

# LAB REPORT – 3

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## PART - A

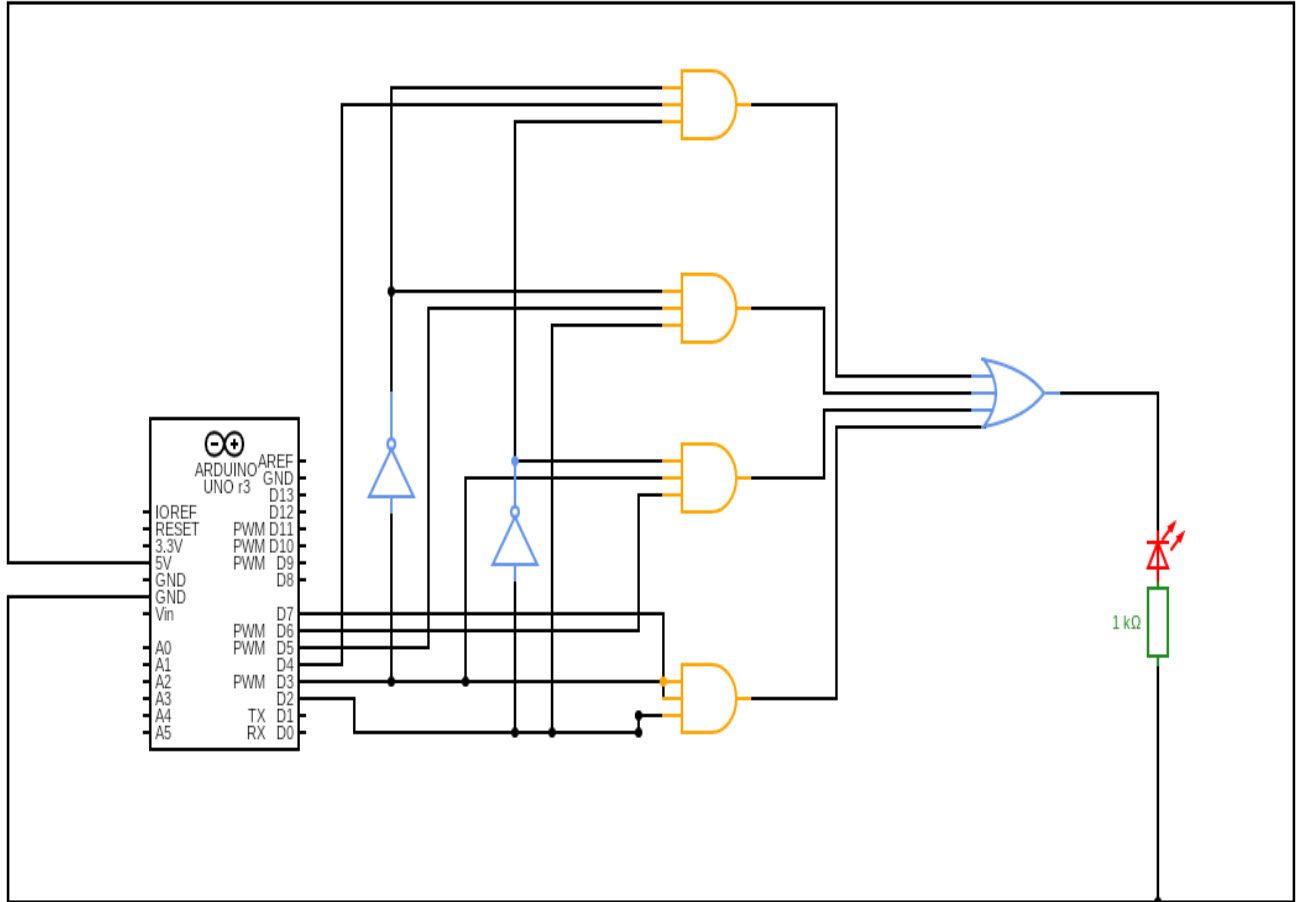
### Aim/Objective of the experiment:

To design a 4:1 Multiplexer using basic logic gates.

### Electronic Components Used:

1. Arduino UNO
2. Breadboard
3. 74HC04 IC (NOT gate)
4. 2 74HC11 ICs (3 Input AND gate)
5. 2 74HC32 ICs (OR Gate)
6. Connecting wires
7. LED
8. Resistor

## Reference Circuit:



## Procedure:

1. Drag all the components mentioned above to the Tinkercad working area.

2. Connect both the select inputs  $S_0$  and  $S_1$  to two AND gates directly and through another two AND gates after passing through a NOT gate.
3. Pass each of the input lines  $I_0$ ,  $I_1$ ,  $I_2$  and  $I_3$  through the AND gate.
4. Pass all the outputs of the four AND gates through an OR gate.
5. Connect an LED to the OR Gate. Connect a resistor to it and ground it.

### Code:

```
int pin1 = 2;
int pin2 = 3;
int pin3 = 4;
int pin4 = 5;
int pin5 = 6;
int pin6 = 7;
int S0, S1, I0, I1, I2, I3, k;

void setup()
{
```

```
pinMode(pin1, OUTPUT);
pinMode(pin2, OUTPUT);
pinMode(pin3, OUTPUT);
pinMode(pin4, OUTPUT);
pinMode(pin5, OUTPUT);
pinMode(pin6, OUTPUT);
Serial.begin(9600);
}

void loop()
{
  Serial.print("\nS0=");
  while(Serial.available()==0){}
  S0= Serial.read();
  S0= S0 - '0';
  Serial.println(S0);

  Serial.print("S1=");
  while(Serial.available()==0){}
  S1= Serial.read();
  S1 = S1 - '0';
  Serial.println(S1);

  Serial.print("I0=");
  while(Serial.available()==0){}
```

```
I0= Serial.read();
```

```
I0 = I0 - '0';
```

```
Serial.println(I0);
```

```
Serial.print("I1=");
```

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

```
I1= Serial.read();
```

```
I1 = I1 - '0';
```

```
Serial.println(I1);
```

```
Serial.print("I2=");
```

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

```
I2= Serial.read();
```

```
I2 = I2 - '0';
```

```
Serial.println(I2);
```

```
Serial.print("I3=");
```

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

```
I3= Serial.read();
```

```
I3 = I3 - '0';
```

```
Serial.println(I3);
```

```
digitalWrite(pin1, OUTPUT);
```

```
digitalWrite(pin2, OUTPUT);
```

```
digitalWrite(pin3, OUTPUT);
```

```
digitalWrite(pin4, OUTPUT);
```

```
digitalWrite(pin5, OUTPUT);
```

```
digitalWrite(pin6, OUTPUT);
```

```
Serial.print("Enter anything to go to read again");
```

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

```
k=Serial.read();
```

```
}
```

### Observation:

$S_1$	$S_0$	OUTPUT
0	0	$I_0$
0	1	$I_1$
1	0	$I_2$
1	1	$I_3$

### CONCLUSIVE EXPRESSION:

$$Y = I_0(S_1)'(S_0)' + I_1(S_1)'S_0 + I_2S_1(S_0)' + I_3S_1S_0$$

[Link for Tinkercad Simulation circuit part A](#)

## PART – B

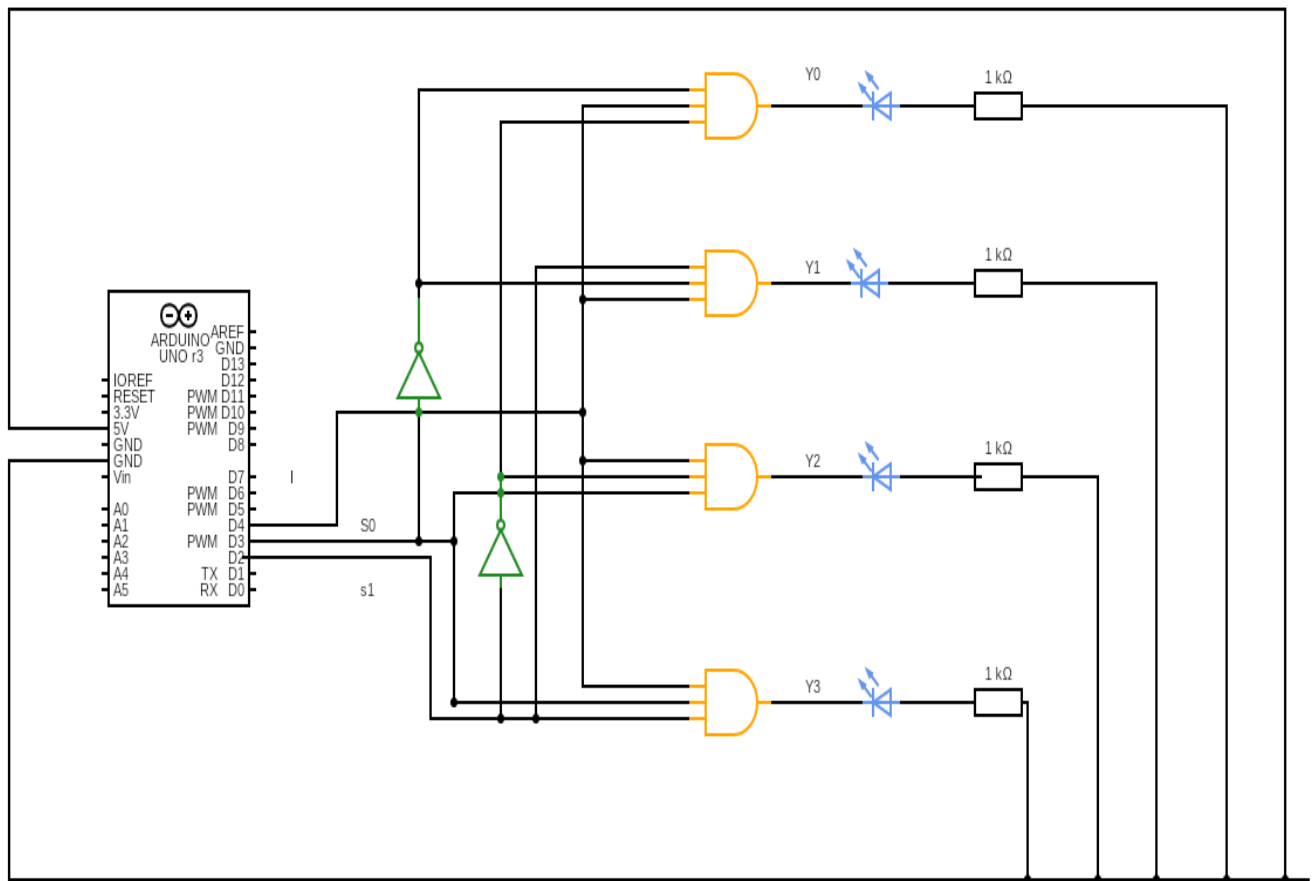
Aim/Objective of the experiment:

To design a 1:4 demultiplexer using basic logic gates.

Electronic Components Used:

1. Arduino UNO
2. Breadboard
3. Connecting Wires
4. 4 LEDs
5. 4 Resistors
6. 74HC04 IC
7. 2 74HC11 ICs

Reference Circuit:



I

### Procedure:

1. Drag all the electronic components mentioned above to the Tinkercad working area.
2. Pass the select lines S0 and S1 through two AND gates directly and through another two AND gates after passing through NOT gates.
3. Pass the input line through all four AND gates.



4. Connect an LED to each of the AND gates.
5. Connect resistors to the LEDs and ground them.

Code:

```
int pin1 = 2;
int pin2 = 3;
int pin3 = 4;
int x,y,z,k;

void setup()
{
  pinMode(pin1, OUTPUT);
  pinMode(pin2, OUTPUT);
  pinMode(pin3, OUTPUT);
  Serial.begin(9600);
}

void loop()
{
  Serial.print("\nS0=");
  while(Serial.available()==0){}
  x= Serial.read();
  x= x-'0';
  Serial.println(x);

  Serial.print("S1=");
```

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

```
y= Serial.read();
```

```
y = y- '0';
```

```
Serial.println(y);
```

```
Serial.print("Y=");
```

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

```
z= Serial.read();
```

```
z = z- '0';
```

```
Serial.println(z);
```

```
digitalWrite(pin1, x);
```

```
digitalWrite(pin2, y);
```

```
digitalWrite(pin3, z);
```

```
Serial.print("Enter anything to go to read again");
```

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

```
k=Serial.read();
```

```
}
```

**Observation:**

S <sub>1</sub>	S <sub>0</sub>	Y <sub>3</sub>	Y <sub>2</sub>	Y <sub>1</sub>	Y <sub>0</sub>
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0	0	0	0	0	I
0	1	0	0	I	0
1	0	0	I	0	0
1	1	I	0	0	0

$$y_0 = I(S_1)'(S_0)'$$

$$y_1 = I(S_1)'S_0$$

$$y_2 = IS_1(S_0)'$$

$$y_3 = IS_1S_0$$

[Link for Tinkercad Simulation circuit part B](#)

## PART – C

Aim/Objective of the experiment:

To assemble and test the circuits designed in parts A and B.

Electronic Components used:

1. Breadboards (2)
2. Mini Breadboard
3. Connecting wires

4. Arduino UNO

5. 4 LEDs

6. 4 Resistors

7. 74HC04 ICs (2)

8. 74HC11 ICs (4)

9. 74HC32 IC

Reference Circuit:

3. Connect both the breadboards having the MUX and DEMUX configurations to each other using another mini breadboard.

4. Connect all the breadboards to Arduino making  $V_{cc}$  and Ground connections.

Code:

```
int pin1 = 2;
int pin2 = 3;
int pin3 = 8;
int pin4 = 9;
int pin5 = 10;
int pin6 = 11;
int S0, S1, I0, I1, I2, I3, k;

void setup()
{
  pinMode(pin1, OUTPUT);
  pinMode(pin2, OUTPUT);
  pinMode(pin3, OUTPUT);
  pinMode(pin4, OUTPUT);
  pinMode(pin5, OUTPUT);
  pinMode(pin6, OUTPUT);
  Serial.begin(9600);
}
```

```
void loop()
{
  Serial.print("\nS0=");
  while(Serial.available()==0){}
  S0= Serial.read();
  _S0= S0-'0';
  Serial.println(S0);
```

```
  Serial.print("S1=");
  while(Serial.available()==0){}
  S1= Serial.read();
  S1 = S1- '0';
  Serial.println(S1);
```

```
  Serial.print("I0=");
  while(Serial.available()==0){}
  I0= Serial.read();
  I0 = I0- '0';
  Serial.println(I0);
```

```
  Serial.print("I1=");
  while(Serial.available()==0){}
  I1= Serial.read();
  I1 = I1- '0';
```

```
Serial.println(I1);
```

```
Serial.print("I2=");
```

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

```
I2= Serial.read();
```

```
I2 = I2- '0';
```

```
Serial.println(I2);
```

```
Serial.print("I3=");
```

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

```
I3= Serial.read();
```

```
I3 = I3- '0';
```

```
Serial.println(I3);
```

```
digitalWrite(pin1, OUTPUT);
```

```
digitalWrite(pin2, OUTPUT);
```

```
digitalWrite(pin3, OUTPUT);
```

```
digitalWrite(pin4, OUTPUT);
```

```
digitalWrite(pin5, OUTPUT);
```

```
digitalWrite(pin6, OUTPUT);
```

```
Serial.print("Enter anything to go to read again");
```

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

```
k=Serial.read();
```



}

Observation:

$S_1$	$S_0$	OUTPUT
0	0	$I_0$
0	1	$I_1$
1	0	$I_2$
1	1	$I_3$

[Link for Tinkercad simulation circuit part C](#)