

**AMERICAN INTERNATIONAL UNIVERSITY–BANGLADESH (AIUB)**

**FACULTY OF SCIENCE & TECHNOLOGY**

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**MICROPROCESSOR AND EMBEDDED SYSTEMS**

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**Section:** Q**, Group: 08**

**LAB REPORT ON**

*Familiarization with microcontroller, study of blink test using and implementation of a*

*traffic control system using microcontrollers*

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

**Objective:**

The aim of this experiment is to gain hands-on experience with microcontroller programming using Arduino. This includes learning how to program an Arduino board to blink an LED using delay functions for timing control, as well as designing and implementing a basic traffic control system to apply these concepts in a practical scenario. Through this exercise, students will develop foundational skills in embedded system applications, including timing functions and logic circuit implementation.

**Apparatus:**

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

**Experimental Setup:**

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| Picture for **BLINK TEST** | |
| **Figure 1:** Light on for 1 second | |
| Images for **TRAFFIC CONTROL SYSTEM** | |
| **Figure 2:** Traffic Control System | **Figure 3:** Red light on for 3 second |
| **Figure 4:** Red and Yellow light on for 1 second | **Figure 5:** Yellow off and Green on for 3 second |
| **Figure 6:** Green light blink 3 times | |
| **Figure 7:** Yellow light on for 1 second | **Figure 8:** Yellow off and Red on for 3 second |

**Code:**

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| **Code for Blink Test** |
| int pin = 13;  void setup() {  pinMode(pin,OUTPUT);  }  void loop() {  digitalWrite(pin,HIGH);  delay(1000);  digitalWrite(pin,LOW);  delay(1000);  } |
| **Code for Traffic Control System** |
| #define Red\_pin 8  #define Yellow\_pin 10  #define Green\_pin 12  int Red\_on = 3000;  int Red\_yellow = 1000;  int Yellow\_on = 1000;  int Green\_on = 3000;  int Gblink = 500;  void setup() {  pinMode(Red\_pin,OUTPUT);  pinMode(Yellow\_pin,OUTPUT);  pinMode(Green\_pin,OUTPUT);  }  void loop() {  digitalWrite(Red\_pin,HIGH);  delay(Red\_on);  digitalWrite(Yellow\_pin,HIGH);  delay(Red\_yellow);  digitalWrite(Red\_pin,LOW);  digitalWrite(Yellow\_pin,LOW);  digitalWrite(Green\_pin,HIGH);  delay(Green\_on);  digitalWrite(Green\_pin,LOW);  for(int i=1; i<=3; i++){  delay(Gblink);  digitalWrite(Green\_pin,HIGH);  delay(Gblink);  digitalWrite(Green\_pin,LOW);  }  digitalWrite(Yellow\_pin,HIGH);  delay(Yellow\_on);  digitalWrite(Yellow\_pin,LOW);} |

**Question Answer:**

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| **Simulation for BLINK TEST** | |
| **Figure 1:** Light off for 1 second | **Figure 2:** Light on for 1 second |
| **Simulation for TRAFFIC CONTROL SYSTEM** | |
| **Figure 3:** Traffic Control System | **Figure 4:** Red light on for 3 second |
| **Figure 5:** Red and Yellow light on for 1 second | **Figure 6:** Yellow off and Green on for 3 second |
| **Figure 7:** Green light off | **Figure 8:** Green light blink 3 times |
| **Figure 9:** Yellow light on for 1 second | **Figure 10:** Yellow off and Red on for 3 second |

**Discussion and Conclusion:**

\*\*Discussion and Conclusion\*\*

This laboratory project provided a structured exploration of microcontroller applications, emphasizing the integration of theoretical principles with practical implementation. The investigation was divided into two phases: an introductory LED blink test and the development of a simulated traffic control system.

The initial phase—the LED blink test—served as a foundational exercise to familiarize the team with microcontroller programming fundamentals. By writing and uploading code to control an LED’s blinking pattern, core concepts such as syntax structure, delay functions, and input/output (I/O) pin configuration were reinforced. While seemingly simplistic, this exercise highlighted the importance of precision in timing and code structure, as minor errors in syntax or delay values directly impacted the LED’s behavior. These insights laid the groundwork for more complex tasks.

Building on this foundation, the second phase involved designing a traffic control system to simulate real-world scenarios. Virtual sensors were programmed to detect hypothetical vehicular and pedestrian activity, while output signals regulated traffic light sequences. This phase demanded meticulous calibration of timing intervals and sensor-response logic to ensure seamless operation. Challenges such as synchronizing multiple lights and optimizing code for real-time responsiveness underscored the critical role of algorithmic efficiency in embedded systems. For instance, adjusting delay functions to balance sensor input processing with light transitions revealed how even minor inefficiencies could disrupt system stability.

The project underscored two key lessons. First, the transition from basic exercises (e.g., blinking an LED) to complex applications (e.g., traffic control) demonstrated how foundational skills scale into real-world engineering solutions. Second, the iterative process of debugging and refining code emphasized the necessity of precision in embedded systems, where hardware-software interactions leave little margin for error.

In conclusion, this lab successfully bridged theoretical knowledge with hands-on practice, illustrating the transformative potential of microcontrollers in modern engineering. The LED exercise established essential programming competencies, while the traffic system project illuminated the challenges of designing reliable, real-time embedded systems. The experience reinforced the importance of code optimization, systematic problem-solving, and attention to detail—skills critical for future endeavors in microcontroller-based design. These outcomes not only advanced technical proficiency but also fostered a deeper appreciation for the role of microcontrollers in enabling intelligent, automated systems. Moving forward, the methodologies and insights gained will serve as a framework for tackling more advanced projects in embedded systems development.

**Reference(s):**

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