Assignment 2

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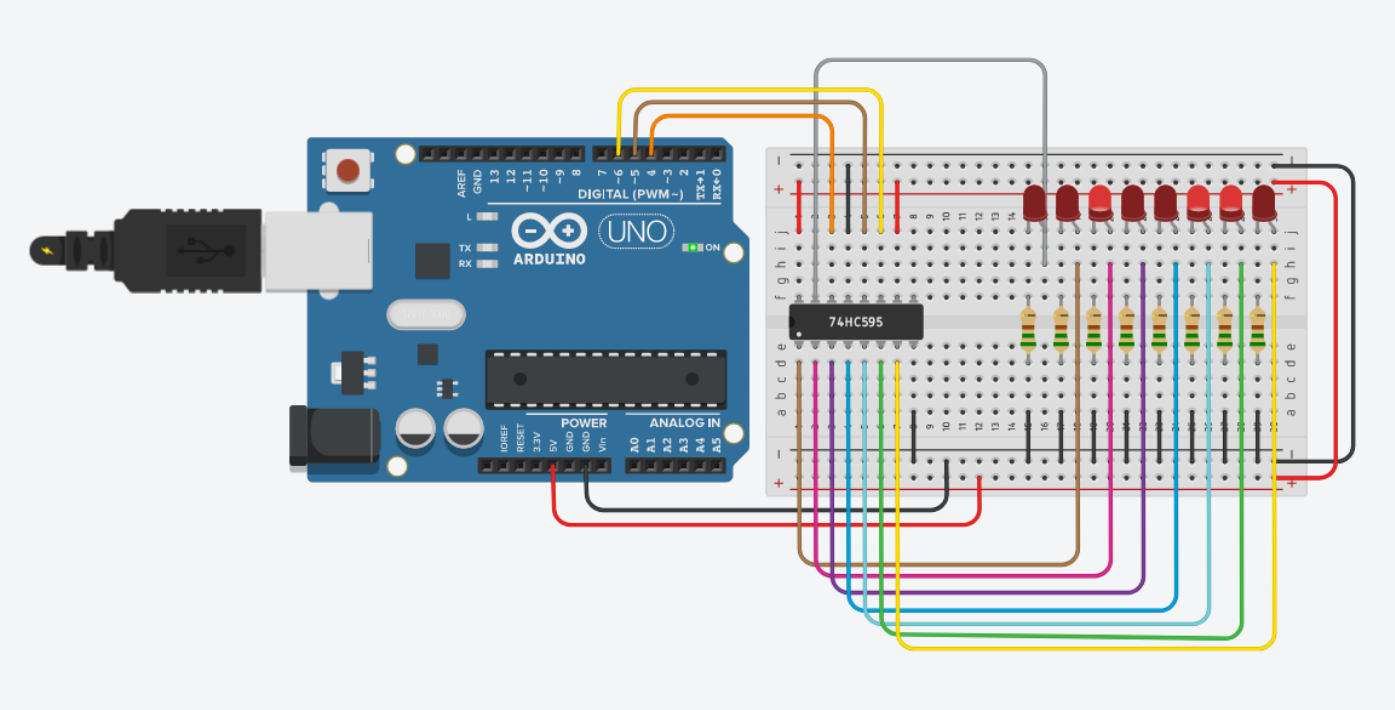
Problem 1.1

Number to display in binary = 100



https://www.tinkercad.com/things/bYpO42DETHK-problem-11-of-spi-type-shift-register-74hc595/editel?sharecode=RPyFJ4CS7YJOYUfRsSpc7vmz9jUdQ_OrOs9NWixckMU

Arduino code

```
//Pin connected to ST_CP of 74HC595
int latchPin = 5;
//Pin connected to SH_CP of 74HC595
int clockPin = 6;
//Pin connected to DS of 74HC595
int dataPin = 4;
//Input the number to display in binary
byte numberToDisplay = 100;

void setup() {
//set pins to output so you can control the shift register
pinMode(latchPin, OUTPUT);
pinMode(clockPin, OUTPUT);
pinMode(dataPin, OUTPUT);
}
```

```
void loop() {
// take the latchPin low so
// the LEDs don't change while you're sending in bits:
digitalWrite(latchPin, LOW);
// shift out the bits:
shiftOut(dataPin, clockPin, MSBFIRST, numberToDisplay);
//take the latch pin high so the LEDs will light up:
digitalWrite(latchPin, HIGH);
delay(500);
}
```

Problem 1.2

https://www.tinkercad.com/things/ijN0bNJuQq2-part-2b-of-spi-type-shift-register-74hc595/editel?sharecode=vBoPtPXOkrN1hVgi6ImjRZuabSozeoSRWLtR6I_9iM4

Arduino code

```
// Initial Pins
int latchPin = 5; // Latch pin of 74HC595 is connected to Digital pin 5
int clockPin = 6; // Clock pin of 74HC595 is connected to Digital pin 6
int dataPin = 4;  // Data pin of 74HC595 is connected to Digital pin 4
byte leds = 0;                // Variable to hold the pattern of which LEDs are currently turned on or off

void setup()
{
 // Set all the pins of 74HC595 as OUTPUT
 pinMode(latchPin, OUTPUT);
 pinMode(dataPin, OUTPUT);
 pinMode(clockPin, OUTPUT);
 Serial.begin(9600);
}
void loop()
{
 int data[] = {1,0,1,0,1,0,0,1}; //binary array that will be shown
 leds=0;           // Initially turns all the LEDs off, by giving the variable 'leds' the value 0
 updateShiftRegister(leds);
 //delay(500);
 for (int i = 0; i < 8; i++)  // Turn all the LEDs ON one by one.
 {
  leds = data[i];
  if (leds == 1){
    bitSet(leds, i);                    // Set the bit that controls that LED in the variable 'leds'
  }
  updateShiftRegister(leds);
  delay(1000);
 }
}

void updateShiftRegister(byte data)
{
  digitalWrite(latchPin, LOW);
  shiftOut(dataPin, clockPin, LSBFIRST, leds);
  digitalWrite(latchPin, HIGH);
}
```

Problem 2

YouTube: https://www.youtube.com/watch?v=NJH22YGJd10

Github : https://github.com/aripsn/App-of-Sensors-in-Civil-Eng/tree/Assignment_2

```
#include <Wire.h>
#include <DHT.h>
#include <LiquidCrystal_I2C.h>

//LCD
LiquidCrystal_I2C lcd(0x27, 16, 2);

//DHT11
#define DHTPIN 2           // data pin we're connected to
#define DHTTYPE DHT11      // or DHT 22  (AM2302)
DHT dht(DHTPIN, DHTTYPE);  //// Initialize DHT sensor
//Variable to Store humidity and temperature value
float hum, temp;

//Ultrasound
const int trigPin = 6;
const int echoPin = 5;
long duration;
int FirstDistance = 0;
int SecondDistance = 0;
double speed = 0;
int distance = 1;
float Time = 2.0;
float delayedtime = 1000 * Time;

void setup() {
  pinMode(13, OUTPUT);
  //LCD
  lcd.begin(16, 2);
  lcd.init();
  lcd.backlight();
  Serial.begin(9600);
  //DHT11
  dht.begin();
  //Ultrasound
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
}
```

```
void loop() {
  //Calculate temperature to adjust speed of sound
  CalcTemp();
  //Measure distance of vehicle
  //Max range = 4 meter, Min range = 2 cm
  CalcDistance();
  if (distance < 350) {
    CalcSpeed();
    Serial.println("within range");
    if (speed > 10 && distance <50){ //define the speed threshold and distance to
      lcd.setCursor(1,0);            // display the warning on LCD
      lcd.print("Slow down!!!");
      Serial.println("Slow down!!");
      delay(2000);
      lcd.clear();
    }
    if (speed <5 && distance <50){    //define the speed threshold and distance to
      lcd.setCursor(1,0);             // display the warning on LCD
      lcd.print("Kick the gas!!!");
      Serial.println("Kick the gas!!!");
      delay(2000);
      lcd.clear();
    }
  }
}

//Function for calculate temperature and humidity
float CalcTemp() {
  //Read data and store it to variables hum and temp
  hum = dht.readHumidity();
  temp = dht.readTemperature();
  //Delay 2 sec, this is important to maintain that much delay in each reading
  delay(2000);
}
//Function for calculate distance
float CalcDistance() {
  // Clears  trigPin
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  // Sets  trigPin HIGH  for 10 microsec
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
  // Reads  echoPin, returns the wave travel time in microsec
  duration = pulseIn(echoPin, HIGH);
  //calcdistance
  distance = duration * (0.0331 + (0.61 * temp * 0.0001)) / 2;  //calibrated with
temperature
  // Prints distance on Serial Monitor
  Serial.print("Distance in cm : ");
  Serial.println(distance);
  return distance;
}
```

```
void CalcSpeed() {

  FirstDistance = CalcDistance();                  //get the first distance
  delay(delayedtime);                              //waits 2 seconds depending on the
time declared above ,, feel free to change the value dependng on the resolution of
your sensor
  SecondDistance = CalcDistance();                 //gets the second distance
  speed = abs((FirstDistance - SecondDistance) / Time);  // now calculating the
difference
  // print speed on  serial monitor
  Serial.print("the speed (cm/s) is  :  ");
  Serial.println(speed);
}
```