LAB REPORT: 4

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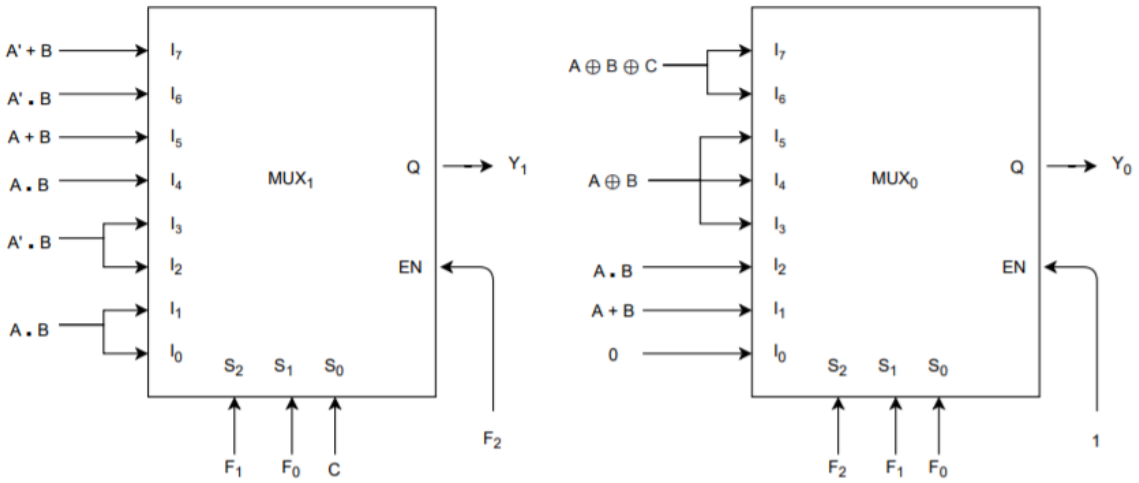
Aim/Objective of the experiment: To design an Arithmetic Logical Unit (ALU) capable of performing 8 arithmetic/logic functions on 1 bit operands.

Electronic components used: 1 Arduino board, two 1 kilo ohm resistors, 2 LEDs, 3 hex inverters(74HC04), 8 dual 4-input AND gates(74HC21), 5 quad OR gates(74HC32), 3 quad AND gates(74HC08), 1 quad XOR gate, wires

Reference Circuit:



Procedure:

1. The ALU is designed in accordance with the circuit diagram above.
2. F_0, F_1, F_2, A, B and C are taken as inputs from the Arduino with appropriate code.
3. All the input combinations are applied one by one and the observed output Y_0 and Y_1 are tabulated.

   The code:

```
int f0,f1,f2,a,b,c;

void setup()
{
  pinMode(2,OUTPUT);
  pinMode(3,OUTPUT);
  pinMode(4,OUTPUT);
  pinMode(7,OUTPUT);
  pinMode(6,OUTPUT);
  pinMode(5,OUTPUT);
  Serial.begin(9600);
}

void loop()
{

  if(Serial.available()>0)
  {
    f0=Serial.read();
    f0=f0-'0';

    digitalWrite(2,f0);
    Serial.print("\nF0: ");
    Serial.print(f0);
  }

  if(Serial.available()>0)
  {
    f1=Serial.read();
    f1=f1-'0';

    digitalWrite(3,f1);
    Serial.print("\nF1: ");
    Serial.print(f1);
  }
```

```
  if(Serial.available()>0)
  {
    f2=Serial.read();
    f2=f2-'0';

    digitalWrite(4,f2);
    Serial.print("\nF2: ");
    Serial.print(f2);
  }

  if(Serial.available()>0)
  {
    a=Serial.read();
    a=a-'0';

    digitalWrite(7,a);
    Serial.print("\nA: ");
    Serial.print(a);
  }

  if(Serial.available()>0)
  {
    b=Serial.read();
    b=b-'0';

    digitalWrite(6,b);
    Serial.print("\nB: ");
    Serial.print(b);
  }

  if(Serial.available()>0)
  {
    c=Serial.read();
    c=c-'0';

    digitalWrite(5,c);
    Serial.print("\nC: ");
     Serial.print(c);
    Serial.print("\n");
  }
  delay(100);

}
```

Conclusion:

Y_0Y_1 is tabulated for all input combinations.

ABC → / **$F_0F_1F_2$ ↓**	000	001	010	011	100	101	110	111
000	00	00	00	00	00	00	00	00
001	00	00	01	01	01	01	01	01
010	00	00	00	00	00	00	01	01
011	00	00	01	01	01	01	00	00
100	00	00	01	01	01	01	10	10
101	00	00	11	11	01	01	00	00
110	00	01	01	10	01	10	10	11
111	00	11	11	10	01	00	00	11

So, it is verified that they conform to the respective ALU functions.

TinderCAD simulation: https://www.tinkercad.com/things/9PQoIWKgqPl-lab-4-alu-81/editel?sharecode=vxqqnCBHr8hEr0Ag3ChdCpqgeLHcPKp947PCUE8QKxI