Figure 7.3

Activity 2:

a) Refer to the circuit in figure 7.4 which is designed to control the brightness of a LED using a potentiometer. Identify the components used here and design it in Wokwi.

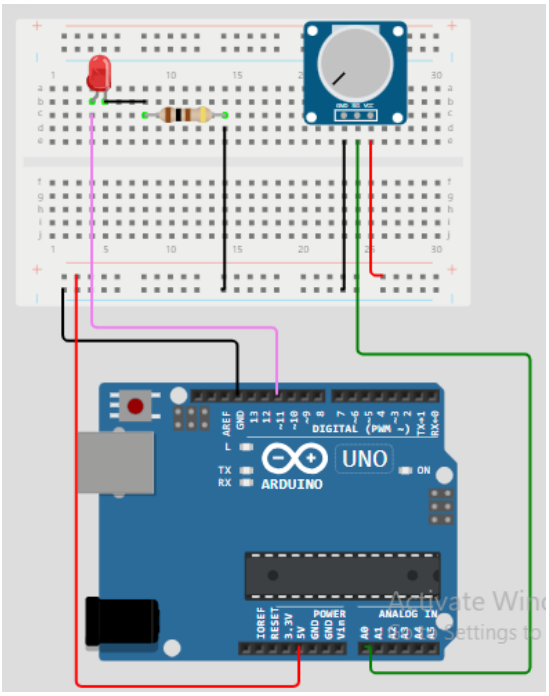


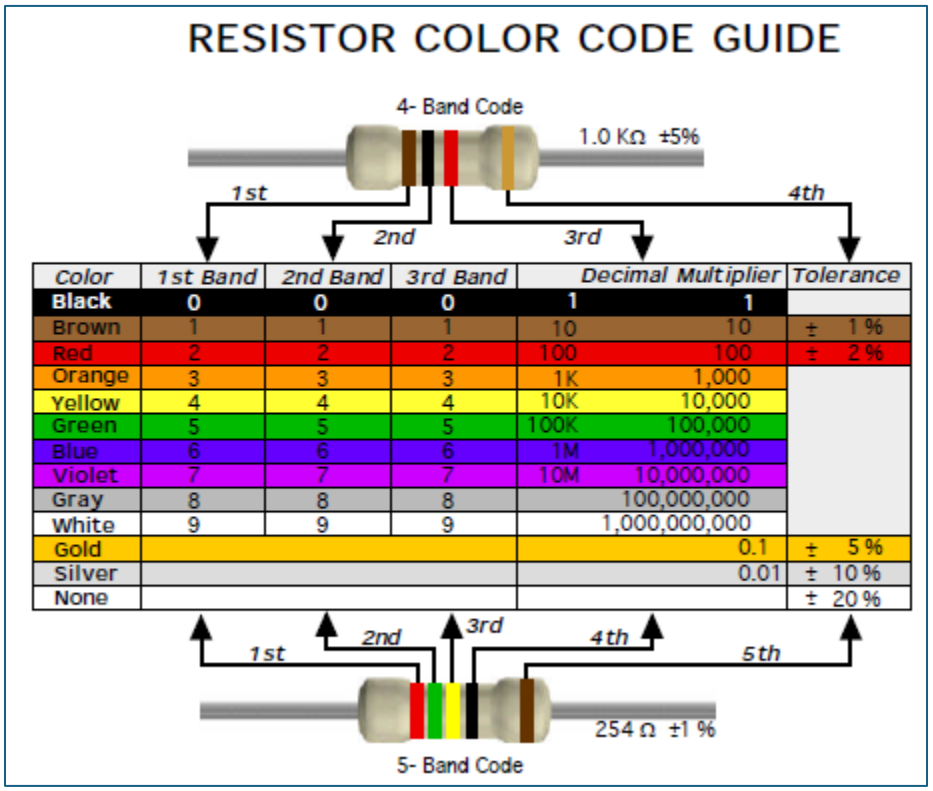
Figure 7.4

b) Consider the sample code given below and complete the missing parts in **Line A, Line B** and **Line C**.

```
#define LED_PIN 11
#define POTENTIOMETER_PIN A0

void setup()
{
    pinMode(Line A, OUTPUT);
    Serial.begin(9600);
}
void loop()
{
    int potentiometerValue = analogRead(Line B);
    int brightness = map(potentiometerValue, 0, 1023, 0, 255);
    Serial.println(brightness);
    analogWrite(line C, brightness);
}
```

c) Refer to figure 7.5 below. It explains the meaning of color codes in a resistor. Understand the calculation of the resistance value.



Color	1st Band	2nd Band	3rd Band	Decimal Multiplier		Tolerance
Black	0	0	0	1	1	
Brown	1	1	1	10	10	± 1 %
Red	2	2	2	100	100	± 2 %
Orange	3	3	3	1K	1,000	
Yellow	4	4	4	10K	10,000	
Green	5	5	5	100K	100,000	
Blue	6	6	6	1M	1,000,000	
Violet	7	7	7	10M	10,000,000	
Gray	8	8	8		100,000,000	
White	9	9	9		1,000,000,000	
Gold					0.1	± 5 %
Silver					0.01	± 10 %
None						± 20 %

Figure 7.5- I

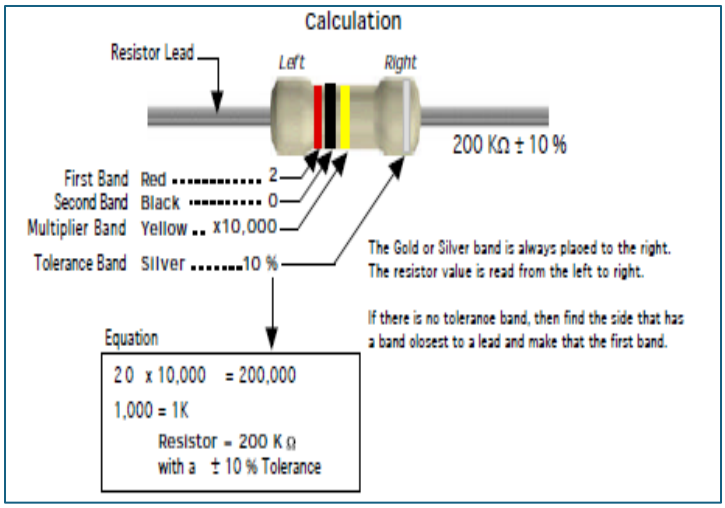


Figure 7.5 - II

Resistor color codes are given by several color bands. Each type of color band has its unique representation as shown in figure 7.5. The first two bands represent the first two digits of the resistance value, while the third band represents the multiplier. The fourth band denotes the tolerance value of the resistor.

d) According to the calculation given in above figure 7.5, determine the resistance value of the below resistor.

Include all the findings of the activities in your submission report.