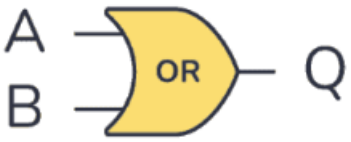
TITLE: DIGITAL IC TESTER

MADE BY: HARSHITHA M(1DS21EE039) & NIKHILESH SINGH(1DS21EE063)
DAYANANDA SAGAR COLLEGE OF ENGINEERING

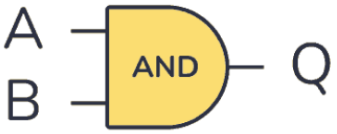
Introduction

The digital IC tester is an essential tool designed to verify the functionality of digital integrated circuits (ICs) like 7400, 7402, 7404, 7408, and 7432. These ICs are fundamental building blocks in digital electronics, and their correct operation is crucial in various applications. This project uses an Arduino microcontroller to automate the testing process and displays the results on an LCD screen, making it a user-friendly and efficient solution for checking IC health.



A	B	Q
0	0	0
0	1	1
1	0	1
1	1	1

Truth table for the OR gate



A	B	Q
0	0	0
0	1	0
1	0	0
1	1	1

Truth table for the AND gate

A	B	Q
0	0	1
0	1	0
1	0	0
1	1	0

Truth table for the NOR gate

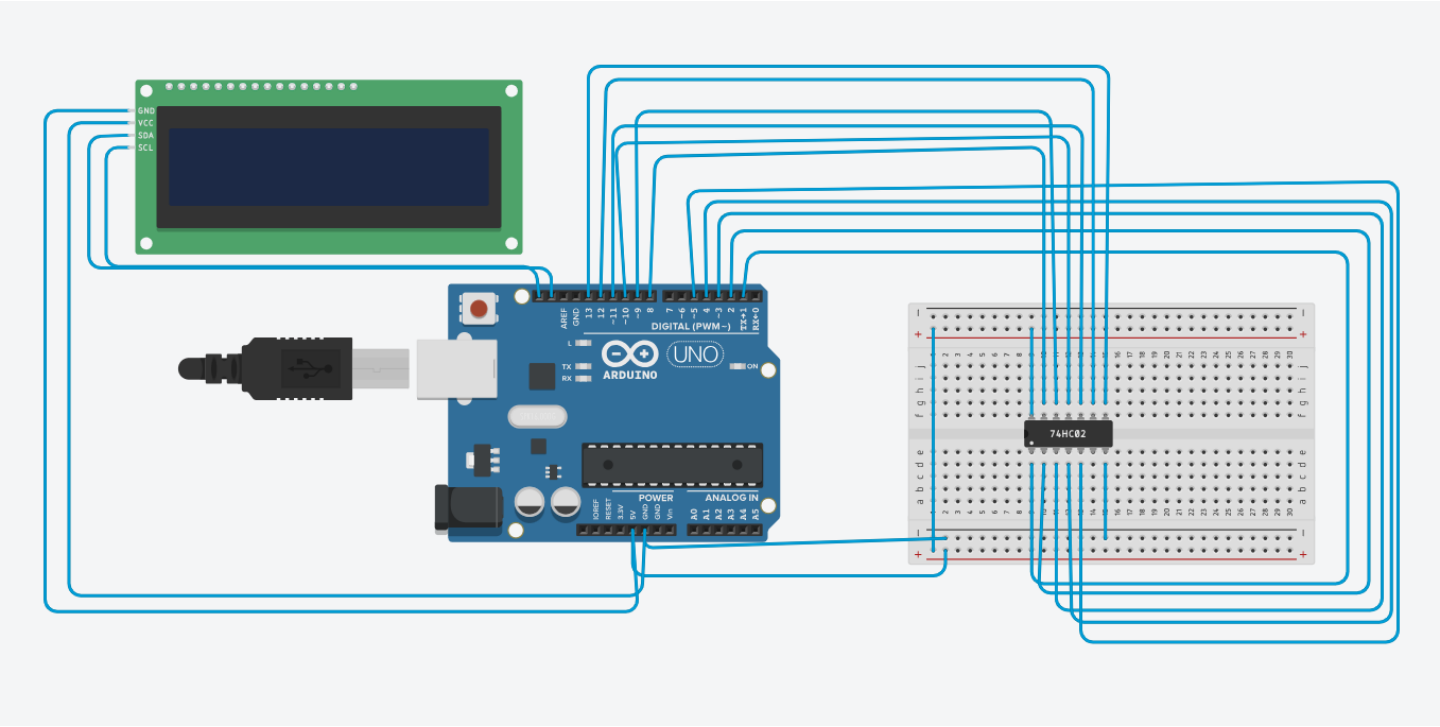
A	Q
0	1
1	0

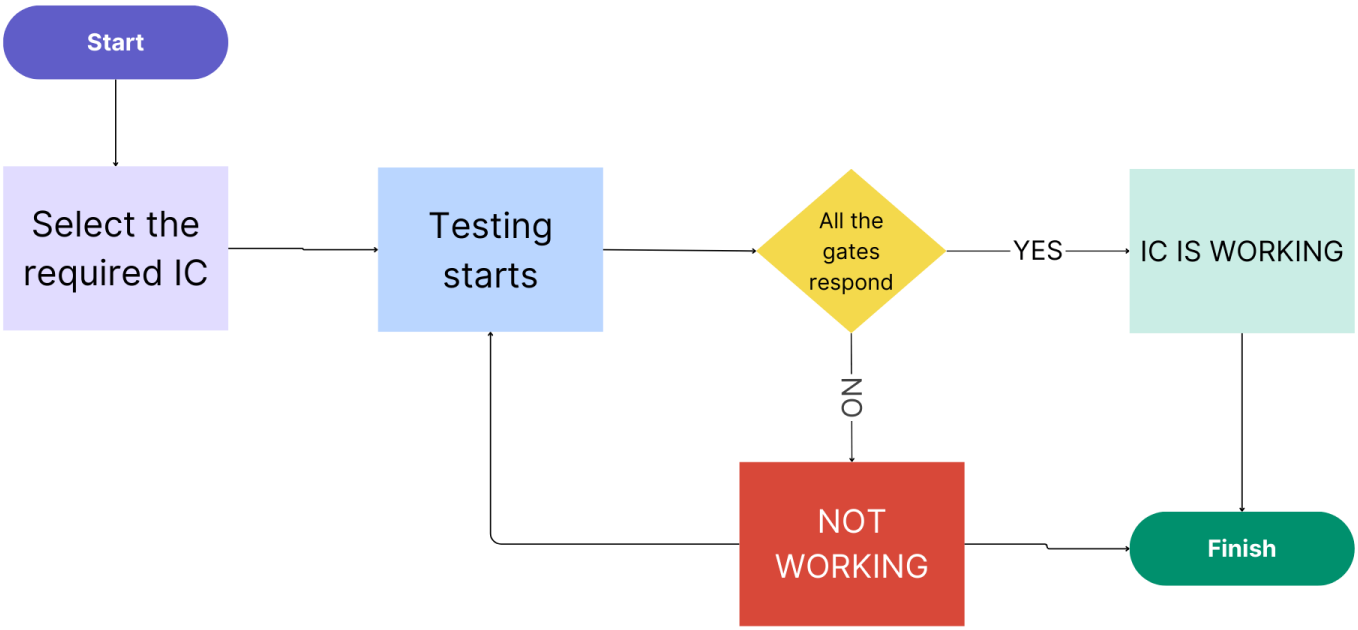
Truth table for the NOT gate (inverter)

Working

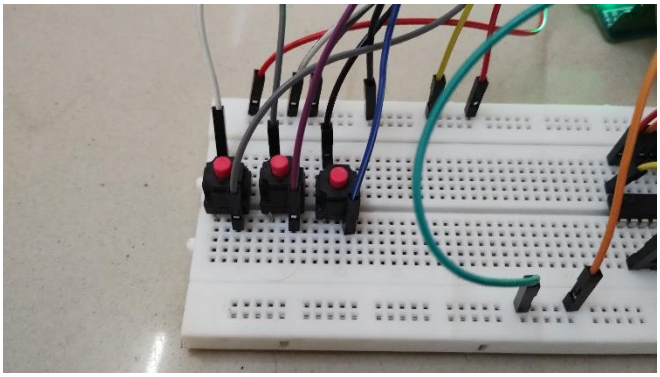
The IC tester operates by interfacing the Arduino with the target IC and an LCD display. The Arduino is programmed to sequentially apply predefined input signals to the IC under test. It then reads the corresponding outputs from the IC and compares them to expected results stored in the program.

1. **Setup**: The IC is inserted into a designated socket connected to the Arduino. The connections ensure that each input and output pin of the IC can be controlled and monitored by the microcontroller.
2. **Testing**: The Arduino sends specific logic levels (HIGH or LOW) to the input pins of the IC. It then reads the output pins' states and compares them to the correct logic levels for that particular IC type.
3. **Result Display**: If the IC operates as expected, the Arduino sends a signal to the LCD, indicating the IC is functioning correctly. If there is any discrepancy between the expected and actual outputs, the Arduino displays a failure message, signifying a faulty IC.

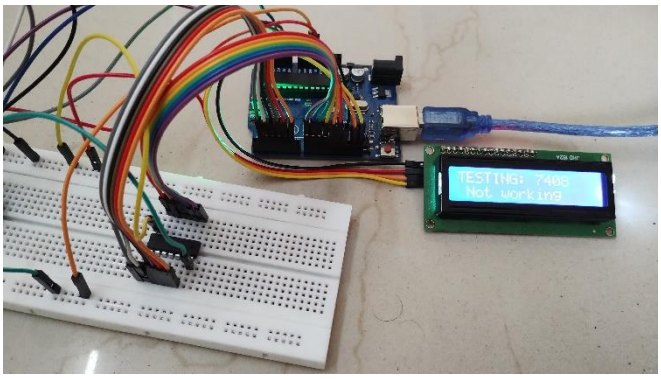


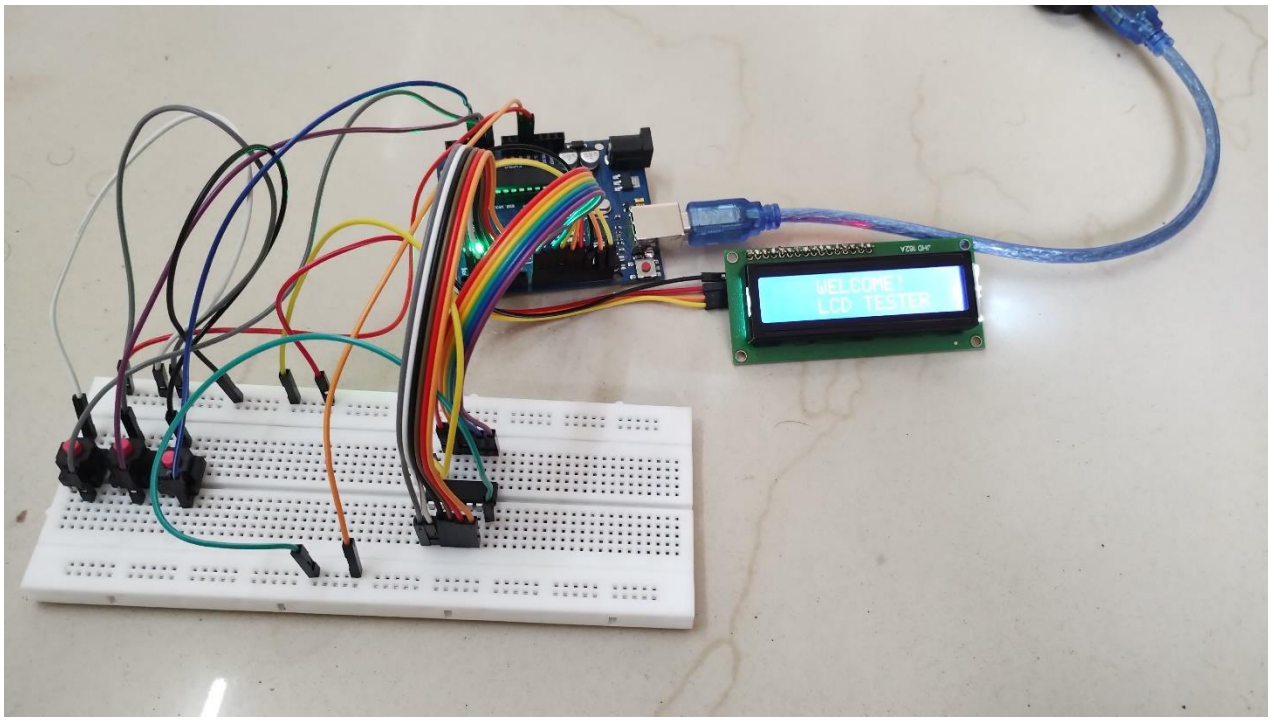

Start
Select the required IC
Testing starts
All the gates respond
YES
IC IS WORKING
NO
NOT WORKING
Finish


WELCOME!
LCD TESTER




TESTING: 7408
Not working





CODE:

```
#include <LiquidCrystal_I2C.h>
#include <Wire.h>

int scrollUp = A0;
int scrollDown = A1;
int enter = A2;

LiquidCrystal_I2C lcd(0x27,  16, 2);
void setup() {
  lcd.init();
  lcd.backlight();
  delay(250);
  pinMode(scrollUp, INPUT);
  pinMode(scrollDown, INPUT);
  pinMode(enter, INPUT);
}
```

```
void loop() {
  int ics[] = {7400,7402,7404,7407,7408,7432};
  int total = sizeof(ics)/sizeof(ics[0]);
  int currentIndex = 0;
  bool selected = false;
  void (*tester[total])() {
    nand7400,
    nor7402,
    not7404,
    buffer7407,
    aand7408,
    or7432,
  };
  print(4,0,"WELCOME!");
  delay(2000);
  lcd.clear();

  while(!selected){
    lcd.clear();
    print(0,0,"IC: " + String(ics[currentIndex]));
    if(digitalRead(scrollUp) && currentIndex<total-1){
      delay(500);
      if(digitalRead(scrollUp) && currentIndex<total-1)
      currentIndex++;

    }
    if(digitalRead(scrollDown) && currentIndex > 0){
      delay(500);
      if(digitalRead(scrollDown) && currentIndex > 0)
      currentIndex--;
    }
    if(digitalRead(enter)){
      delay(500);
      if(digitalRead(enter)){
        lcd.clear();
        print(0,0,"TESTING: " + String(ics[currentIndex]));
        delay(500);
        print(1, 1, "Testing...");
        tester[currentIndex]();

        delay(5000);

      }
    }
  }
}

void print(int c,int r,String s){
```

```
  lcd.setCursor(c,r);
  lcd.print(s);
  delay(250);

}

bool not7404() {
  int ip[] = {1, 3, 5, 9, 11, 13};
  int op[] = {2, 4, 6, 8, 10, 12};
  int a = 0, b = 0, p = 0;
  for (int i = 0; i < 6; i++) {
    pinMode(ip[i], INPUT);
    pinMode(op[i], OUTPUT);
  }
  for (int i = 0; i < 6; i++) {
    digitalWrite(ip[i], HIGH);
    a = digitalRead(op[i]);
    delay(500);
    digitalWrite(ip[i], LOW);
    b = digitalRead(op[i]);
    delay(500);
    if (a == 0 && b == 1) {
      p++;
      continue;
    } else {
      break;
    }
  }
  if(p == 6){
    lcd.clear();
    print(0, 1,"IC: 7404");
    print(1, 1,"Working");
  }
  else{
    lcd.clear();
    print(0, 1,"IC: 7404");
    print(1,1,"Not Working");
  }
}

bool buffer7407() {
  int ip[] = {1, 3, 5, 9, 11, 13};
  int op[] = {2, 4, 6, 8, 10, 12};
  int a = 0, b = 0, p = 0;
  for (int i = 0; i < 6; i++) {
    pinMode(ip[i], INPUT);
    pinMode(op[i], OUTPUT);
  }
  for (int i = 0; i < 6; i++) {
```

```
    digitalWrite(ip[i], HIGH);
    delay(500);
    a = digitalRead(op[i]);
    delay(500);
    digitalWrite(ip[i], LOW);
    delay(500);
    b = digitalRead(op[i]);
    delay(500);
    if (a == 1 && b == 0) {
      p++;
      continue;
    } else {
      break;
    }
  }
  return (p == 6);
}

bool nand7400() {
  int ip[] = {1,2,4,5,9,10,12,13};
  int op[] = {3,6,8,11};
  int a = 0, b = 0, c = 0,d=0,p=0;
  int j=0;
  for (int i = 0; i < 8; i++)
    pinMode(ip[i], INPUT);
    for (int i = 0; i < 4; i++)
    pinMode(op[i], OUTPUT);
    for(int i=0;i<8;i+=2){
      j=0;
    digitalWrite(ip[i],LOW);
    digitalWrite(ip[i+1],LOW);
    a=digitalRead(op[j]);

      digitalWrite(ip[i],LOW);
    digitalWrite(ip[i+1],HIGH);
    b=digitalRead(op[j]);

      digitalWrite(ip[i],HIGH);
    digitalWrite(ip[i+1],LOW);
    c=digitalRead(op[j]);

      digitalWrite(ip[i],HIGH);
    digitalWrite(ip[i+1],HIGH);
    d=digitalRead(op[j]);
    j=j+1;

    if(a==1 && b==1 && c==1 && d==0){
      p++;
      continue;
```

```
  }

  else
  break;
  }
  if(p == 4){
  lcd.clear();
  print(0, 1,"IC: 7400");
  print(1, 1,"Working");
}
else{
  lcd.clear();
  print(0, 1,"IC: 7400");
  print(1,1,"Not Working");
}
  }

  bool aand7408() {
int ip[] = {1,2,4,5,9,10,12,13};
int op[] = {3,6,8,11};
int a = 0, b = 0, c = 0,d=0,p=0;
int j=0;
for (int i = 0; i < 8; i++)
  pinMode(ip[i], INPUT);
  for (int i = 0; i < 4; i++)
  pinMode(op[i], OUTPUT);
  for(int i=0;i<8;i+=2){
    j=0;
  digitalWrite(ip[i],LOW);
  digitalWrite(ip[i+1],LOW);
  a=digitalRead(op[j]);

    digitalWrite(ip[i],LOW);
  digitalWrite(ip[i+1],HIGH);
  b=digitalRead(op[j]);

    digitalWrite(ip[i],HIGH);
  digitalWrite(ip[i+1],LOW);
  c=digitalRead(op[j]);

    digitalWrite(ip[i],HIGH);
  digitalWrite(ip[i+1],HIGH);
  d=digitalRead(op[j]);
  j=j+1;

  if(a==0 && b==0 && c==0 && d==1){
    p++;
    continue;
  }
```

```
  else
  break;
  }
  if(p == 4){
  lcd.clear();
  print(0, 1,"IC: 7408");
  print(1, 1,"Working");
}
else{
  lcd.clear();
  print(0, 1,"IC: 7408");
  print(1,1,"Not Working");
}
  }

  bool nor7402() {
int ip[] = {2,3,5,6,8,9,11,12};
int op[] = {1,4,10,13};
int a = 0, b = 0, c = 0,d=0,p=0;
int j=0;
for (int i = 0; i < 8; i++)
  pinMode(ip[i], INPUT);
  for (int i = 0; i < 4; i++)
  pinMode(op[i], OUTPUT);
  for(int i=0;i<8;i+=2){
    j=0;
  digitalWrite(ip[i],LOW);
  digitalWrite(ip[i+1],LOW);
  a=digitalRead(op[j]);

    digitalWrite(ip[i],LOW);
  digitalWrite(ip[i+1],HIGH);
  b=digitalRead(op[j]);

    digitalWrite(ip[i],HIGH);
  digitalWrite(ip[i+1],LOW);
  c=digitalRead(op[j]);

    digitalWrite(ip[i],HIGH);
  digitalWrite(ip[i+1],HIGH);
  d=digitalRead(op[j]);
  j=j+1;

  if(a==1 && b==0 && c==0 && d==0){
    p++;
    continue;
  }
```

```
  else
  break;
  }
  if(p == 4){
  lcd.clear();
  print(0, 1,"IC: 7402");
  print(1, 1,"Working");
}
else{
  lcd.clear();
  print(0, 1,"IC: 7402");
  print(1,1,"Not Working");
};
  }

  bool or7432() {
int ip[] = {1,2,4,5,9,10,12,13};
int op[] = {3,6,8,11};
int a = 0, b = 0, c = 0,d=0,p=0;
int j=0;
for (int i = 0; i < 8; i++)
  pinMode(ip[i], INPUT);
  for (int i = 0; i < 4; i++)
  pinMode(op[i], OUTPUT);
  for(int i=0;i<8;i+=2){
    j=0;
  digitalWrite(ip[i],LOW);
  digitalWrite(ip[i+1],LOW);
  a=digitalRead(op[j]);

    digitalWrite(ip[i],LOW);
  digitalWrite(ip[i+1],HIGH);
  b=digitalRead(op[j]);

    digitalWrite(ip[i],HIGH);
  digitalWrite(ip[i+1],LOW);
  c=digitalRead(op[j]);

    digitalWrite(ip[i],HIGH);
  digitalWrite(ip[i+1],HIGH);
  d=digitalRead(op[j]);
  j=j+1;

  if(a==0 && b==1 && c==1 && d==1){
    p++;
    continue;
  }

  else
```

```
   break;
   }
   if(p == 4){
   lcd.clear();
   print(0, 1,"IC: 7432");
   print(1, 1,"Working");
  }
  else{
   lcd.clear();
   print(0, 1,"IC: 7432");
   print(1,1,"Not Working");
  };


}
```

Conclusion

The digital IC tester provides a reliable, quick, and straightforward method for verifying the functionality of common digital ICs. By leveraging the capabilities of an Arduino, the tester simplifies the process of IC validation, making it accessible for both hobbyists and professionals in electronics. The successful implementation of this project demonstrates the versatility and power of microcontroller-based systems in practical applications.