



AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH

Faculty of Engineering

Lab Report

Experiment # 01

Experiment Title: Familiarization with a microcontroller, the study of blink test and implementation of a traffic control system using microcontrollers.

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Course Title:	MICROPROCESSOR AND EMBEDDED SYSTEMS LAB		
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Semester:	Spring 2024-25	Degree Program:	BSc in CSE
Course Teacher:	Prof. Dr. Engr. Muhibul Haque Bhuyan		

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Group # 02

Sl No	Name	ID	PROGRAM	SIGNATURE
1	MD. SIAM MEHEDI	22-48342-3	BSc in CSE	
2	MAHBUB HASAN	22-47419-2	BSc in CSE	
3	MD.TOYEB ALI	23-51819-2	BSc in CSE	
4	MD.SALMAN ISLAM	22-47393-2	BSc in CSE	
5	MUJTAHID TABASSUM MOHONA	22-47430-2	BSc in CSE	

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Experiment Title: Familiarization with a microcontroller, the study of blink test and implementation of a traffic control system using microcontrollers.

Objectives:

The objectives of this experiment are to

1. Familiarize with the Arduino microcontroller
2. Implement a simple circuit to make an LED light blink using the delay function
3. Implement a simple traffic control system

Apparatus:

1. Arduino IDE (any version)
2. Arduino Uno (R3) board or Arduino mega 2560 board
3. LED lights (RED, GREEN, and YELLOW)
4. Three 200 ohms resistors, and
5. Jumper wires

Experimental Setup:

a)LED Blink Test:

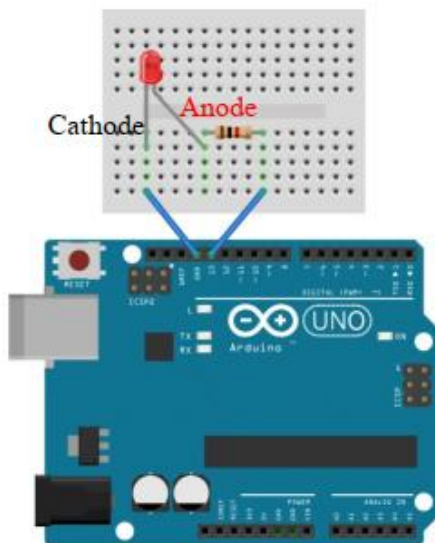


Fig. 1 LED Blinking Test

b)Traffic Control System:

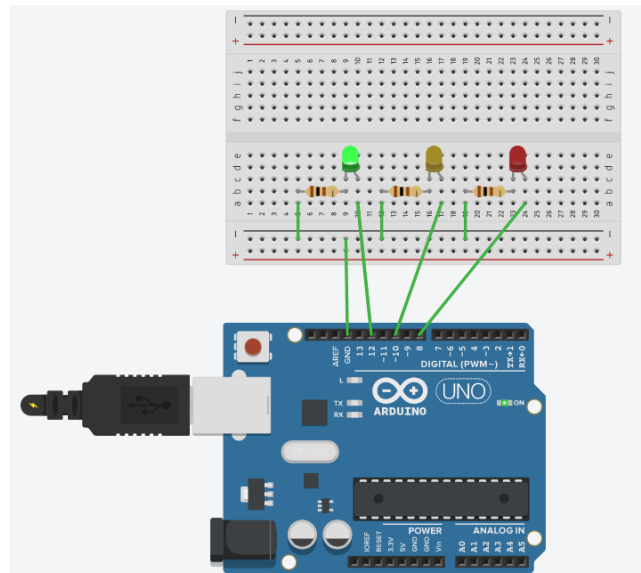


Fig. 2 Hardware circuit diagram for the traffic light

Code:**Code for LED Blink Test:**

```
void setup () {  
  // Pin type declaration for the red LED pinMode(5, OUTPUT);  
}  
void loop () {  
  // Turning on the voltage at output pin 5 (for red LED)  
  digitalWrite(5, HIGH);delay(1000); // LED is turned on for 1 second  
  digitalWrite(5, LOW);delay(1000); // LED is turned off for 1 second  
}
```

Code for Traffic Light System:

```
void setup() {  
  // pin connections for the LED lights  
  pinMode(8, OUTPUT);  
  pinMode(10, OUTPUT);  
  pinMode(12, OUTPUT);  
}  
void loop() {  
  // Turning on the voltage at the output pin 8 (for green LED)  
  digitalWrite(8, HIGH);  
  delay(3000); // green LED is on for 3 seconds  
  // Turning off the voltage at output pin 8 (for green LED)  
  digitalWrite(8, LOW); // green LED is off  
  // Turning the yellow LED on and off for 4 times  
  for (int i = 0; i < 4; i = i+1)  
  {  
    digitalWrite(10, HIGH);  
    delay(500); // yellow LED is on for 0.5 seconds  
    digitalWrite(10, LOW);  
    delay(500); // yellow LED is off for 0.5 seconds  
  }  
  // Turning on the voltage at the output pin 12 (for red LED)  
  digitalWrite(12, HIGH);  
  delay(6000); // red LED is on for 6 seconds  
  // Turning off the voltage at the output pin 12 (for red LED)  
  digitalWrite(12, LOW); // red LED is off  
} // void loop() function ends and repeats
```

Experimental Results:

Here is the hardware implementation of the LED blink test and implement simple traffic control system test and the necessary explanation of the implementation:

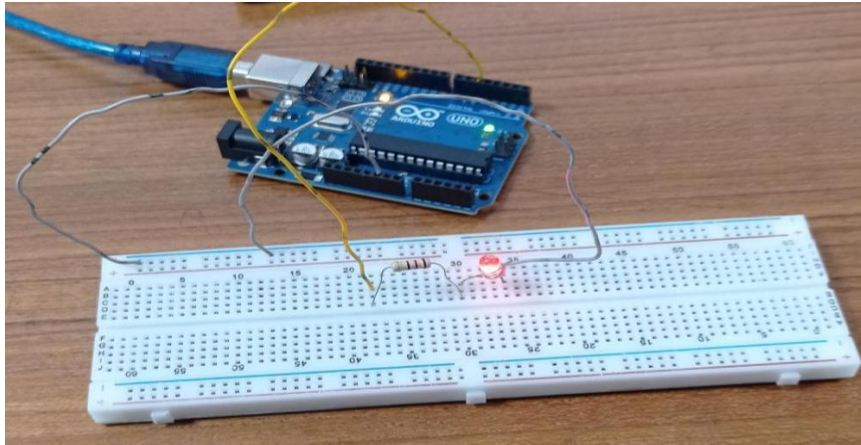


Fig.3 Hardware implementation for the blink test

Explanation: In the following implementation, a jumper wire was connected at pin 8 of the Arduino Uno board. The wire was then connected to the breadboard. The anode of an LED light was connected with the wire connected with pin 8. The cathode of the LED light was connected with a 100 Ω resistor. The following resistor was then connected with the Ground (GND) of the Arduino Uno board. The Arduino Uno board was connected with a PC to compile and import necessary codes.

Here is the hardware implementation of Traffic Light System and the necessary explanation of the implementation:

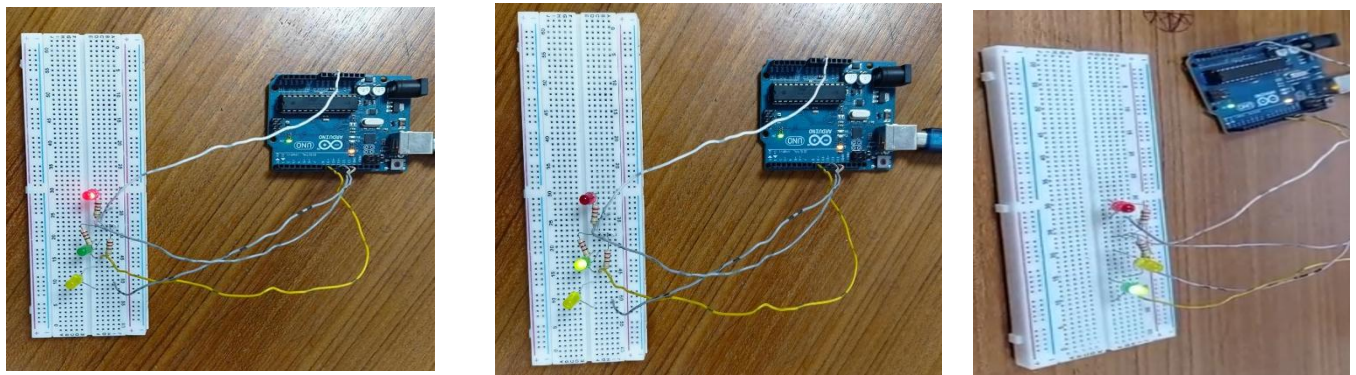


Fig.4 Hardware circuit diagram for the traffic light system

Explanation: In the following experiment, jumper wires were connected from pin 8, 10 and 12 of the Arduino Uno board to the anodes of the RED, YELLOW and GREEN LED consecutively. Three 100 Ω resistors were connected at each cathode of all the LEDs. Jumper wires were then connected at the negative common row of the breadboard. A jumper wire was connected then with the Ground (GND) of the Arduino Uno board from the common negative of the breadboard. The Arduino Uno board was connected with a PC to compile and import necessary codes.

Simulation Output Results:

Here are the simulation output results of Light Blink Test on Proteus simulation and explanation:

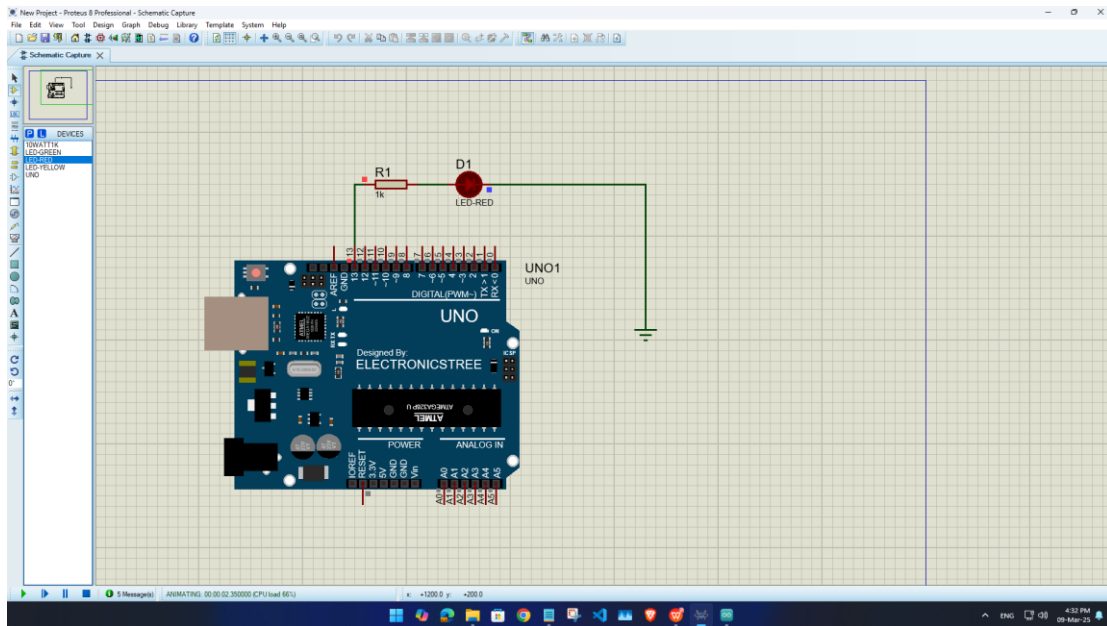


Fig.5 LED is ON in Light Blink Test on Proteus Simulation

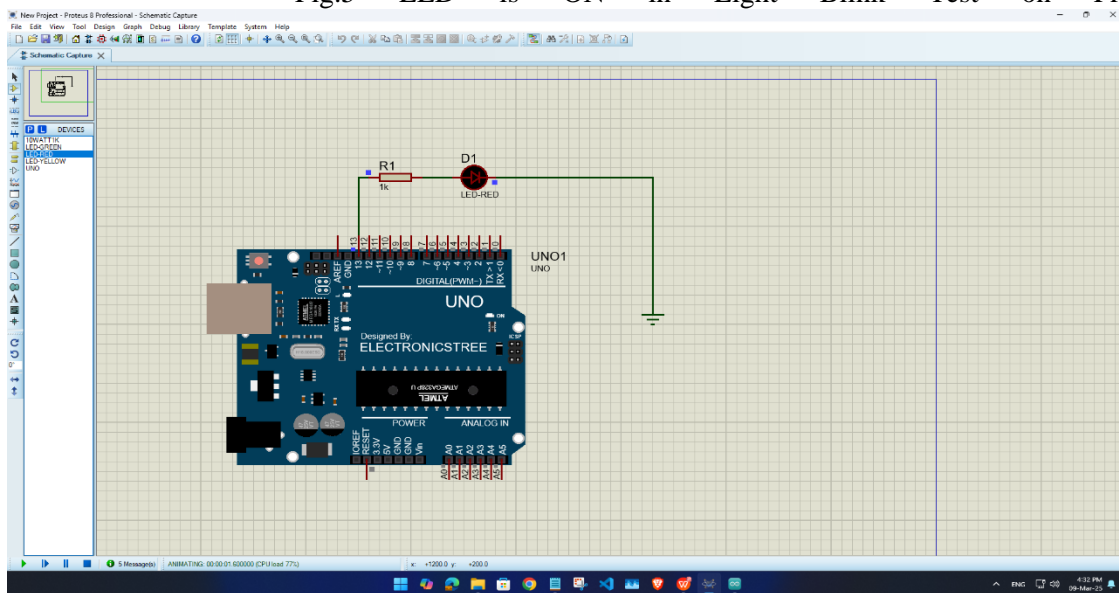


Fig.6 LED is OFF in Light Blink Test on Proteus Simulation

Explanation: In this simulation, an Arduino Uno Board, Resistor and LED was configured according to the hardware implementation that was performed. The program was made in the Arduino IDE was verified. As a result, an HEX file was generated. The following HEX file was implemented in the Proteus simulation for operation related instructions of the simulation. Afterwards, the simulation was performed and the results that were obtained were noted and compared with the hardware results. Here are the simulation output results of Traffic Light System on Proteus simulation and explanation:

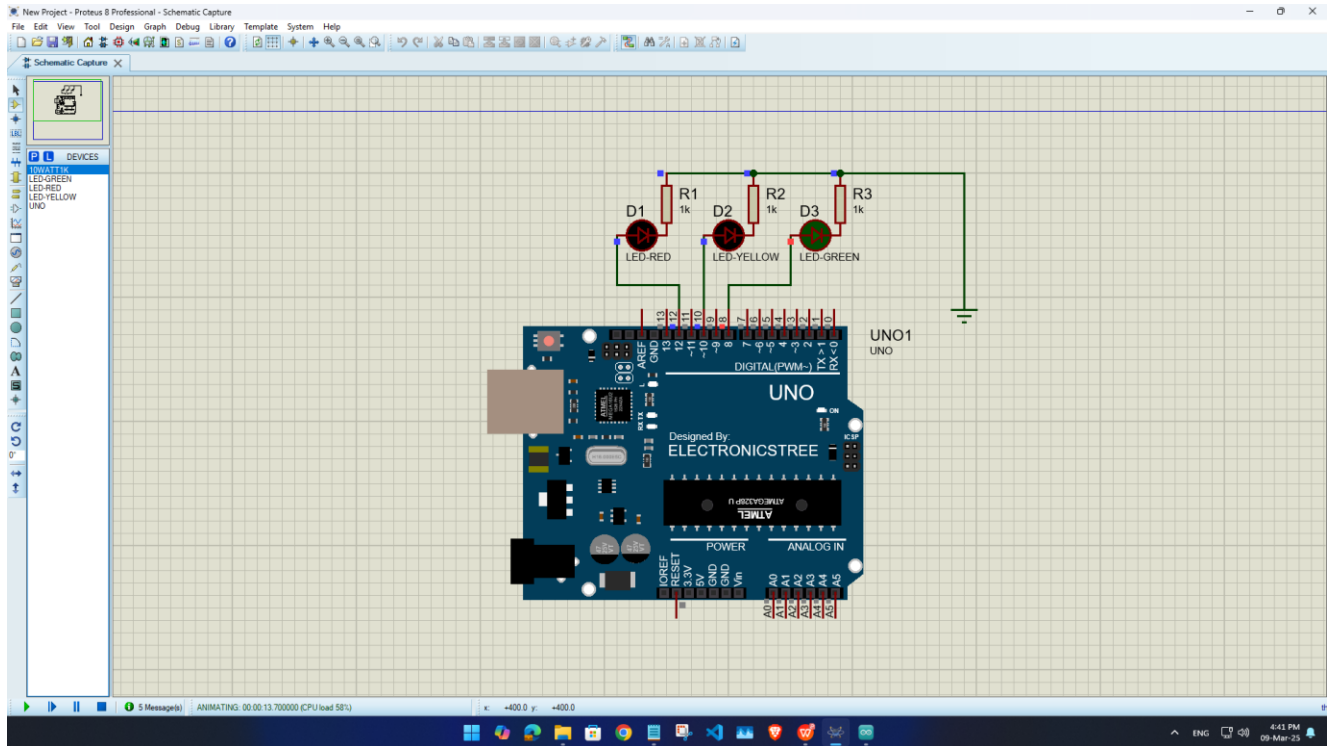


Fig.8 Green LED is ON in Traffic Light System on Proteus Simulation

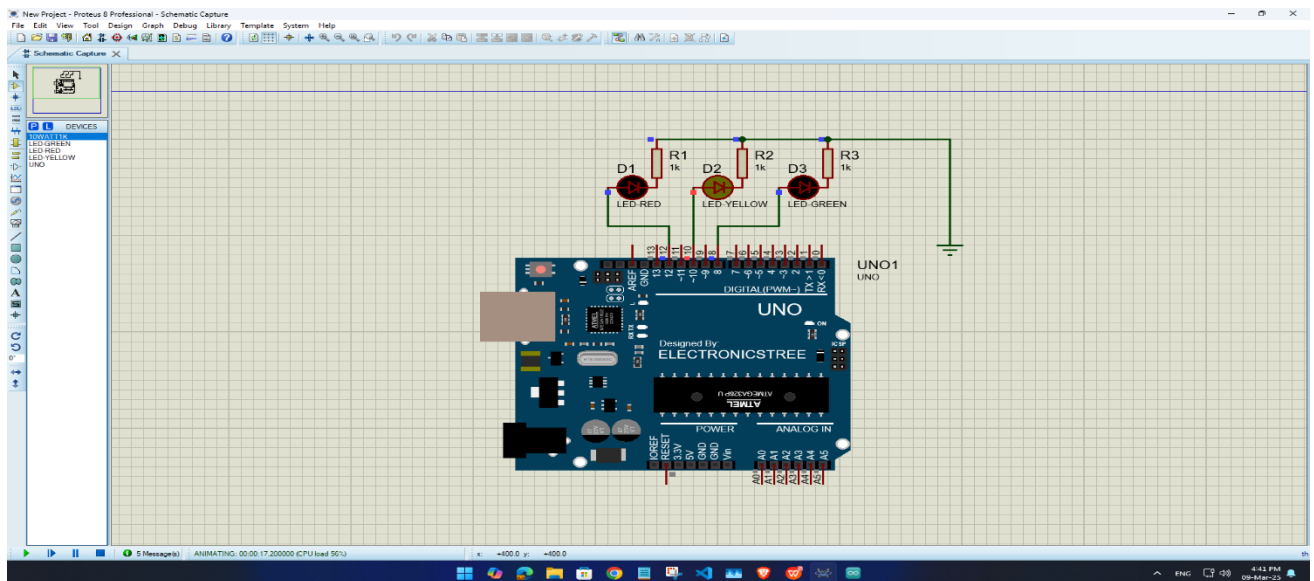


Fig.7 Yellow LED is ON in Traffic Light System on Proteus Simulation

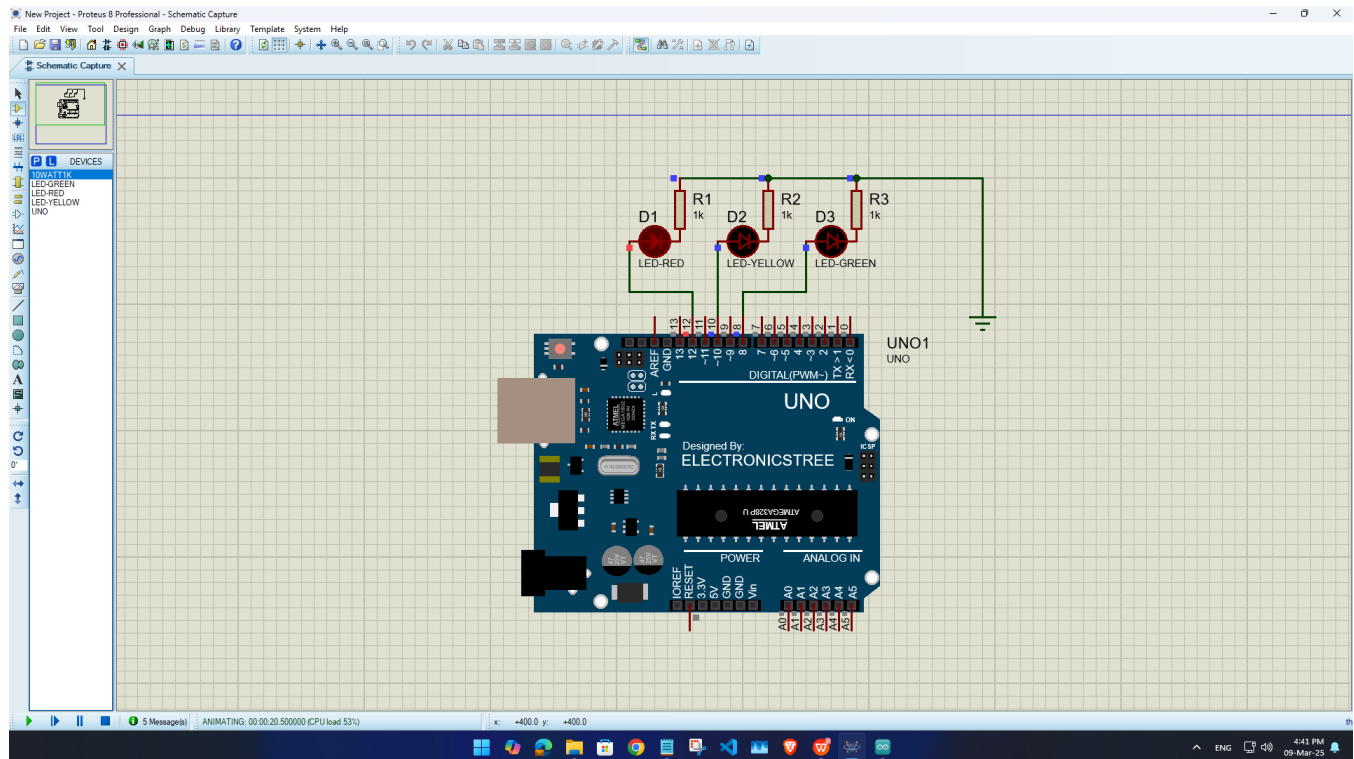


Fig.8 Red LED is ON in Traffic Light System on Proteus Simulation

Explanation: In this simulation, an Arduino Uno Board, Resistor, RED, GREEN and YELLOW LEDs were configured according to the hardware implementation that was performed. The program was made in the Arduino IDE was verified. As a result, a HEX file was generated. The following HEX file was implemented in the Proteus simulation for operation related instructions of the simulation. Afterwards, the simulation was performed and the results that were obtained were noted and compared with the hardware results.

Answers to the Questions in the Lab Manual:

All answers were provided in the Lab report regarding the Questions. Such as including codes and scripts, providing outputs in the form of images. Descriptions with all the pictures were provided. Also, proteus simulations of the experiments were provided in the report with proper methodology.

References:

1. <https://www.arduino.cc/>.
2. <https://www.coursera.org/learn/arduino/lecture/ei4ni/1-10-first-glance-at-a-program>.
3. Jeremy Blum; Exploring Arduino: Tools and Techniques for Engineering Wizardry.