

LAB REPORT- 4

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Aim/Objective of the experiement:

To design an Arithmetic and Logic Unit (ALU) capable of performing 8 Arithmetic/Logic functions on 1-bit operands,as listed in below table.

$F_2F_1F_0$	ALU function	Y_0	Y_1
000	0 (Zero)	-	0
001	A OR B	-	$A+B$
010	A AND B	-	$A*B$
011	A EXOR B	-	$A\oplus B$
100	A PLUS B	carry	sum
101	A MINUS B	borrow	difference
110	A PLUS B PLUS C	carry	sum
111	A MINUS B MINUS C	borrow	difference

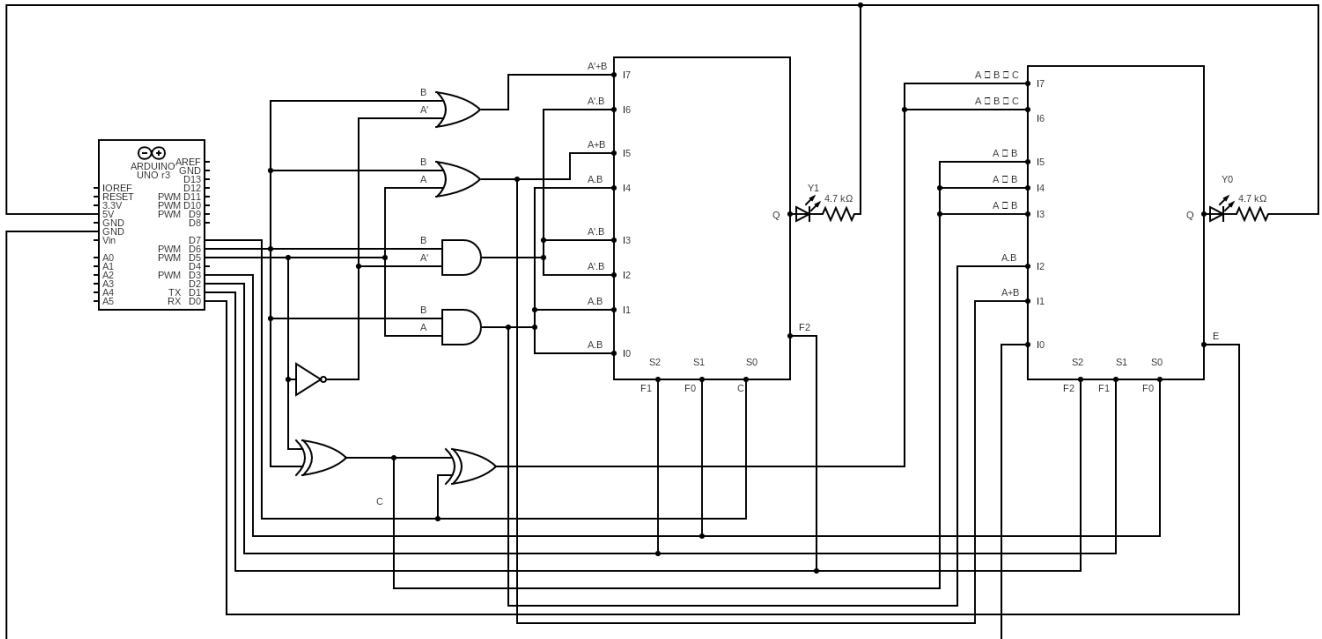
ELECTRONIC COMPONENTS USED:

- 1)3-Hex inverters
- 2)8-Dual 4-Input AND gate
- 3)5-Quad OR gate
- 4)2-Red LEDs
- 5)2- 1 k Ω Resistors
- 6)3-Quad AND gates
- 7)1-Quad XOR gate.
- 8)1-Arduino Uno R3.

9)3-Breadboards.

10)4-Breadboard mini and 2-Breadboard small.

REFERENCE CIRCUIT:



PROCEDURE:

1)Make two 8:1 MUX es.

2)Connect power pin and ground pin to the both of the MUXes .

3)Take one breadboard and place 7404 IC,7408 IC,7432 IC, 7486 IC on it.

4)Give connections to the IC s according to the ALU function mentioned in the above table.

5) Finally , make the circuit as shown in the above reference circuit.

6)After completing the setup enter the below code and observe outputs from the both Y_1 and Y_0 .

7)CODE:

```
int pin1=2;
int pin2=3;
int pin3=4;
int pin4=5;
int pin5=6;
int pin6=7;
int A,B,C,F0,F1,F2,r;
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("\nF2=");  
while(Serial.available() == 0) {}  
F2 = Serial.read();  
F2 = F2 - '0';  
Serial.println(F2);
```

```
Serial.print("\nF1=");  
while(Serial.available() == 0) {}  
F1 = Serial.read();  
F1 = F1 - '0';  
Serial.println(F1);
```

```
Serial.print("\nF0=");  
while(Serial.available() == 0) {}  
F0 = Serial.read();  
F0 = F0 - '0';  
Serial.println(F0);
```

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

```
A=Serial.read();  
A=A-'0';  
Serial.println(A);
```

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

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

```
digitalWrite(pin1,F2);  
digitalWrite(pin2,F1);  
digitalWrite(pin3,F0);  
digitalWrite(pin4,A);
```

```
digitalWrite(pin5,B);
```

```
digitalWrite(pin6,C);
```

```
Serial.print("Press key to forward");
```

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

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

```
delay(1000);
```

```
}
```

CONCLUSION:

1)We construct the truth table for the inputs from F2,F2,F0,A,B,C and outputs Y1&Y0.

2)For the MUX1 we don't get any output if F2=0 because here we give f2 as enable pin

3)We observed for 64 inputs and note down their outputs as mentioned below.

Truth table for the ALU function							
F2	F1	F0	A	B	C	Y1	Y0
For F2=0 ; F1=0 ;F0=0							
0	0	0	0	0	0	~	0
0	0	0	0	0	1	~	0
0	0	0	0	1	0	~	0
0	0	0	0	1	1	~	0
0	0	0	1	0	0	~	0
0	0	0	1	0	1	~	0
0	0	0	1	1	0	~	0
0	0	0	1	1	1	~	0

For F2=0 ; F1=0 ;F0=1							
0	0	1	0	0	0	~	0
0	0	1	0	0	1	~	0
0	0	1	0	1	0	~	1
0	0	1	0	1	1	~	1
0	0	1	1	0	0	~	1
0	0	1	1	0	1	~	1
0	0	1	1	1	0	~	1
0	0	1	1	1	1	~	1
For F2=0 ; F1=1 ;F0=0							
0	1	0	0	0	0	~	0
0	1	0	0	0	1	~	0
0	1	0	0	1	0	~	0
0	1	0	0	1	1	~	0
0	1	0	1	0	0	~	0
0	1	0	1	0	1	~	0
0	1	0	1	1	0	~	1
0	1	0	1	1	1	~	1
For F2=0 ; F1=1 ;F0=1							
0	1	1	0	0	0	~	0
0	1	1	0	0	1	~	0
0	1	1	0	1	0	~	1
0	1	1	0	1	1	~	1
0	1	1	1	0	0	~	1
0	1	1	1	0	1	~	1
0	1	1	1	1	0	~	0
0	1	1	1	1	1	~	0
For F2=1 ; F1=0 ;F0=0							
1	0	0	0	0	0	~	0
1	0	0	0	0	1	~	0
1	0	0	0	1	0	~	1
1	0	0	0	1	1	~	1
1	0	0	1	0	0	~	1
1	0	0	1	0	1	~	1
1	0	0	1	1	0	1	0

1	0	0	1	1	1	1	0
For F2=1 ; F1=0 ;F0=1							
1	0	1	0	0	0	0	0
1	0	1	0	0	1	0	0
1	0	1	0	1	0	1	1
1	0	1	0	1	1	1	1
1	0	1	1	0	0	0	1
1	0	1	1	0	1	0	1
1	0	1	1	1	0	0	0
1	0	1	1	1	1	0	0
For F2=1 ; F1=1 ;F0=0							
1	1	0	0	0	0	0	0
1	1	0	0	0	1	0	1
1	1	0	0	1	0	0	1
1	1	0	0	1	1	1	0
1	1	0	1	0	0	0	1
1	1	0	1	0	1	1	0
1	1	0	1	1	0	1	0
1	1	0	1	1	1	1	1
For F2=1 ; F1=1 ;F0=1							
1	1	1	0	0	0	0	0
1	1	1	0	0	1	1	1
1	1	1	0	1	0	1	1
1	1	1	0	1	1	1	0
1	1	1	1	0	0	0	1
1	1	1	1	0	1	0	0
1	1	1	1	1	0	0	0
1	1	1	1	1	1	1	1

LINK FOR THE TINKERCAD SIMULATION:

https://www.tinkercad.com/things/cDcjEWNqzaE-alu-lab4/editel?sharecode=p3Kvb9FDTNRBUP0HHbdVq_PliPVBviOhWkUV-3JmkZo

