**AMERICAN INTERNATIONAL UNIVERSITY- BANGLADESH**

**Faculty of Science and Technology**

Lab Report Cover Sheet

|  |  |  |
| --- | --- | --- |
| Assignment Title: | Building a Decade Counter using Arduino Uno and a 7 Segment Display | |
| Assignment No: | 08 Date of Submission: 16 December 2021 | |
| Course Title: | Microprocessor and Embedded Systems | |
| Course Code: | EEE 4211 | Section: M |
| Semester: | Fall 2021-22 | Course Teacher: Dr. Ferdous Jahan Shaun |

**Declaration and Statement of Authorship:**

1. I/we hold a copy of this Assignment/Case-Study, which can be produced if the original is lost/damaged.
2. This Assignment/Case-Study is my/our original work and no part of it has been copied from any other student’s work or

from any other source except where due acknowledgement is made.

1. No part of this Assignment/Case-Study has been written for me/us by any other person except where such collaboration has been authorized by the concerned teacher and is clearly acknowledged in the assignment.
2. I/we have not previously submitted or currently submitting this work for any other course/unit.
3. This work may be reproduced, communicated, compared and archived for the purpose of detecting plagiarism.
4. I/we give permission for a copy of my/our marked work to be retained by the faculty for review and comparison, including review by external examiners.
5. I/we understand that Plagiarism is the presentation of the work, idea or creation of another person as though it is your own. It is a formofcheatingandisaveryseriousacademicoffencethatmayleadtoexpulsionfromtheUniversity. Plagiarized material can be drawn from, and presented in, written, graphic and visual form, including electronic data, and oral presentations. Plagiarism occurs when the origin of them arterial used is not appropriately cited.
6. I/we also understand that enabling plagiarism is the act of assisting or allowing another person to plagiarize or to copy my/our work.

*\* Student(s) must complete all details except the faculty use part.*

\*\* Please submit all assignments to your course teacher or the office of the concerned teacher.

Group Name/No.: B

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
| **No** | **Name** | **ID** | **Program** | **Signature** |
| 1 | Rokon, Nurul Huda Bhuiyan (Author) | 18-38983-3 | BSc [CSE] |  |
| 2 | Pia, Tonima Hossain (Author) | 18-38892-3 | BSc [CSE] |  |
| 3 | Sazid Al Farabi | 19-39478-1 | BSc [CSE] |  |
| 4 | Joy Karmakar | 18-39263-3 | BSc [CSE] |  |
| 5 | Durjoy Dey | 18-39013-3 | BSc [CSE] |  |
| 6 | Ananya Chowdhury | 18-39028-3 | BSc [CSE] |  |
| 7 | Sharika Parvin Joba | 18-38721-3 | BSc [CSE] |  |
| 8 | Salma Jahan Sahara | 18-38788-3 | BSc [CSE] |  |
|  |  |  |  |  |

|  |  |
| --- | --- |
|  |  |

|  |  |  |
| --- | --- | --- |
| ***Faculty use only*** | | |
| FACULTYCOMMENTS | **Marks Obtained** |  |
|  |
|  |
|  | **Total Marks** |  |
|  |
|  |

Assignment/Case-Study Cover; © AIUB-2020

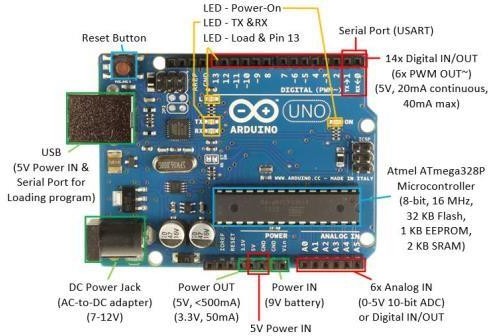
**Title:** Building a decade counter using Arduino Uno and a 7-segment display.

**Abstract:** In the experiment we try to Build a decade counter using Arduino Uno and a 7segment display. A common anode seven segment display is connected to the microcontroller for displaying the digits. The code allows push button increment of the counter from 0 to 7. The whole circuit is powered from a standard 9V PP3/6FF22 battery. Seven segment LED displayLT542, a combination of 8 LED’s is used to display the decade counter. The software used to implement the code is ARDUINO Integrated Development Environment 1.0. The code can be further multiplexed to run different symbols such as colon, apostrophe, alphabets etc.

**Decade Counter:** A decade counter is one that counts in decimal digits, rather than binary. A decade counter may have each (that is, it may count in binary-coded decimal, as the 7490 integrated circuit did) or other binary encodings. A decade counter is a binary counter that is designed to count to 1010 (decimal 10).

**7 Segment Display:** A seven-segment display is a form of electronic display device for displaying decimal numerals that is an alternative to the more complex dot matrix displays. Seven-segment displays are widely used in digital clocks, electronic meters, basic calculators, and other electronic devices that display numerical information.

**Arduino Uno:** Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online knowing the internals of the hardware or software.



**Basis of a 7-segment display:** A seven segment display consists of 7 LEDs/ segments all arranged in the shape of the digit “8”. Most of the segment display has 8 segments (with a dot at the right side of the digit representing the decimal point. All of the seven segments are named by sequence from “A” letter to “G” and “DP” for the decimal point. And each of the segments can be controlled as individually just like a regular LED.



**Objective:** The objective of this experiment is to interface a 7-segment display with Arduino Uno.

# Apparatus:

1. Arduino IDE (any version)
2. Arduino Uno (R3) board or Arduino mega 2560.
3. 7 segment display (HDSP5503).

# Simulation Result:

|  |
| --- |
|  |
|  |
|  |
|  |
|  |
|  |
|  |
|  |

**Flowchart:**

|  |
| --- |
|  |

**Arduino Code for Traffic Control System:**

|  |  |  |
| --- | --- | --- |
| #define | segA | 2 |
| #define | segB | 3 |
| #define | segC | 4 |
| #define | segD | 5 |
| #define | segE | 6 |
| #define | segF | 7 #define |

segG 8 int COUNT=0; void setup(){ for (int i=2;i<9;i++){ pinMode(i, OUTPUT);

}

}

void loop()

{ switch (COUNT)

{ case 0:

digitalWrite(segA, HIGH); digitalWrite(segB, HIGH); digitalWrite(segC, HIGH); digitalWrite(segD, HIGH); digitalWrite(segE, HIGH); digitalWrite(segF, HIGH); digitalWrite(segG, LOW); break;

case 1:

digitalWrite(segA, LOW); digitalWrite(segB, HIGH); digitalWrite(segC, HIGH); digitalWrite(segD, LOW); digitalWrite(segE, LOW); digitalWrite(segF, LOW); digitalWrite(segG, LOW); break;

case 2:

digitalWrite(segA, HIGH); digitalWrite(segB, HIGH); digitalWrite(segC, LOW); digitalWrite(segD, HIGH); digitalWrite(segE, HIGH); digitalWrite(segF, LOW); digitalWrite(segG, HIGH); break;

case 3:

digitalWrite(segA, HIGH); digitalWrite(segB, HIGH);

digitalWrite(segC, HIGH); digitalWrite(segD, HIGH); digitalWrite(segE, LOW); digitalWrite(segF, LOW); digitalWrite(segG, HIGH); break;

case 4:

digitalWrite(segA, LOW); digitalWrite(segB, HIGH); digitalWrite(segC, HIGH); digitalWrite(segD, LOW); digitalWrite(segE, LOW); digitalWrite(segF, HIGH); digitalWrite(segG, HIGH); break;

case 5:

digitalWrite(segA, HIGH); digitalWrite(segB, LOW); digitalWrite(segC, HIGH); digitalWrite(segD, HIGH); digitalWrite(segE, LOW); digitalWrite(segF, HIGH); digitalWrite(segG, HIGH); break;

case 6:

digitalWrite(segA, HIGH); digitalWrite(segB, LOW); digitalWrite(segC, HIGH); digitalWrite(segD, HIGH); digitalWrite(segE, HIGH); digitalWrite(segF, HIGH); digitalWrite(segG, HIGH); break;

case 7:

digitalWrite(segA, HIGH); digitalWrite(segB, HIGH); digitalWrite(segC, HIGH); digitalWrite(segD, LOW); digitalWrite(segE, LOW); digitalWrite(segF, LOW); digitalWrite(segG, LOW); break;

case 8:

digitalWrite(segA, HIGH); digitalWrite(segB, HIGH); digitalWrite(segC, HIGH); digitalWrite(segD, HIGH); digitalWrite(segE, HIGH); digitalWrite(segF, HIGH);

digitalWrite(segG, HIGH); break;

case 9:

digitalWrite(segA, HIGH);

digitalWrite(segB, HIGH);

digitalWrite(segC, HIGH);

digitalWrite(segD, HIGH);

digitalWrite(segE, LOW); digitalWrite(segF, HIGH);

digitalWrite(segG, HIGH); break; break;

}

if (COUNT<10){ COUNT++;

delay(1000);

}

if (COUNT==10){

COUNT=0;

delay(1000);

}

}

|  |
| --- |
|  |

**Discussion:** ARDUINO based decade counter using a 7-segment LED display is devised using ARDUINO IDE software 1.0. The ARDUINO UNO can be powered via the USB connection or with an external power supply. It is designed in a way that allows it to be reset by software running on a connected computer. It provides a complete, easy-to-use and cost-efficient hardware and software solution for designing application-based circuits. It started off as a cheap means of implementing physical computing and control of interactive projects building. However, now there is a great variety of different implementations based on the original board. Seven-segment displays are very suitable to use and simple to design. The relevance of using a seven-segment display as a method of showing a mathematical output for a decade counter was deliberated here. Though the basic framework provided here should harvest other applications also. The displays are highly versatile and with proper input can display a variety of numbers, letters, and figures. If the case occurs where multiple digits are needed to be displayed, then expanding of the applications is possible provided serial inputs should be found that allow control of a set of digits from only a few inputs.

|  |
| --- |
|  |

**Conclusion:** The experiment in this lab is easy to use and since it requires only one ARDUINO microcontroller is cost efficient as well. The biggest advantage of ARDUINO is that its library of examples is present inside the software for ARDUINO. The automatic unit conversion capability makes debugging effortless and time-saving. Moreover, this seven segment LED display is feasible and compatible for high level applications and functions as it requires very low power supply to operate. However, each segment requires a separate resistor otherwise the

current per segment/brightness will vary with the number of segments involved in the display digit**.**

# References:

* 1. <https://www.arduino.cc/>
  2. [https://www.electronicshub.org/arduino-traffic-light-controller/#Components](https://www.electronicshub.org/arduino-traffic-light-controller/%23Components)
  3. <https://www.electronicshub.org/decade-counterbcd-counter/>
  4. <https://www.electronicshub.org/decade-counterbcd-counter/>
  5. <https://www.arduino.cc/>
  6. HDSP5503 Datasheet