4-bit Binary adder with Arduino

Digital Electronics Project Submission by

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CONTENT

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1. Description

In this project I will build a conversion system that will add two 4-bit binary number. Then it will convert the binary number into decimal. At last it will print the addition and decimal number into an LCD display with the help of an Arduino. I am using a 4-bit adder to add two binary number. My main motive is to show how computer works with 1 and 0's and how it will add two numbers. I am also trying to show the concept of a full adder.

2. Equipment

- Bread board
- Slide Switch
- 220 k Resistor
- Connecting wire
- 74HC283 IC (4-bit adder)
- Battery
- LED light
- Arduino
- LED 16 x 2 Display
- Potentiometer

3. Circuit Diagram
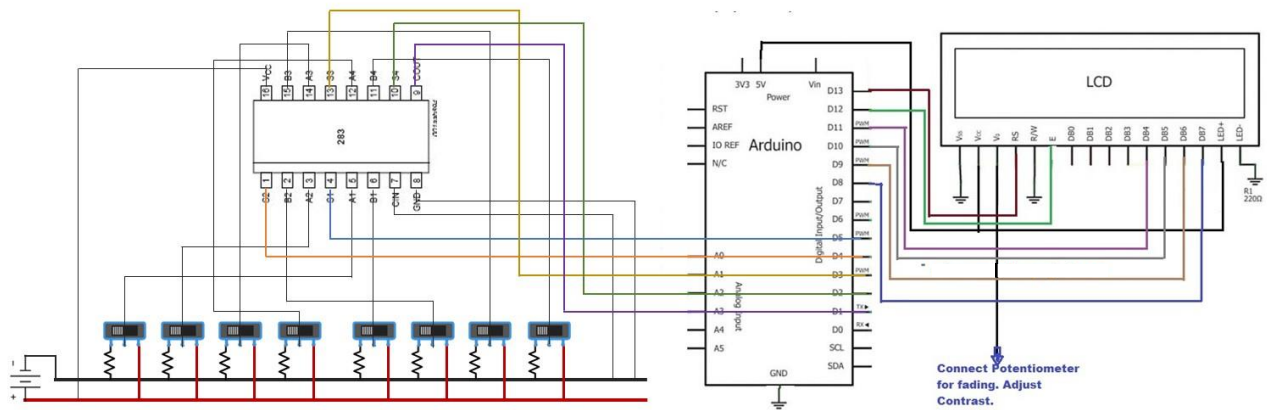
At first, I have design the 74HC283 (4-bit adder) IC part to add two binary numbers. I have used 8 switches for the input. And we have 5 output from the 74HC283 IC.

In this IC we have VCC and GND in pin 8 and 16. So, I have added those pins according to battery supply and ground. We have input pins like A1, B1, A2, B2, A3, B3, A4, B4. I have added those pins according to the circuit diagram with the 8 switches. After that we have got our output in pins S1, S2, S3, S4 and COUT. We have also a pin CIN, as we have no carry at the begging so I add this with the ground to provide 0 as an input.

Then the second part is to join output into an Arduino as an input. In this case I have add these outputs into pin D1 – D5 as inputs. After doing this, as we get the output from 74HC283 into our Arduino then we need to write some algorithm to convert the binary number into a decimal number.

Code:

```
// include the library code:
#include <LiquidCrystal.h>
#include <math.h>

// initialize the library with the numbers of the interface pins
```

```
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);
void setup() {
  // set up the LCD's number of columns and rows:
  pinMode(7, INPUT);
  pinMode(6, INPUT);
  pinMode(1, INPUT);
  pinMode(0, INPUT);
  pinMode(8, INPUT);
  lcd.begin(16, 2);
}
int power(int b, int p){
      int i, res = 1;
  for(i = 1; i <= p; i++){
      res = res * b;
  }
  return res;
}

int decimals(int arr[]){
  int sum = 0, i;
  for(i = 0; i<5 ; i = i + 1){
      sum = ((power(2, i)) * arr[i]) + sum;
  }
  return sum;
}

void loop() {
  // set the cursor to column 0, line 1
  // (note: line 1 is the second row, since counting begins with 0):

  lcd.print("Sum = ");
  if(digitalRead(7) == HIGH){
      lcd.print("1");
  }else{
      lcd.print("0");
  }
  if(digitalRead(6) == HIGH){
      lcd.print("1");
  }else{
      lcd.print("0");
  }
  if(digitalRead(1) == HIGH){
      lcd.print("1");
  }else{
      lcd.print("0");
  }
  if(digitalRead(0) == HIGH){
```

```
    lcd.print("1");
}else{
    lcd.print("0");
}
if(digitalRead(8) == HIGH){
    lcd.print("1");
}else{
    lcd.print("0");
}

lcd.setCursor(0, 1);


int arr[5],i;
arr[0] = digitalRead(8);
arr[1] = digitalRead(0);
arr[2] = digitalRead(1);
arr[3] = digitalRead(6);
arr[4] = digitalRead(7);
int result = decimals(arr);
lcd.print("Decimal: ");
lcd.print(result);

delay(2000);
lcd.clear();
delay(2000);
}
```

Then the third part is to connect the LCD display with the Arduino.

We have to connect the LED⁻ to the ground and LED⁺ to the 5v of the Arduino. Then from the DB4 – DB7 we have connected those pins with the Arduino from Pin D8 – D11. Pin E and Pin Rs of the LCD will be connected with the D12 and D13 of the Arduino. At last in pin V_o we have to connect this with a Potentiometer for fading and adjusting the contrast.

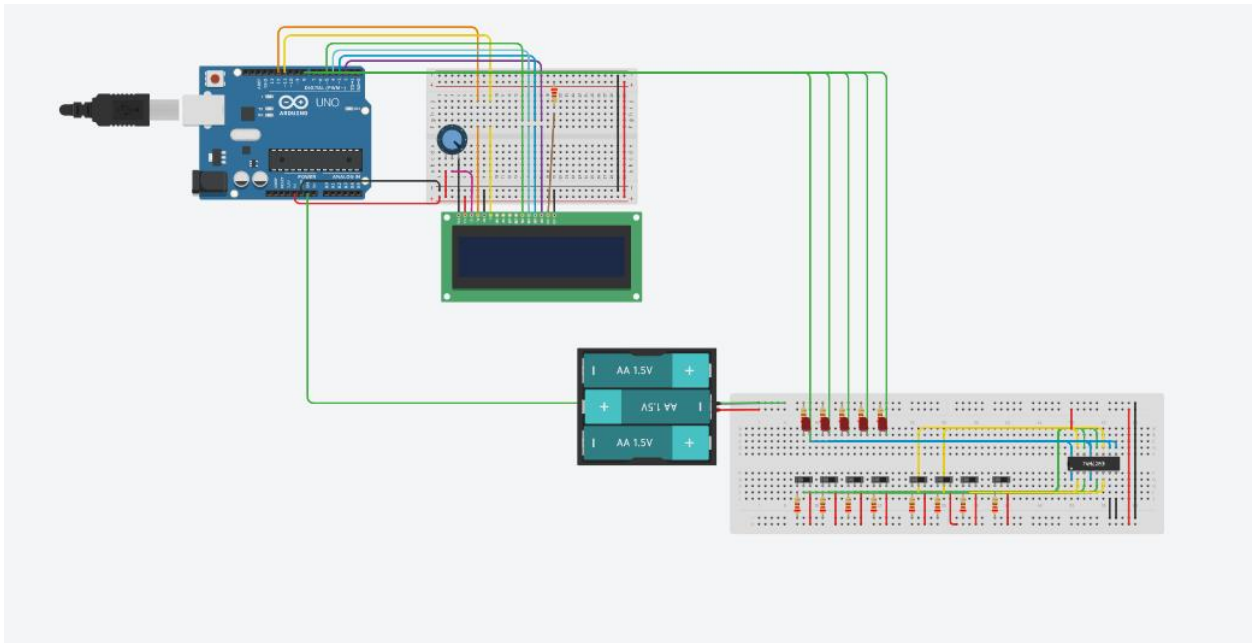After doing all this thing we will see the output into our LCD display.
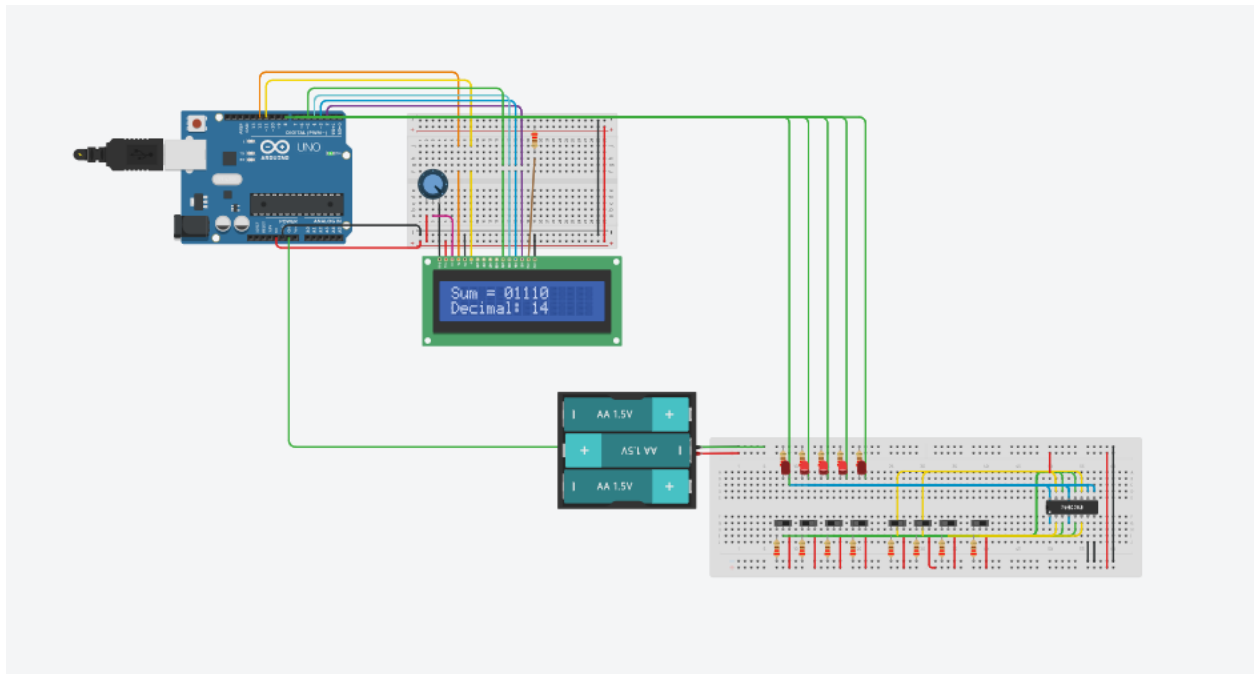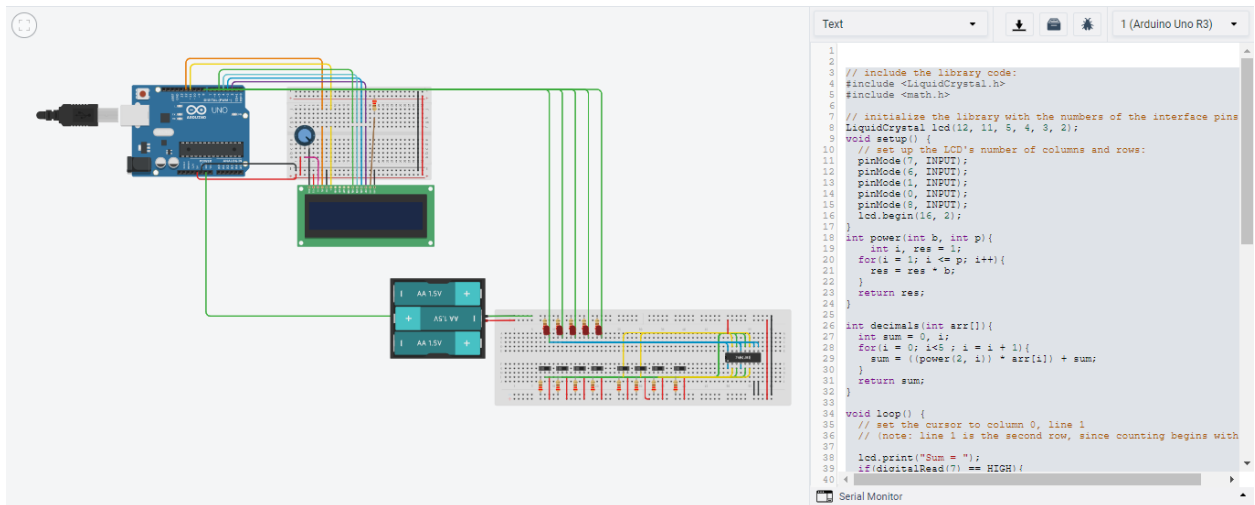
4. Advantages

- Add two binary number
- Binary to decimal conversion
- Understand how IC works

5. Disadvantages

- Display blink after 4 second
- Circuit diagram is complicated
- Hard to implement

6. Project Screenshot

Project Link:
https://www.tinkercad.com/things/frJcgFrETVe-dc-
project/editel?sharecode=uyh4sjECWPJLOqoXQWsSG7Lc4sOiC6oFwJub4vFFSDE