

# 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:	23 April 2022
Course Title:	Microprocessor and Embedded Systems		
Course Code:	EEE 4211	Section:	A
Semester:	Spring 2021-22	Course Teacher:	Md Ali Noor

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**Marks Obtained**

**Total Marks**

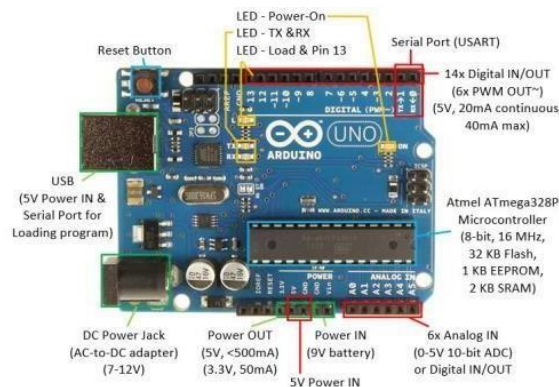
**Title:** Building a decade counter using Arduino Uno and a 7-segment display.

**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.

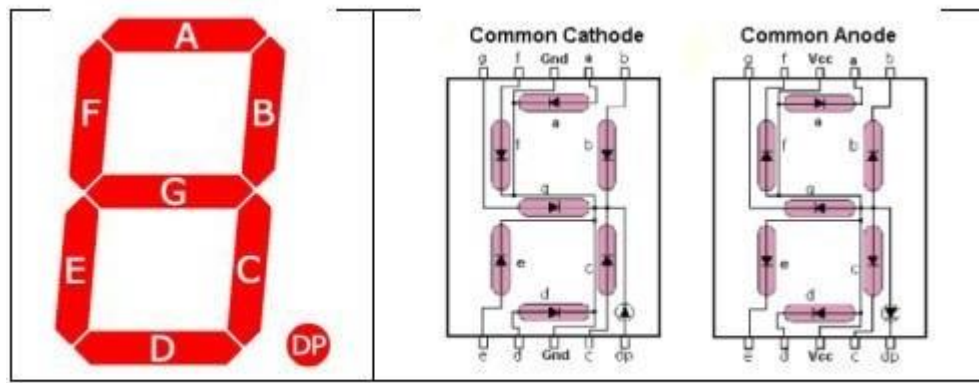
**Decade Counter:** A decade counter is one that counts in decimal digits, rather than binary. A decade counter may have each (that is, it may count in binary-coded decimal, as the 7490 integrated circuit did) or other binary encodings. A decade counter is a binary counter that is designed to count to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



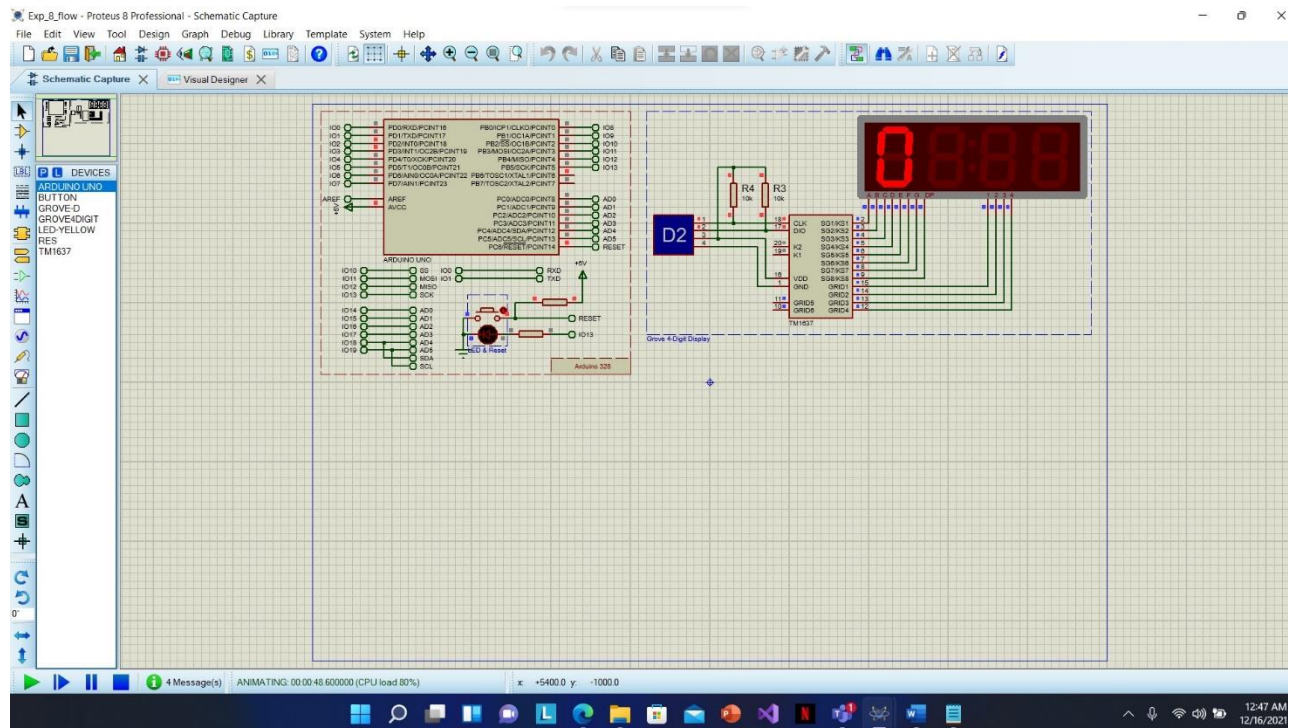
### 7 Segment Display

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

### **Apparatus:**

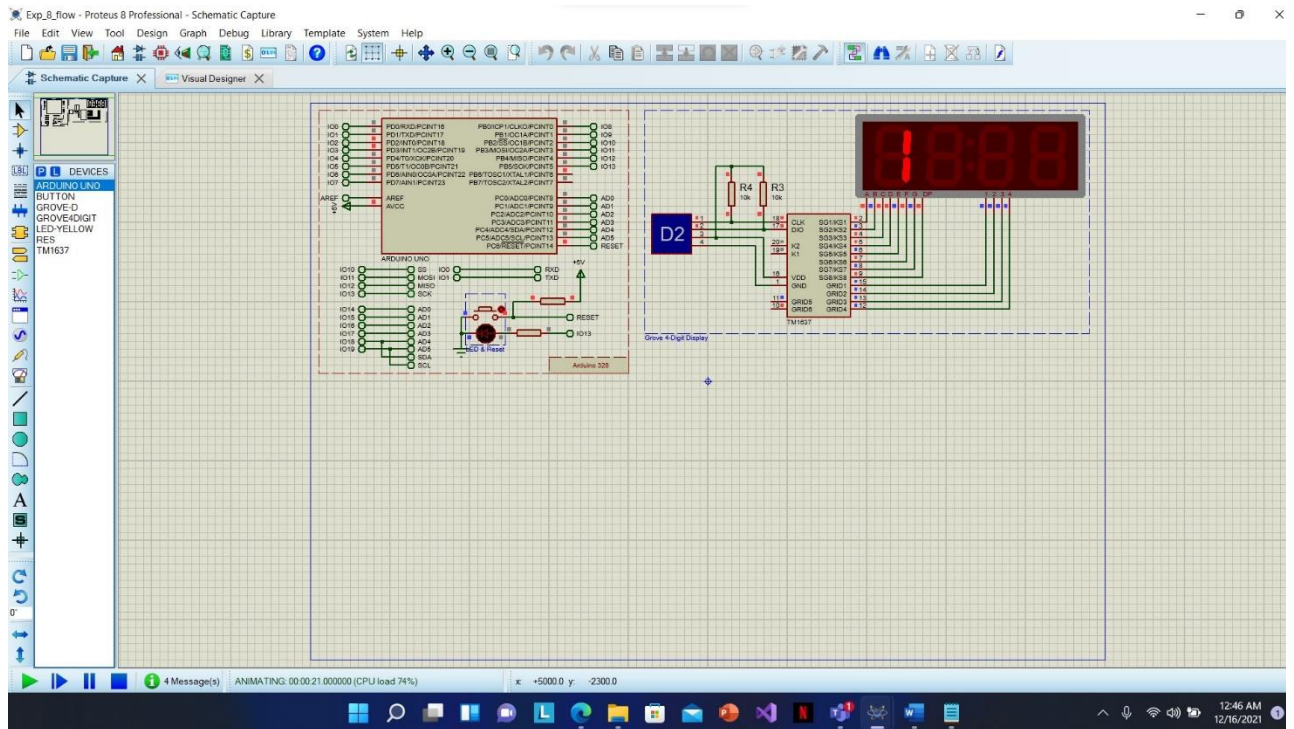
- 1) Arduino IDE (any version)
- 2) Arduino Uno (R3) board or Arduino mega 2560.
- 3) 7 segment display (HDSP5503).

### **Simulation Result:**

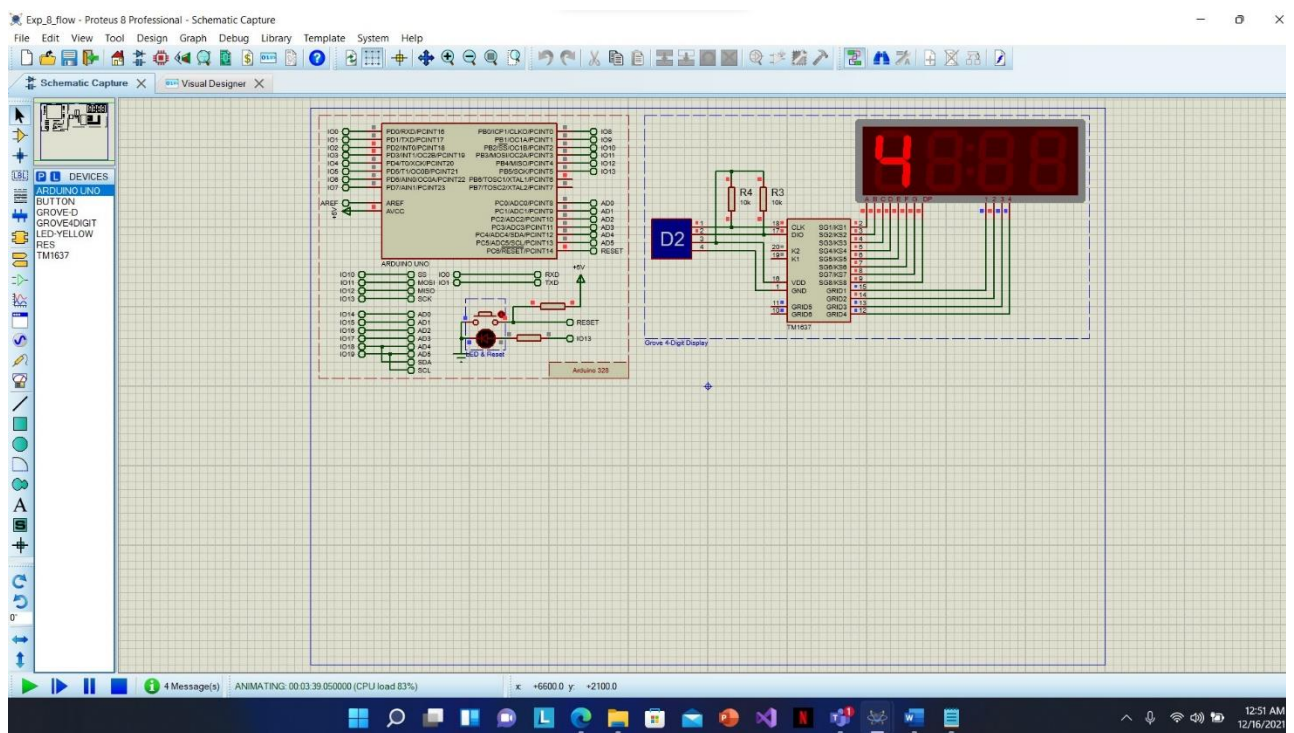
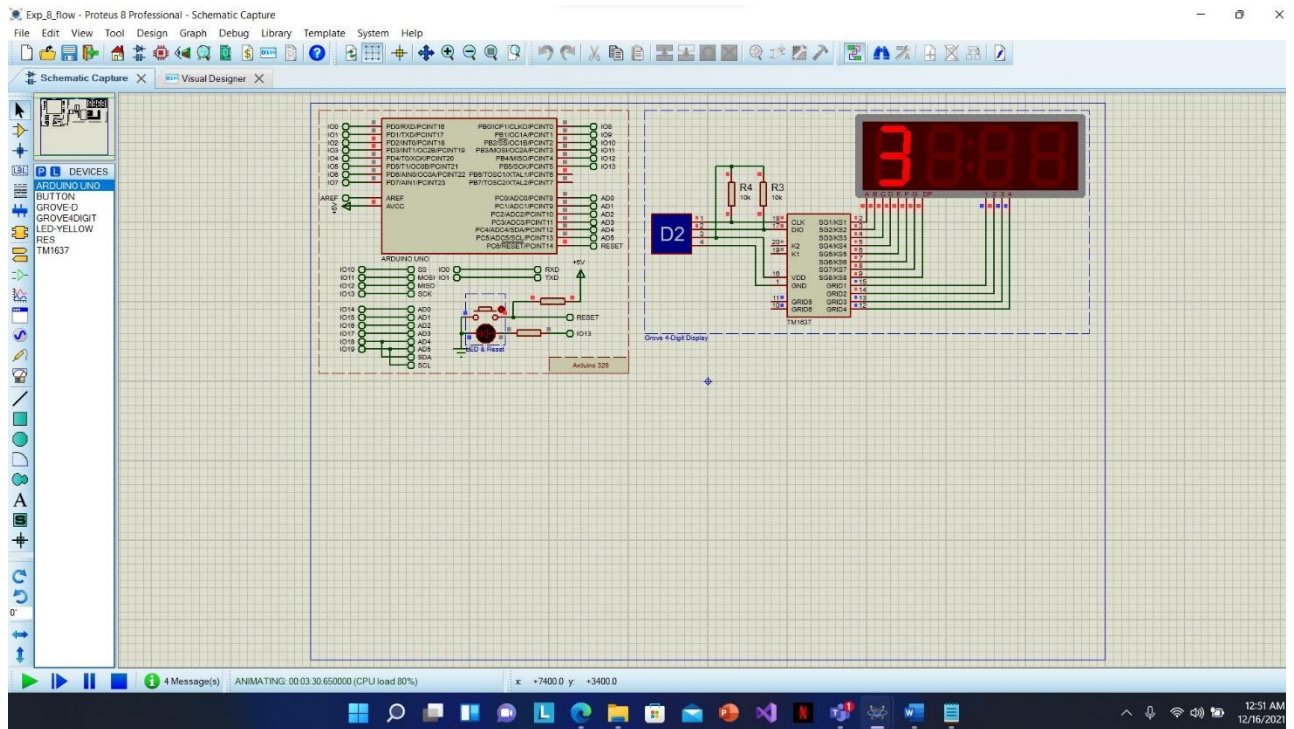




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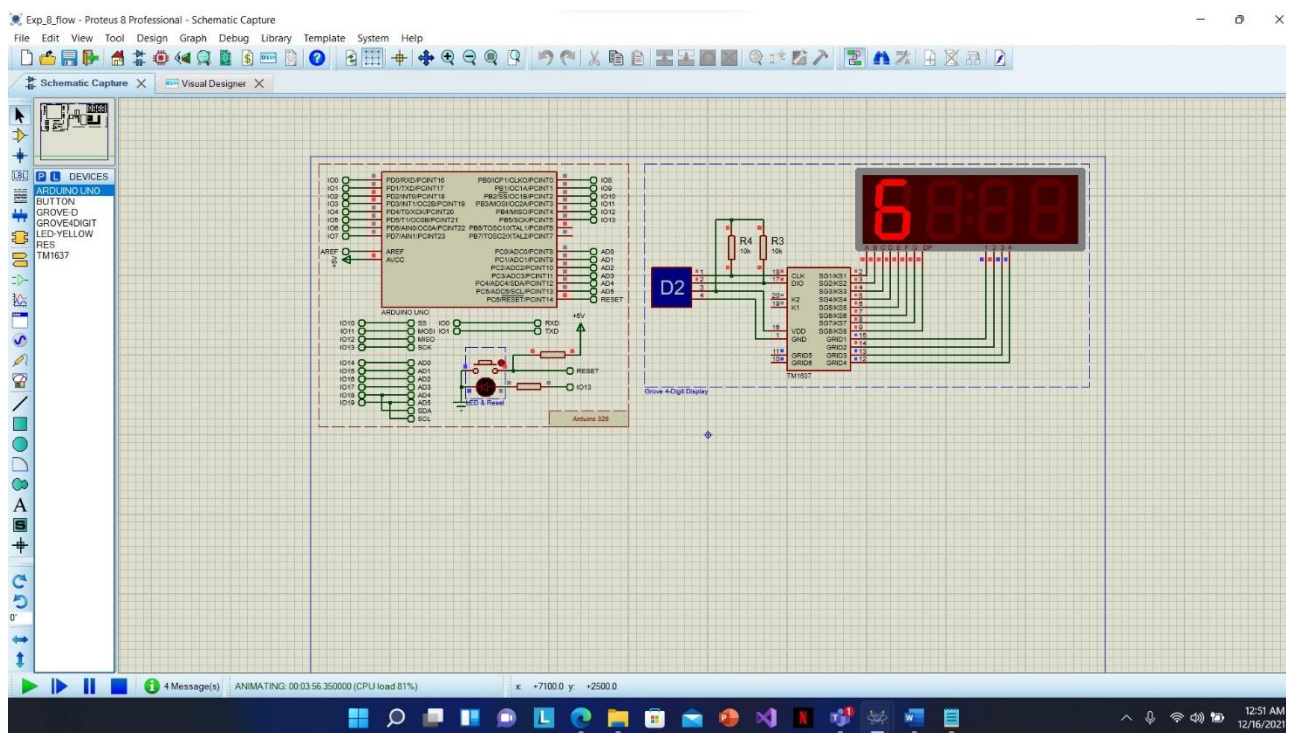
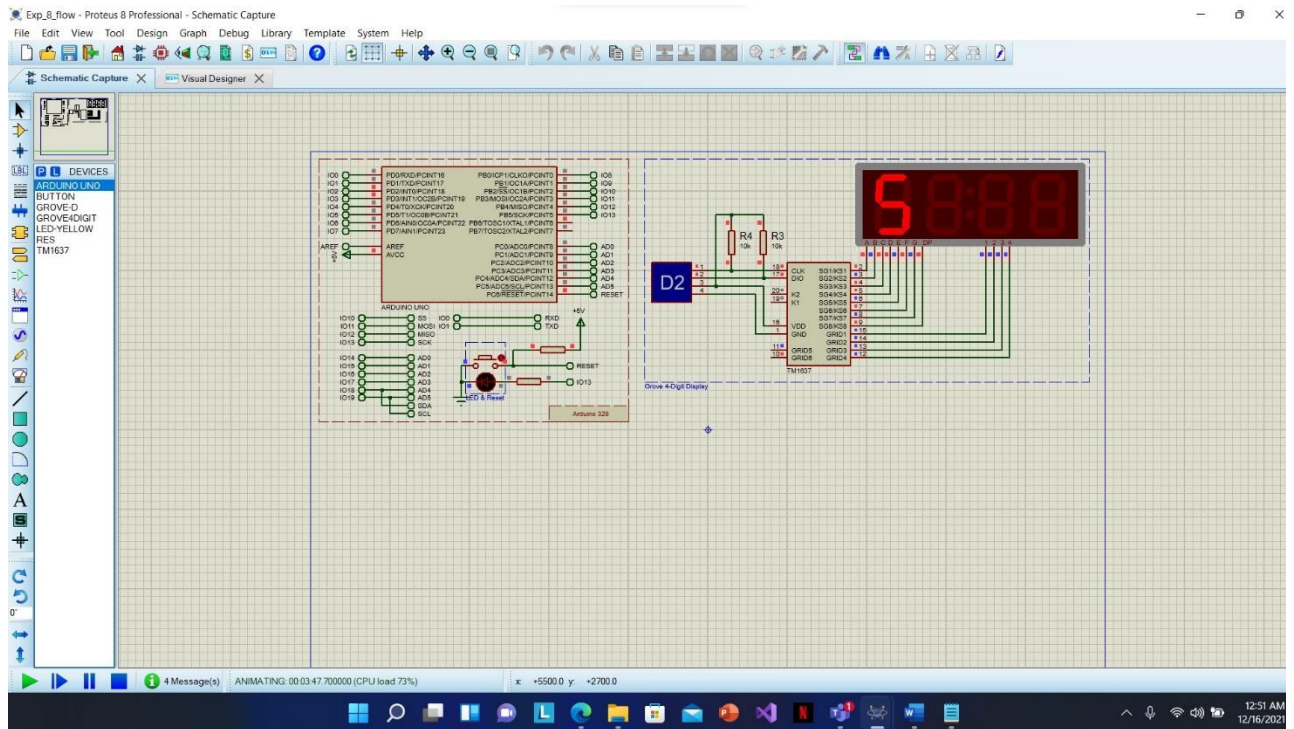


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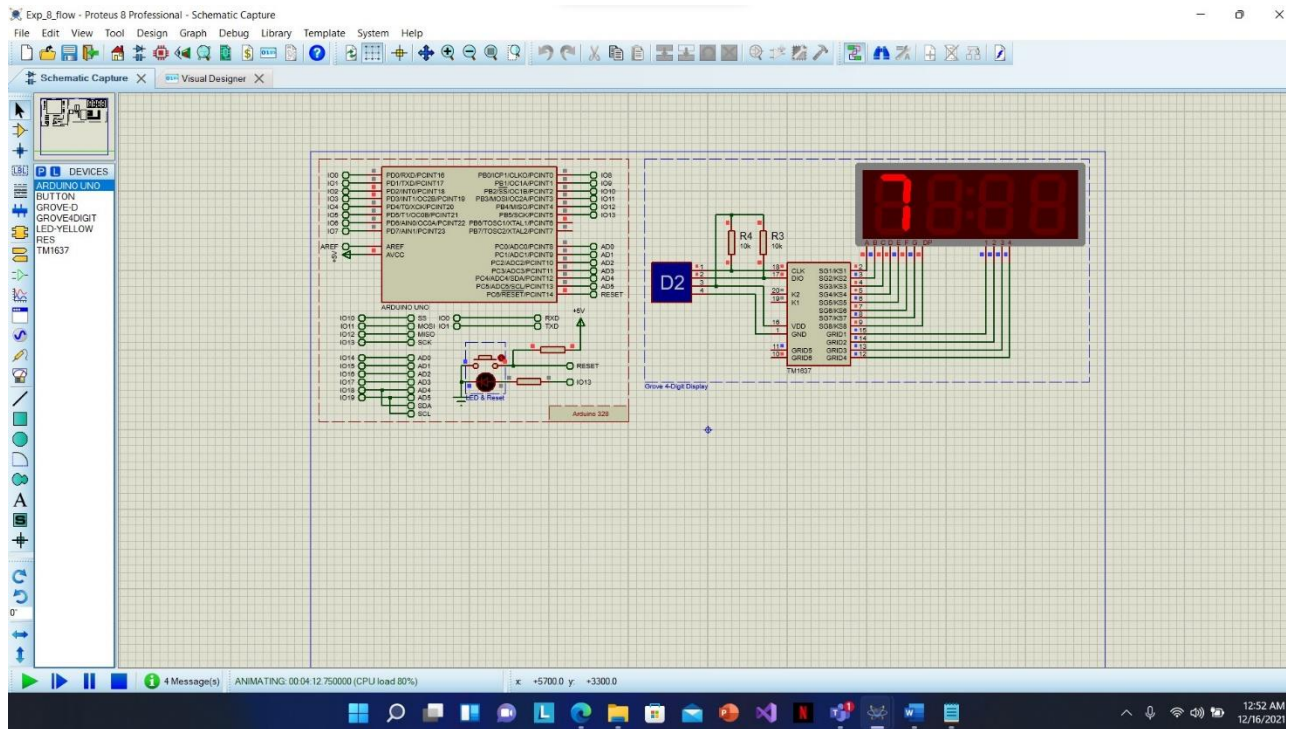


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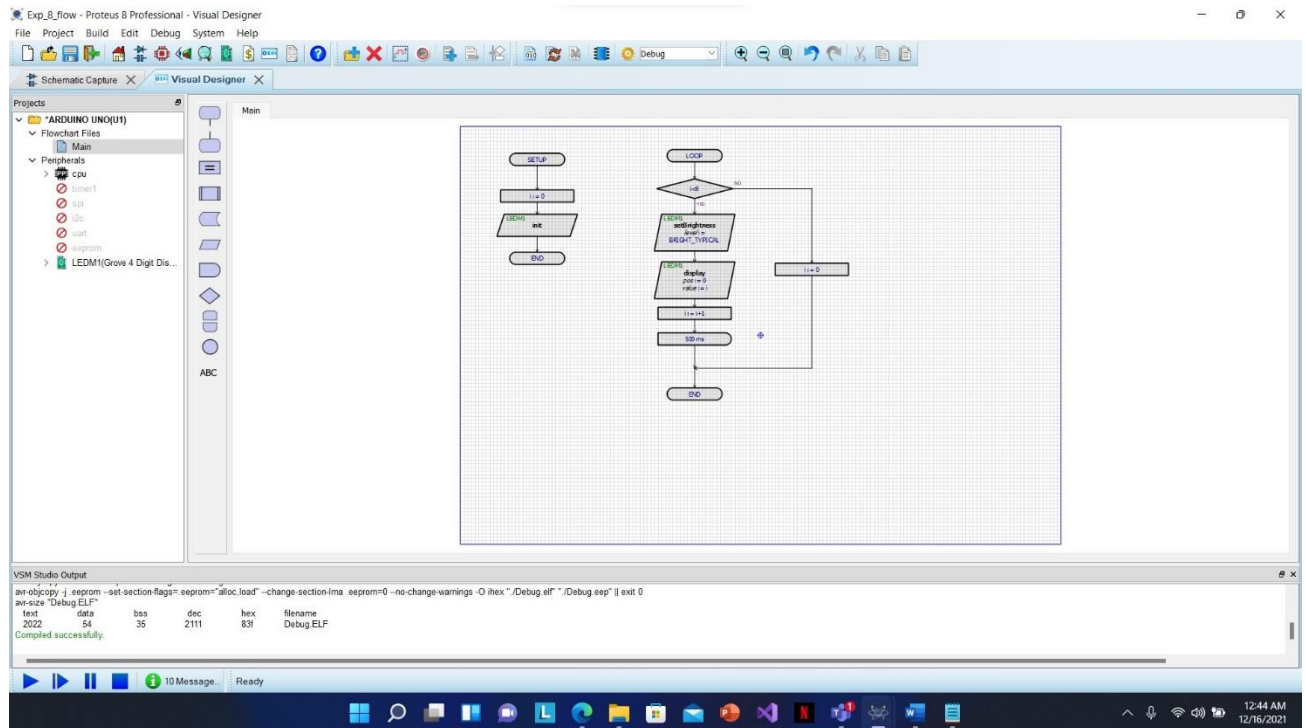




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## Flowchart:



### 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:

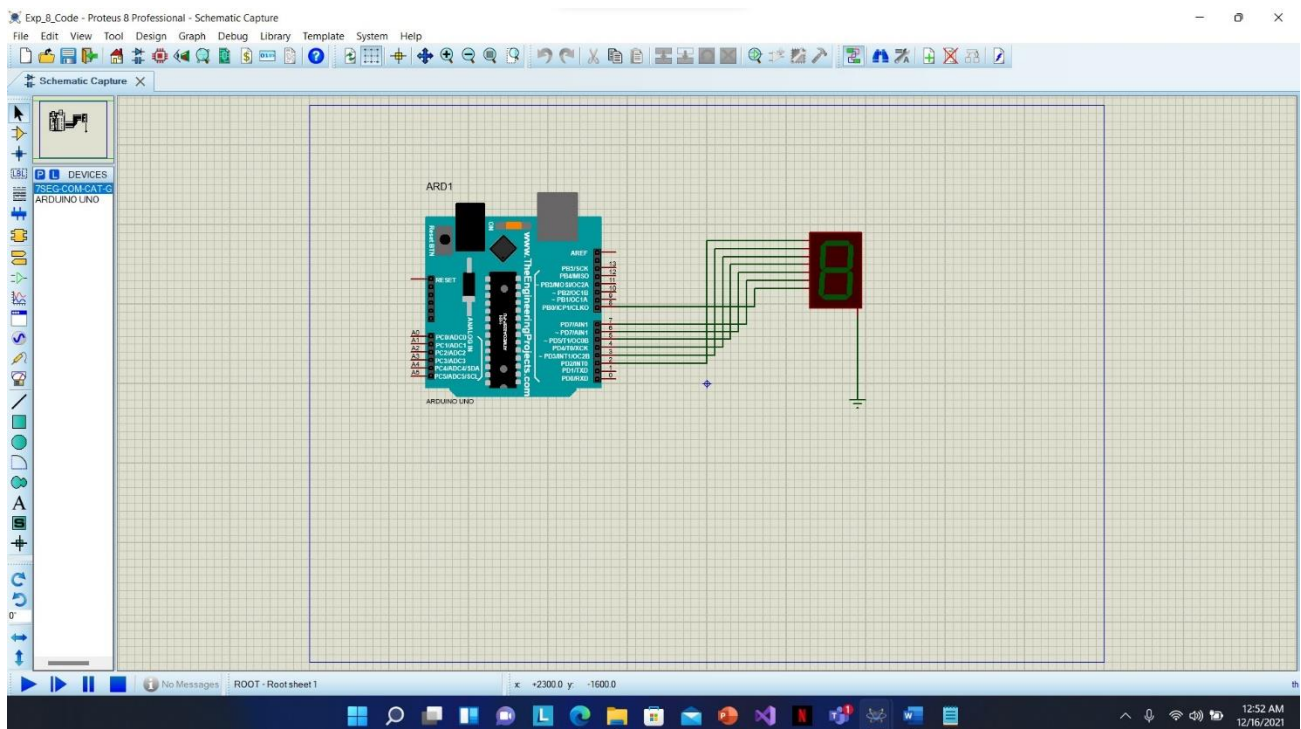
```
digitalWrite(segA, HIGH);  
digitalWrite(segB, HIGH);  
digitalWrite(segC, HIGH);  
digitalWrite(segD, LOW);  
digitalWrite(segE, LOW);  
digitalWrite(segF, LOW);  
digitalWrite(segG, LOW);  
break;
```

case 8:

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

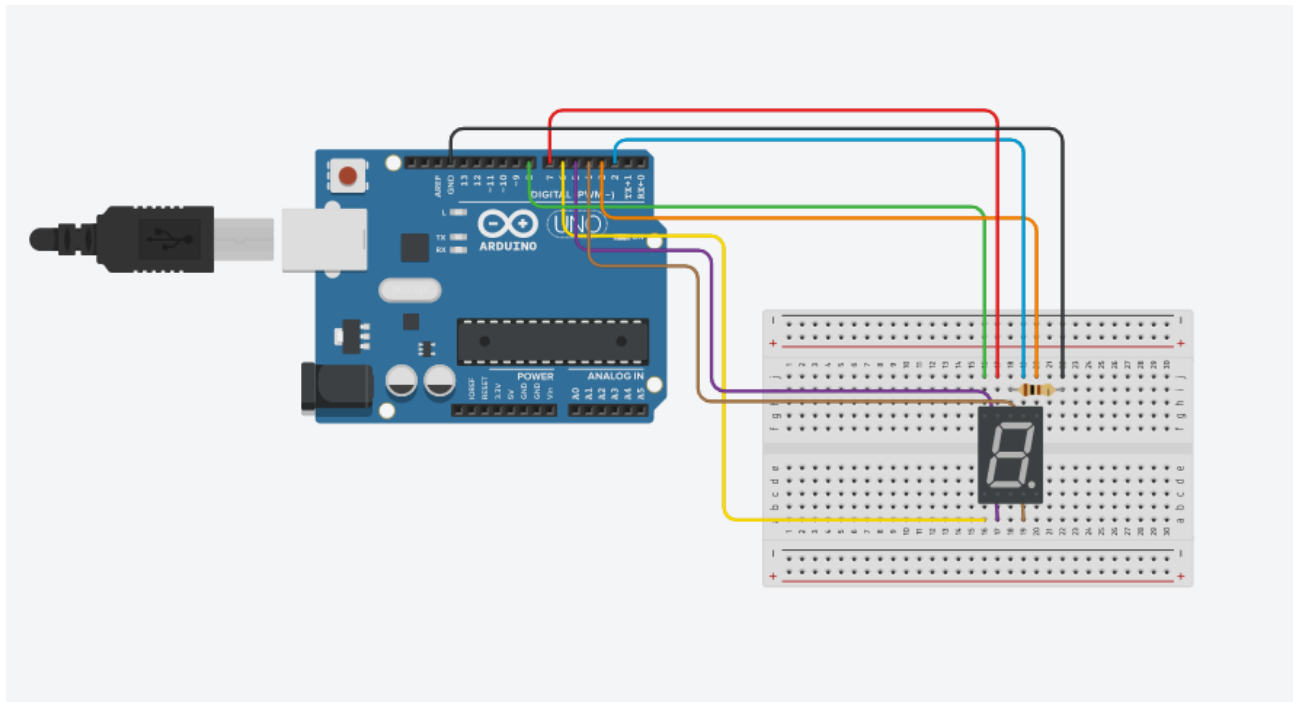


```
digitalWrite(segG, HIGH);  
break;  
case 9:  
digitalWrite(segA,  
HIGH);  
digitalWrite(segB,  
HIGH);  
digitalWrite(segC,  
HIGH);  
digitalWrite(segD,  
HIGH);  
digitalWrite(segE, LOW);  
digitalWrite(segF,  
HIGH);  
digitalWrite(segG,  
HIGH); break; break;  
}  
if (COUNT<10){ COUNT++;  
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>
- [3] <https://www.electronicshub.org/decade-counterbcd-counter/>
- [4] <https://www.electronicshub.org/decade-counterbcd-counter/>
- [5] <https://www.arduino.cc/>
- [6] HDSP5503 Datasheet