LAB REPORT – 8

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PART - A

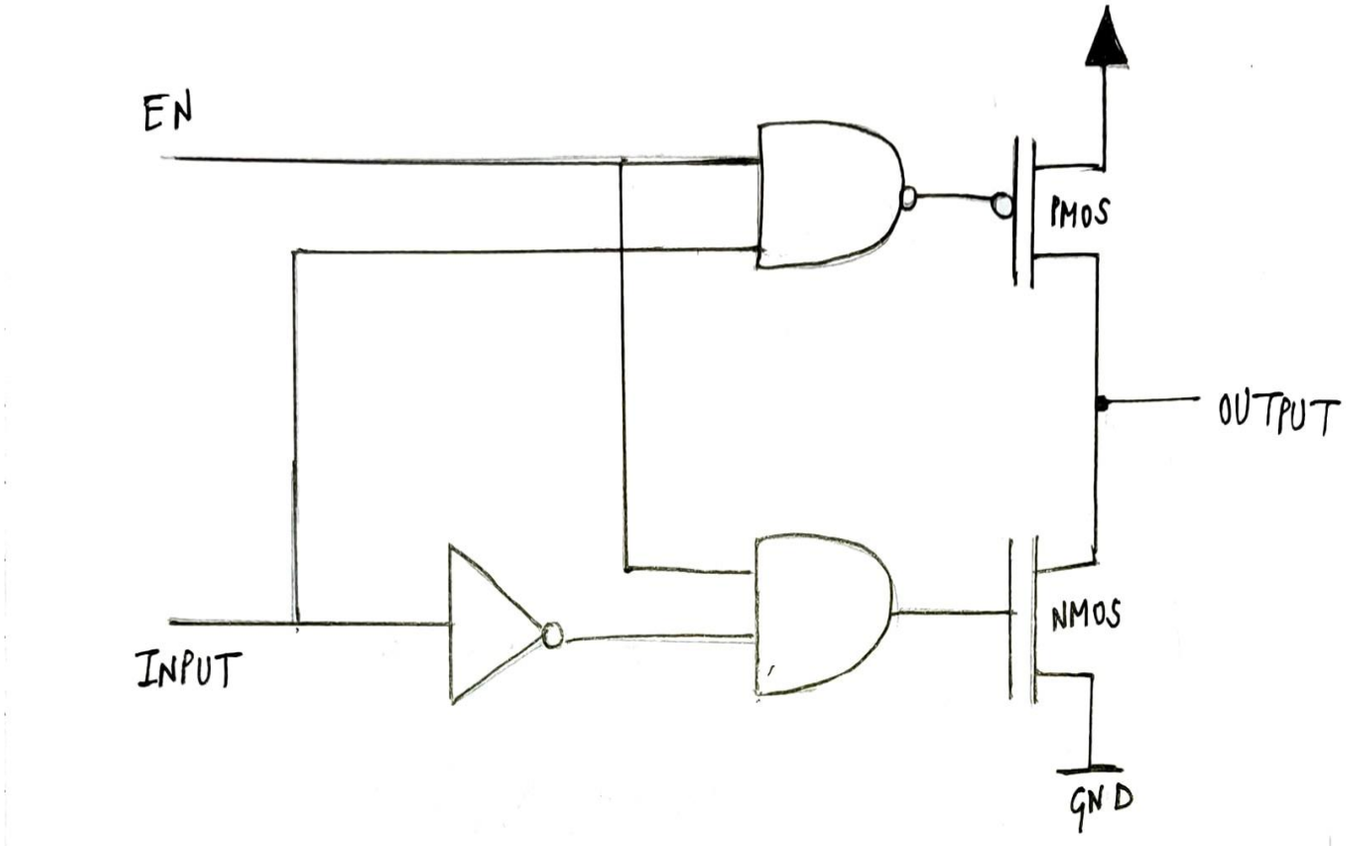
Aim of the experiment:

To get familiar with the working of a tri state buffer and understand data flow control using a tristate buffer.

Electronic Components used:

1. Arduino UNO
2. Small breadboard
3. LED
4. Resistor
5. Nmos gate
6. Pmos gate
7. 74HC00 IC (Nand gate)

Reference Circuit:



Procedure:

1. Drag all components to Tinkercad working area.

2. Make all the connections as shown in the figure and write appropriate code.

Code:

```
int pin1 = 4;

int pin2 = 5;

int a,b,k;

void setup()

{

  pinMode(pin1, OUTPUT);

  pinMode(pin2, OUTPUT);

  Serial.begin(9600);

}

void loop()

{

  Serial.print("\nEnable = ");

  while(Serial.available() == 0){}

  a = Serial.read();

  a = a - '0';

  Serial.println(a);
```

```
  Serial.print("\nInput = ");
  while(Serial.available() == 0){}
  b = Serial.read();
  b = b - '0';
  Serial.println(b);


  digitalWrite(pin1, a);
  digitalWrite(pin2, b);
  Serial.print("Enter anything to go to read\n");
  while(Serial.available() == 0)
  k = Serial.read();
}
```

Observation:

INPUT	ENABLE	OUTPUT	STATE
0	0	0	Z (High Impedance)
1	0	0	Z (High Impedance)
0	1	0	Input Driven

1	1	1	Input Driven

Conclusion:

When the Enable is OFF, the Input is disconnected from the output. Hence, LED does not glow irrespective of the value of the input. When Enable is ON, the Input is connected to the LED and the output LED glows when Input is High and doesn't glow when the input is Low.

Link for Tinkercad simulation circuit part A

PART B

Aim of the experiment:

To understand data flow control using a tristate buffer

Electronic Components used:

1.Arduino UNO

2.Small breadboards (6)

3.LEDs (5)

4.Resistors (4)

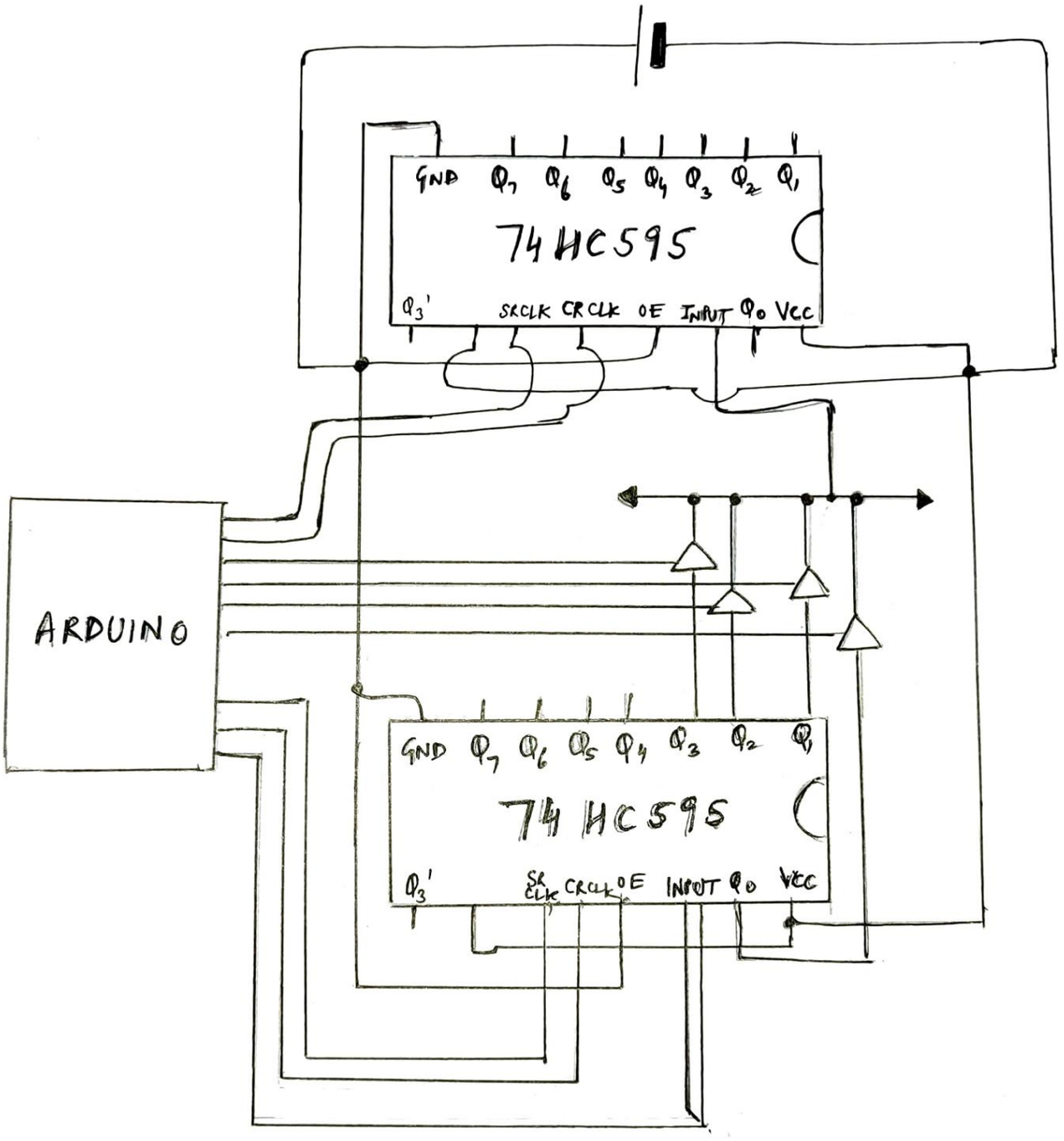
5.Nmos gates (4)

6.Pmos gates (4)

7.74HC00 ICs (4)

8.74HC595 ICs (2)

Reference Circuit:


GND Q7 Q6 Q5 Q4 Q3 Q2 Q1
74HC595
Q3' SRCLK CRCLK OE INPUT Q0 VCC
ARDUINO
GND Q7 Q6 Q5 Q4 Q3 Q2 Q1
74HC595
Q3' SR CLK CRCLK OE INPUT Q0 VCC

Procedure:

1. Drag all the components to Tinkercad working area.
2. Set up the circuit as shown with the Nmos and Pmos gates, 2 shift registers IC and the required number of LEDs.
3. Make all the connections as shown in the figure and write appropriate code.

Code:

```
int pin1 = 2;          //Input

int pin2 = 3;    //output of CLK1

int pin3 = 4;    //shift of CLK1

int pin4 = 8;         //enable 1

int pin5 = 9;         //enable 2

int pin6 = 10;        //enable 3

int pin7 = 11;        //enable 4

int pin8 = 12;   //output of CLK2

int pin9 = 13;   //shift of CLK2

int a,b,input,k;
```

```
void setup()
{
  pinMode(pin1,OUTPUT);
  pinMode(pin2,OUTPUT);
  pinMode(pin3,OUTPUT);
  pinMode(pin4,OUTPUT);
  pinMode(pin5,OUTPUT);
  pinMode(pin6,OUTPUT);
  pinMode(pin7,OUTPUT);
  pinMode(pin8,OUTPUT);
  pinMode(pin9,OUTPUT);
  Serial.begin(9600);
}
void loop()
{
  if(Serial.available()==2){]
  {
  Serial.println("\nMost significant bit of Input = ");
```

```
a = Serial.read();

a = a - '0';

Serial.println(a);


Serial.println("\nSecond bit of Input = ");

b = b - '0';

Serial.println(b);


input = 10*a + b;

Serial.println(input);


digitalWrite(pin2,LOW);          //output of CLK 1 is LOW

shiftOut(pin1,pin3,MSBFIRST,input);

digitalWrite(pin2,HIGH);         //output of CLK 1 is HIGH


digitalWrite(pin8, LOW);

digitalWrite(pin4,LOW);

digitalWrite(pin5, LOW);

digitalWrite(pin6, LOW);
```

```
digitalWrite(pin7,HIGH);        //enable of LSB is HIGH

digitalWrite(pin9,HIGH);

delay (500);

digitalWrite(pin9,LOW);

delay(500);

digitalWrite(pin8, HIGH);

delay(1000);


digitalWrite(pin8, LOW);

digitalWrite(pin4,LOW);

digitalWrite(pin5,LOW);

digitalWrite(pin6,HIGH);        //enable of bit next to LSB is HIGH

digitalWrite(pin7,LOW);

digitalWrite(pin9,HIGH);

delay(500);

digitalWrite(pin9,LOW);

delay(500);

digitalWrite(pin8, HIGH);

delay(1000);
```

```
digitalWrite(pin8, LOW);

digitalWrite(pin4,LOW);

digitalWrite(pin5,HIGH);       //enable of bit next to MSB is HIGH

digitalWrite(pin6,LOW);

digitalWrite(pin7,LOW);

digitalWrite(pin9,HIGH);

delay(500);

digitalWrite(pin9,LOW);

delay(500);

digitalWrite(pin8, HIGH);

delay(1000);


digitalWrite(pin8, LOW);

digitalWrite(pin4, HIGH);        //enable of MSB is HIGH

digitalWrite(pin5, LOW);

digitalWrite(pin6, LOW);

digitalWrite(pin7, LOW);

digitalWrite(pin9, HIGH);
```

```
  delay(500);
  digitalWrite(pin9,LOW);
  delay(500);
  digitalWrite(pin8, HIGH);
  delay(1000);
  }
}
```

Observation:

Input	Shift Register 1(takes input)				Shift register 2 (shows output)			
00	0	0	0	0	0	0	0	0
01	0	0	0	1	0	0	0	1
02	0	0	1	0	0	0	1	0
03	0	0	1	1	0	0	1	1
04	0	1	0	0	0	1	0	0
05	0	1	0	1	0	1	0	1
06	0	1	1	0	0	1	1	0
07	0	1	1	1	0	1	1	1

08	1	0	0	0	1	0	0	0
09	1	0	0	1	1	0	0	1
10	1	0	1	0	1	0	1	0
11	1	0	1	1	1	0	1	1
12	1	1	0	0	1	1	0	0
13	1	1	0	1	1	1	0	1
14	1	1	1	0	1	1	1	0
15	1	1	1	1	1	1	1	1

Link for Tinkercad simulation circuit part B