

NAME : Malla Sailesh
ROLL NUMBER : 2021101106
GROUP NUMBER : 6

LAB 8
DIGITAL SYSTEMS AND MICROCONTROLLERS

AIM :

- 1) **Part A :** Verify the working of the tristate buffer and create a truth table for it .
- 2) **Part B :** We should pass the contents of the first register to the second register (input range in from 0 to 15) .

ELECTRONIC COMPONENTS :

1) **Part A :**

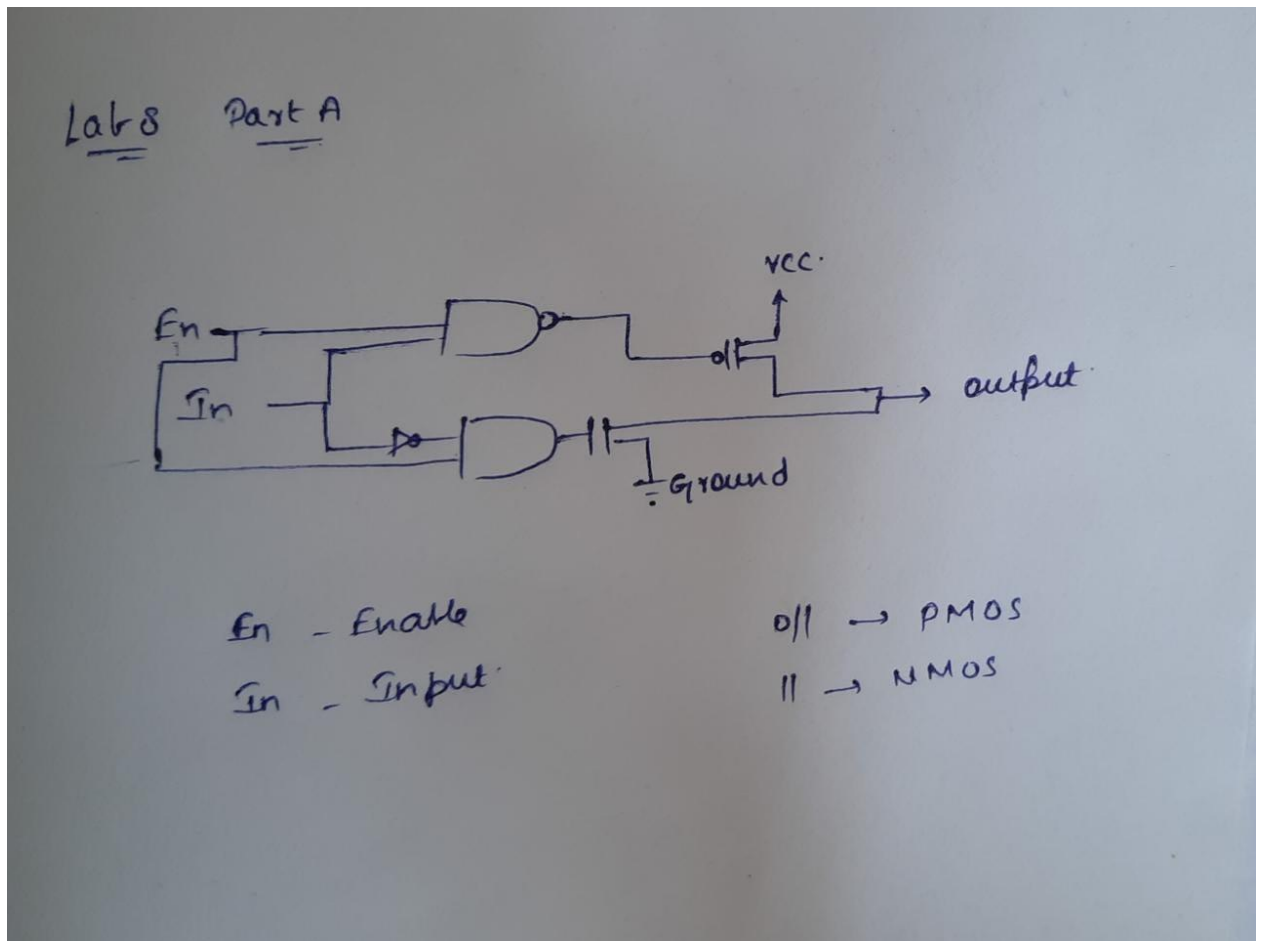
- Breadboard
- Arduino
- Resistor and Led's
- PMOS and NMOS Transistors
- IC (Nand Gate)

2) **Part B :**

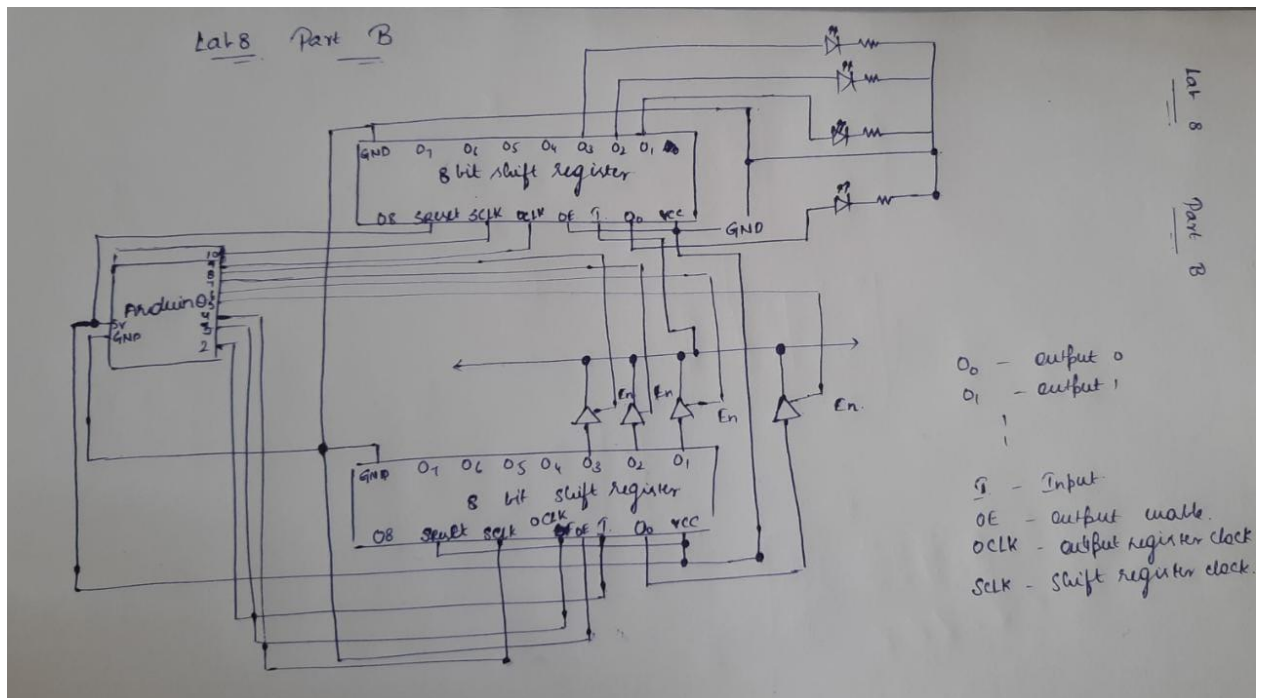
- Breadboard
- Arduino
- Resistor and Led's
- PMOS and NMOS Transistors
- IC (Nand Gate and 74HC595 - 8 bit shift register)

REFERENCE CIRCUIT :

1) Part A :



2) Part B :



PROCEDURE :

1) Part A :

- First implement a tristate buffer using the help of the reference circuit .
- The input to the buffer and the enable signal should be given to the circuit using arduino .
- Verify the working of the truth table according to the observation
- CODE :

```
int i,en;
void setup()
{
    pinMode(10, OUTPUT);
    pinMode(11,OUTPUT);
    Serial.begin(9600);//sets the data rate to 9600 bps
}
```

```
void loop()
{
    if(Serial.available())
    {
        en = Serial.read()-'0';
        i = Serial.read()-'0';

        Serial.print("Enable:");
        Serial.println(en);
        Serial.print("Input:");
```

```

        Serial.println(i);

        digitalWrite(10,i);
        digitalWrite(11,en);
    }
    delay(250);
}

```

2) Part B :

- Take an input number form (0-15) and give it to the first register .
- Then take the parallel output from the first register and using the tristate buffers transfer the content of the first register to the second register . The contents one by one transferred to the bus - the common line , by enabling corresponding buffer only . Then the content from bus is transferred to the second register by enabling the load register . So on complete content is transferred .
- Thus after entering any input from 0 - 15 , both of the registers should contain same value in binary form . This is because the contents in the first register is transferred to the second register .
- CODE :

```

int e1=2,e2=3,e3=4,e4=5,l1=7,l2=9,c1=8,c2=10,i=6,x;
void setup()
{
    pinMode(e1,OUTPUT);
    pinMode(e2,OUTPUT);
    pinMode(e3,OUTPUT);
    pinMode(e4,OUTPUT);
    pinMode(i,OUTPUT);
    pinMode(l1,OUTPUT);
    pinMode(c1,OUTPUT);
    pinMode(l2,OUTPUT);
    pinMode(c2,OUTPUT);
    Serial.begin(9600);//sets the data rate to 9600 bps
}

void loop()
{
    if(Serial.available()>0)
    {
        digitalWrite(e1,LOW);
        digitalWrite(e2,LOW);
        digitalWrite(e3,LOW);
        digitalWrite(e4,LOW);
        digitalWrite(c2,LOW);
        x = Serial.parseInt();
    }
}

```

```

Serial.print("Input : ");
Serial.println(x);
digitalWrite(l1,LOW);
shiftOut(i,c1,MSBFIRST,x);
digitalWrite(l1,HIGH);
digitalWrite(l2,LOW);
digitalWrite(e1,HIGH);
digitalWrite(c2,HIGH);
digitalWrite(c2,LOW);
digitalWrite(e1,LOW);
digitalWrite(e2,HIGH);
digitalWrite(c2,HIGH);
digitalWrite(c2,LOW);
digitalWrite(e2,LOW);
digitalWrite(e3,HIGH);
digitalWrite(c2,HIGH);
digitalWrite(c2,LOW);
digitalWrite(e3,LOW);
digitalWrite(e4,HIGH);
digitalWrite(c2,HIGH);
digitalWrite(l2,HIGH);

```

```

}
}

```

OBSERVATIONS :

1) Part A :

	ENABLE	INPUT	OUTPUT
•	0	0	Z(High impedance state)
•	0	1	Z(High impedance state)
•	1	0	0
•	1	1	1

- High Impedance state means the state where the values oscillate between 0 and 1. So it is shown by glowing dimly in the circuit link provided below .

2) Part B :

- If we input say x between 0 and 15 . It showed the value x in binary form in both first and second register using led's . i.e if we input 10 then led's 1 and 3 glow in both first and second register .

LINK TO THE TINKERCAD SIMULATION :

1) Part A :

<https://www.tinkercad.com/things/3AmYVa79c7I-lab-8-part-a/editel?sharecode=RKkCB2Z1uZjfRe0KwPJK5y-AgOpdLjhPgWIGrZ0oPJ0>

2) Part B :

https://www.tinkercad.com/things/jkNpWu01XpO-lab-8-part-b/editel?sharecode=3v5qE1fT7xSco_VN1MbyAhLQed6zv4rXF6RWCvFRyUo

