



American International University- Bangladesh (AIUB) Faculty of Engineering

Course Name: Microprocessor and Embedded Systems
Semester: Spring 2022-23
Total Marks: 20
Instructor Name: Md. A Noor

Course Code: EEE 4103
Term: Mid
Submission Date: 03-03-2023
Assignment: 02

Course Outcome Mapping with Questions

Item	COs	POIs	K	P	A	Marks	Obtained Marks
Q1	CO1	P.a.4.C3	K4	P1, P3, P7		5	
Q2	CO1	P.a.4.C3	K4	P1, P3, P7		5	
Q3	CO1	P.a.4.C3	K4	P1, P3, P7		5	
Q4	CO1	P.a.4.C3	K4	P1, P3, P7		5	
Total:						20	

Student Information:

Student Name: MD. SUMON

Student ID: 20-42556-1

Section: A

Department: CSE

Marking Rubrics (to be filled by Faculty):

	Excellent [5]	Proficient [4]	Good [3]	Acceptable [2]	Unacceptable [1]	No Response [0]	Secured Marks
Problem #	Detailed unique response explaining the concept properly and answer is correct with all works clearly shown.	Response with no apparent errors and the answer is correct, but explanation is not adequate/unique.	Response shows understanding of the problem, but the final answer may not be correct	Partial problem is solved; response indicates part of the problem was not understood clearly.	Unable to clarify the understanding of the problem and method of the problem solving was not correct	No Response/(Copied/identical submissions will be graded as 0 for all parties concerned)	
1							
2							
3							
4							
Comments						Total marks (20)	

1. Biman Bangladesh operates a flight from Dhaka to London. Usually, the flight from London starts at 8pm local time (after the sun has set). Even though the commercial aircrafts are painted white, it doesn't help when it comes to other aircrafts' visibility. So, to prevent accidents/collisions, aircrafts usually mount 1 light at the bottom surface of the body, 2 lights on 2 wings (left and right) and 1 light on the tail and, these 4 lights flash together periodically. Biman's flight experienced an issue with the program controlling these lights and upon investigating; it was found that the system is built with an Arduino Uno at the heart. Interestingly, the Arduino was already set up to consume as little power as possible not to strain the aircraft's fuel efficiency. Now, prepare a program in Arduino Uno platform to control the 4 lights mounted on the aircraft's body so that all the lights flash together every 2s. [5]
2. Prepare a flowchart to explain the flow of logic for the program in Q1 so that Biman engineers can modify and perfect the program easily when the aircraft is taken to maintenance after completing this flight. [5]
3. The steamer 'Ostrich' ferries people between Dhaka and Barisal. Ostrich usually starts from Dhaka around 7.30pm (evening/night depending on the season). At night, the visibility is usually very low. So, the steamers/launches usually have a flashing signal light on the roof. On top of that, the master of the steamer also honks the horn when necessary. This signal light and the horn are both controlled by an Arduino Uno. The signal light flashes every 4s whereas the horn is sounded whenever the master presses the horn switch. The horn switch already has a small RC circuit attached to it to counter bouncing. Now, **prepare** a program in Arduino Uno to control the signal light and the horn considering the information mentioned above. [5]
4. Prepare a flowchart for the program in Q3 to show the flow of logic. [5]

Answer:

Answer to the question number 1:

Arduino Program:

```
void setup () {  
  pinMode(8, OUTPUT);  
}  
void loop () {  
  digitalWrite(8, HIGH); // Change the state of pin 8 to HIGH (to switch on the LED connected to pin 8).  
  delay(2000); // wait for 2 seconds.  
  digitalWrite(8, LOW); // Change the state of pin 8 to LOW (to switch off LED connected to pin 8).  
  delay(1000); // wait for 1 second.  
}
```

It will need 1 LED and a 220 Ohm Resistor.

Step 1) Connect the Short leg of the LED (Cathode) to the Ground pin of the Arduino and the long leg (Anode) to a 220 Ohm resistor.

Step 2) Connect the free end of the resistor to pin 8 of the Arduino.

Step 3) Connect Arduino to the Computer and open the Arduino IDE.

Step 4) Enter the above program

Code Explanation:

Since it should only run once and initialize the necessary pin as an input or an output, a void type setup() function is created. Every time the board is powered on or reset, it will run. Pins are initialized as INPUT or OUTPUT using the pinMode(value1, value 2) command, the sole command in the setup() function. Since we want to control a pin (pin 8 in our case, so value 1 = 8) connected to a resistor and the LED, we used it as OUTPUT(value 2). We create a void-type loop() function that will run indefinitely until the program is terminated.

The LED will turn on and off following our needs in this way. Used the commands delay and digitalWrite() in this function ().

- i. To change the state of a specific pin, use digitalWrite(value 1, value 2). 1 is a PIN (8 in our case) value 2 = The pin's state (HIGH to switch on & LOW to switch off)
- ii. delay(value) - instructs Arduino to hold off on executing the next instruction for a predetermined amount of time. The millisecond value is given. Therefore, until the user tells it to stop, the loop() function will carry out the four instructions simultaneously.

Answer to the question number 2:

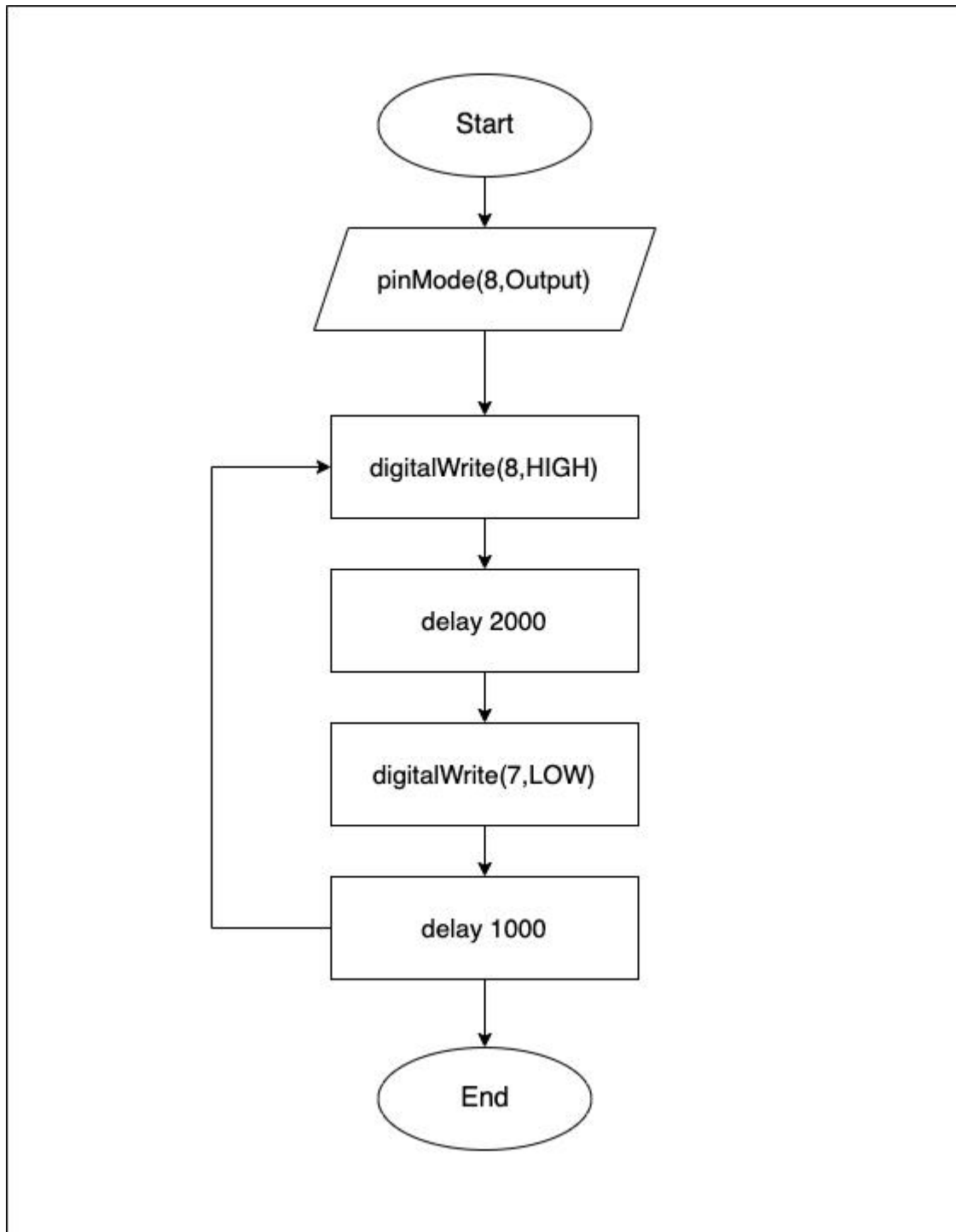


Fig1: Flowchart of question 1

Answer to the question number 3:

Arduino Program:

```
int signal_light = 8;
int horn = 11;
void setup() {
  pinMode(signalLight, OUTPUT);
  pinMode(horn, OUTPUT);
}
void loop() {
  digitalWrite(signalLight, HIGH);
  delay(4000);
  digitalWrite(signalLight, LOW);
  delay(4000);

  digitalWrite(horn, HIGH);
  delay(500);
  digitalWrite(horn, LOW);
}
```

Code Explanation:

The horn is set to pin 11 in the program above, and the signal light is set to pin 8. The signal light flashing will last 4 seconds before turning off. When the master activates the horn switch, the horn will sound. An Arduino Uno controls the traffic signal light: every 4 seconds, the signal light flashes. Every time the master depresses the horn switch, the horn sounds. A small RC circuit is connected to the horn switch to prevent bouncing. The code was created on an Arduino Uno. The horn is set to pin 11, while the signal light is set to pin 8. The signal light flashing will last 4 seconds before turning off. The horn will sound when the master presses the horn switch.

Answer to the question number 4:

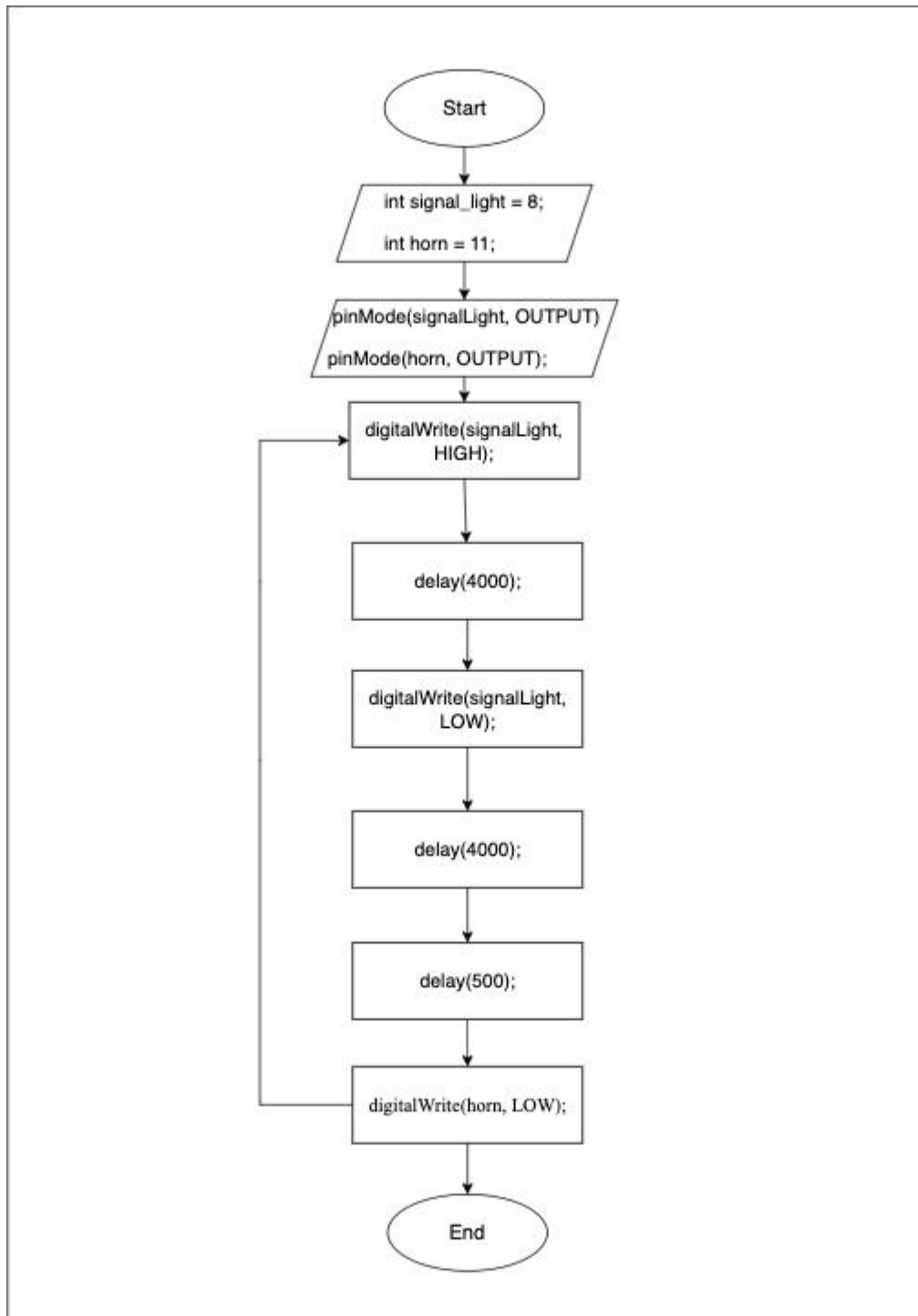


Fig2: Flowchart of question 3