

Assignment-2

ELP - 720 TELECOMMUNICATION NETWORKS LABORATORY

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A report presented for the assignment on
Arduino



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1 Problem Statement-1

1.1 Problem Statement

Use Tinkercad for this.

Implement a Calculator which has the following functionality:

- Take user id from the user and display it in the LCD.
- LCD must display “CORRECT” if the id is correct and “INCORRECT” if the id is wrong,
 - All the LEDs connected to the system must blink.
 - Input two integer numbers from the user and display the decimal form in LCD.
 - Input Operator (+,-,*,/) and display in LCD
 - Calculate the result and display the decimal form in LCD and binary form using the LEDs.
 - After the result, the user should be logged out automatically.

Note: User-id can be hardcoded.

Input and Output Format:

Enter user id: 1234

CORRECT

Enter number1: 5

Enter number2: 7

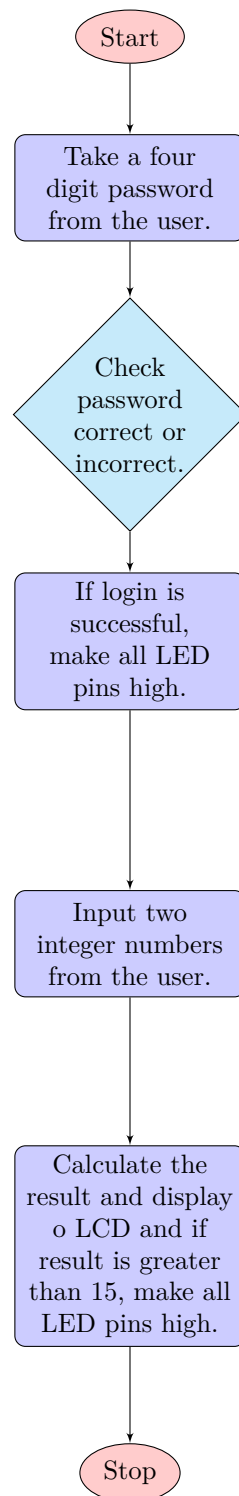
Operator: +

Result: 12

1.2 Algorithm and Implementation

- Start
- Take a four digit password from the user.
- If password is incorrect, again enter password otherwise print correct.
- If login is successful, make all LED pins high.
- Input two integer numbers from the user.
- Assign keys for +, -, * and /.
- Calculate the result and display o LCD and if result is greater than 15, make all LED pins high.
- Stop

1.3 Program Structure



1.4 Screenshots

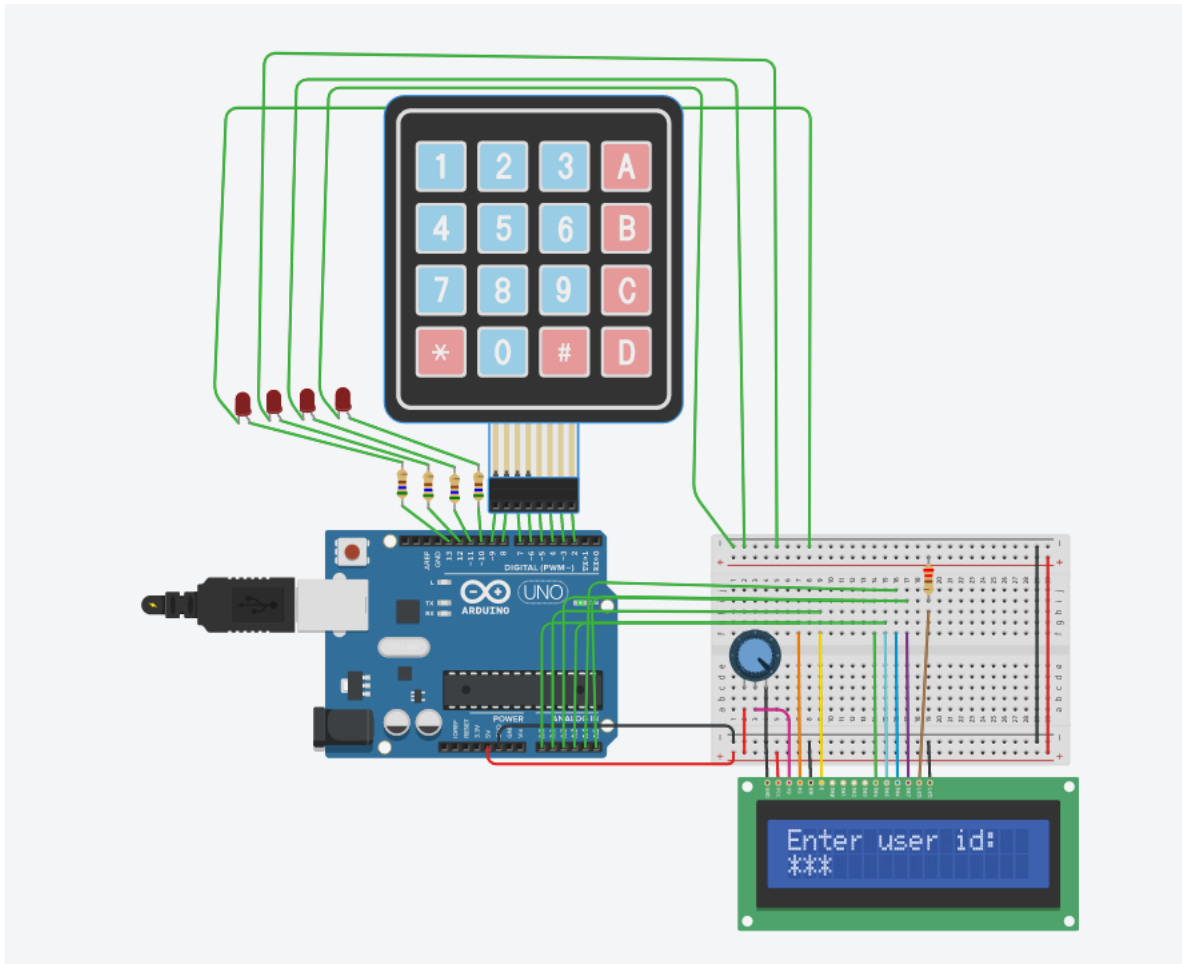


Figure 1: Ps1

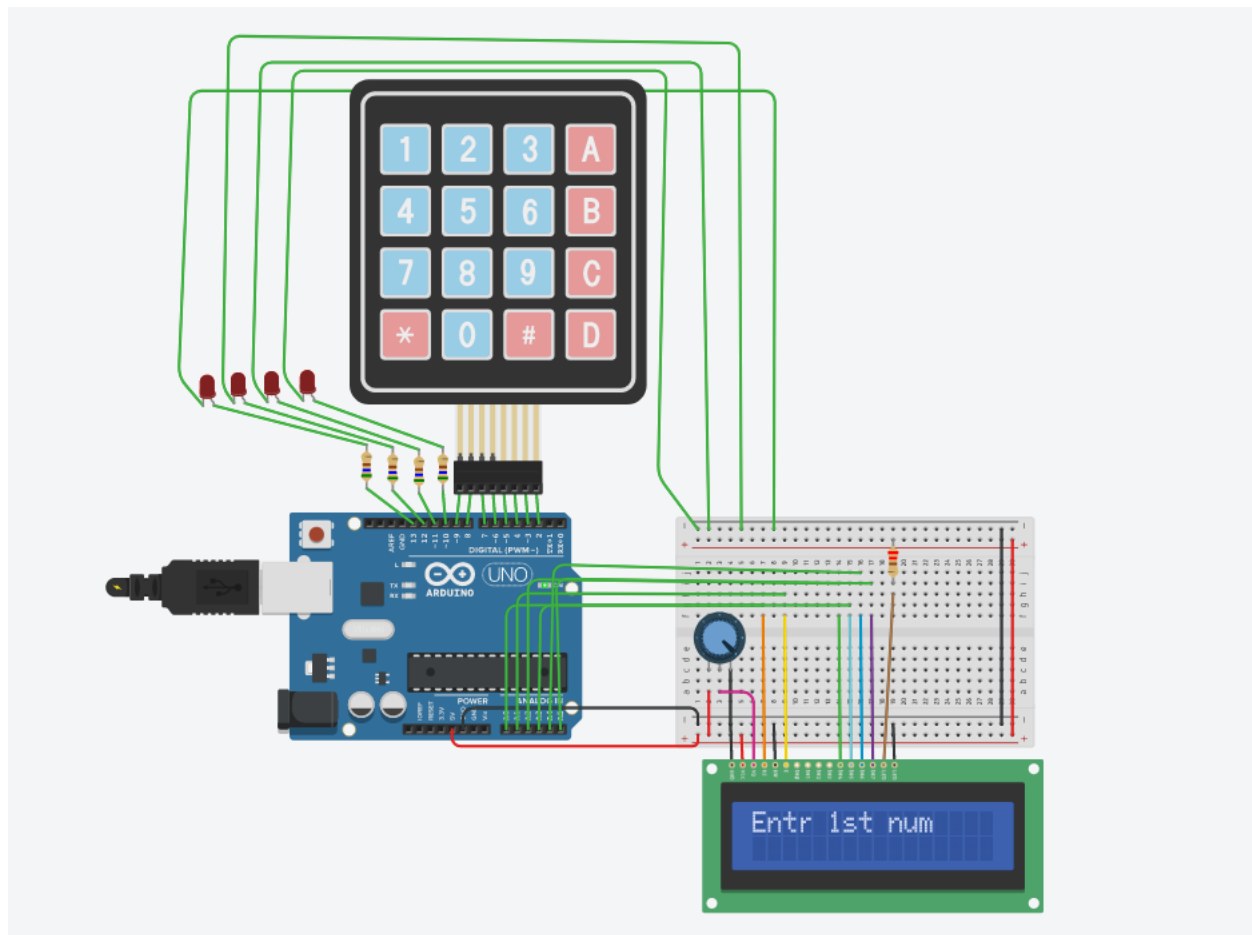


Figure 2: Ps1

2 Problem Statement 2

2.1 Problem Statement

Use the Arduino kit.

Design a priority encoder with 4 inputs and 2 outputs and enable pin.

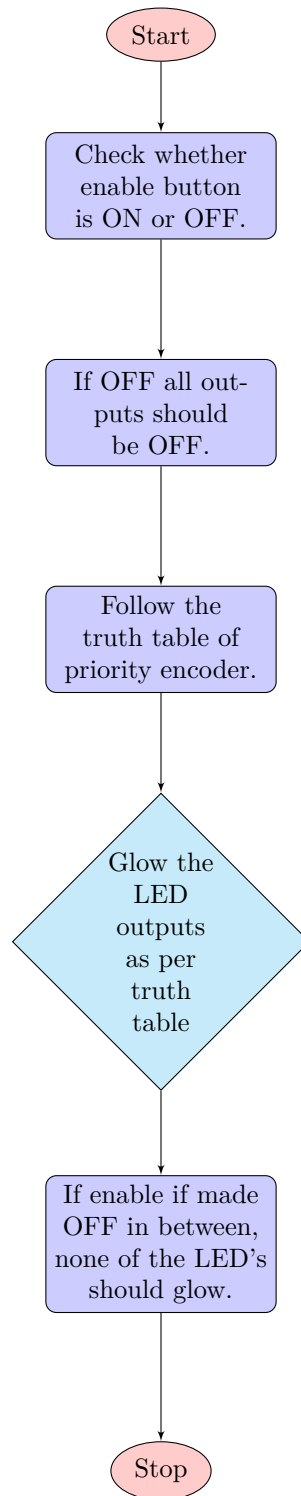
- Use button to enable the system
- Use buttons to enter input
- Display the output using LEDs

Implement the truth table for the priority encoder and write it into a text file which is stored into SD card one at a time as per the value of data, with the following format:
Enable Inp A(High Priority) Inp B Inp C Inp D(Low Priority) Out1 Out0

2.2 Algorithm and Implementation

- Start
- Check whether enable button is ON or OFF.
- If OFF all outputs should be OFF.
- If ON, check for other inputs.
- Follow the truth table of priority encoder.
- Glow the LED outputs as per truth table.
- If enable if made OFF in between, none of the LED's should glow.
- Stop

2.3 Program Structure



2.4 Screenshots

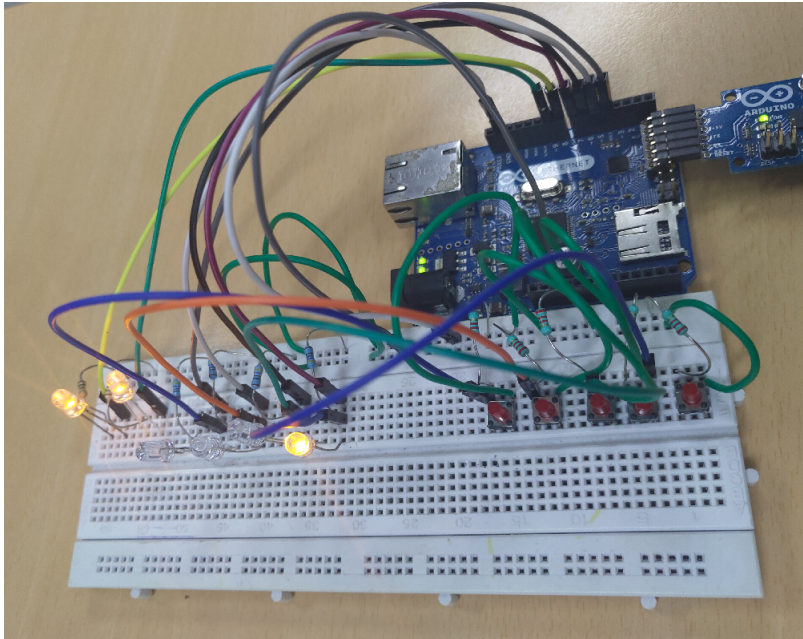


Figure 3: Ps2

A Appendix

A.1 Code for ps1

```
#include <LiquidCrystal.h>
#include <Keypad.h>
bool flg;
char dig;
int num;

int pin2=13;
int pin3=12;
int pin4=11;
int pin5=10;
int waitTime = 1000;

// initialize the library with the numbers of the interface pins
LiquidCrystal lcd(A0,A1,A2,A3,A4,A5);

const byte ROWS = 4;
const byte COLS = 4;
char sum;
int total = 5;

char hexaKeys[ROWS][COLS] = {
  {'1','2','3','+'},

  {'4','5','6','-'},

  {'7','8','9','c'},

  {'*','0','=','/'}}

};

byte rowPins[ROWS] = { 9, 8, 7, 6 };
byte colPins[COLS] = { 5, 4, 3, 2 };

Keypad customKeypad = Keypad(makeKeymap(hexaKeys), rowPins, colPins, ROWS, COLS);

char keypress()
{
  char customKey = customKeypad.getKey();
  while(customKey == 0)
  {
    customKey = customKeypad.getKey();
  }
  return customKey;
}
```

```

void setup() {

pinMode(pin2,OUTPUT);
pinMode(pin3,OUTPUT);
pinMode(pin4,OUTPUT);
pinMode(pin5,OUTPUT);

  lcd.begin(16, 2); //We are using a 16*2 LCD display
  lcd.print("----Welcome----"); //Display a intro message
  lcd.setCursor(0, 1); // set the cursor to column 0, line 1
  lcd.print("---CALCULATOR---"); //Display a intro message


  delay(2000); //Wait for display to show info
  lcd.clear(); //Then clean it

}

void loop() {
  // set the cursor to column 0, line 1
  // (note: line 1 is the second row, since counting begins with 0):
  flg = false;
  while(flg == false)
  {
    lcd.clear();
    lcd.print("Enter user id:");
    lcd.setCursor(0,1);
    char a = keypress();
    lcd.print('*');
    char b = keypress();
    lcd.print('*');
    char c = keypress();
    lcd.print('*');
    char d = keypress();
    lcd.print('*');
    if((a=='1') && (b=='2') && (c=='3') && (d=='4'))
    {
      lcd.print(" Correct");
      delay(2000);
      flg = true;
    }
    else
    {
      lcd.print(" Incorrect");
      delay(2000);
      flg = false;
    }
  }
}

```

```
}
```

```
lcd.clear();  
lcd.print("Entr 1st num");  
lcd.setCursor(0,1);  
dig = keypress();  
lcd.write(dig);  
int num1 = (int(dig)-48);  
while(dig != 'c')  
{  
    dig = keypress();  
    if(dig == 'c')  
    {  
        break;  
    }  
    if(dig!='c')  
    {  
        lcd.write(dig);  
        num1 = num1*10 + (int(dig)-48);  
    }  
}
```

```
lcd.clear();  
lcd.print("Entr 2nd num");  
lcd.setCursor(0,1);  
dig = keypress();  
lcd.write(dig);  
int num2 = (int(dig)-48);  
while(dig != 'c')  
{  
    dig = keypress();  
    if(dig == 'c')  
    {  
        break;  
    }  
    if(dig!='c')  
    {  
        lcd.write(dig);  
        num2 = num2*10 + (int(dig)-48);  
    }  
}
```

```
lcd.clear();  
lcd.print("Enter operation");  
lcd.setCursor(0,1);  
dig = keypress();  
lcd.write(dig);  
delay(1000);
```

```

if(dig =='+')
{
    num = num1 + num2;
    lcd.clear();
    lcd.print("Ans ");
    lcd.print(num);
}
if(dig =='-')
{
    num = num1 - num2;
    lcd.clear();
    lcd.print("Ans ");
    lcd.print(num);
}
if(dig =='*')
{
    num = num1 * num2;
    lcd.clear();
    lcd.print("Ans ");
    lcd.print(num);
}
if(dig =='/')
{
    float num3 = float(num1) / float(num2);
    lcd.clear();
    lcd.print("Ans ");
    lcd.print(num3);
}

if(total==0){
//0
digitalWrite(pin2,LOW);
digitalWrite(pin3,LOW);
digitalWrite(pin4,LOW);
digitalWrite(pin5,LOW);
    delay(waitTime);}
else if(total== 1){
//1
digitalWrite(pin2,LOW);
digitalWrite(pin3,LOW);
digitalWrite(pin4,LOW);
digitalWrite(pin5,HIGH);
    delay(waitTime);}
else if(total== 2){
//2
digitalWrite(pin2,LOW);
digitalWrite(pin3,LOW);
digitalWrite(pin4,HIGH);
digitalWrite(pin5,LOW);
    delay(waitTime);}
else if(total== 3){

```

```

//3
digitalWrite(pin2,LOW);
digitalWrite(pin3,LOW);
digitalWrite(pin4,HIGH);
digitalWrite(pin5,HIGH);
    delay(waitTime);}
    else if(total== 4){
//4
digitalWrite(pin2,LOW);
digitalWrite(pin3,HIGH);
digitalWrite(pin4,LOW);
digitalWrite(pin5,LOW);
    delay(waitTime);}
    else if(total== 5){
//5
digitalWrite(pin2,LOW);
digitalWrite(pin3,HIGH);
digitalWrite(pin4,LOW);
digitalWrite(pin5,HIGH);
    delay(waitTime);}
    else if(total== 6){
//6
digitalWrite(pin2,LOW);
digitalWrite(pin3,HIGH);
digitalWrite(pin4,HIGH);
digitalWrite(pin5,LOW);
    delay(waitTime);}
    else if(total== 7){
//7
digitalWrite(pin2,LOW);
digitalWrite(pin3,HIGH);
digitalWrite(pin4,HIGH);
digitalWrite(pin5,HIGH);
    delay(waitTime);}
    else if(total== 8){
//8
digitalWrite(pin2,HIGH);
digitalWrite(pin3,LOW);
digitalWrite(pin4,LOW);
digitalWrite(pin5,LOW);
    delay(waitTime);}
    else if(total== 9){
//9
digitalWrite(pin2,HIGH);
digitalWrite(pin3,LOW);
digitalWrite(pin4,LOW);
digitalWrite(pin5,HIGH);
    delay(waitTime);}
    else if(total== 10){
//10
digitalWrite(pin2,HIGH);

```

```

digitalWrite(pin3,LOW);
digitalWrite(pin4,HIGH);
digitalWrite(pin5,LOW);
    delay(waitTime);}
    else if(total== 11){
//11
digitalWrite(pin2,HIGH);
digitalWrite(pin3,LOW);
digitalWrite(pin4,HIGH);
digitalWrite(pin5,HIGH);
    delay(waitTime);}
    else if(total== 12){
//12
digitalWrite(pin2,HIGH);
digitalWrite(pin3,HIGH);
digitalWrite(pin4,LOW);
digitalWrite(pin5,LOW);
    delay(waitTime);}
    else if(total== 13){
//13
digitalWrite(pin2,HIGH);
digitalWrite(pin3,HIGH);
digitalWrite(pin4,LOW);
digitalWrite(pin5,HIGH);
    delay(waitTime);}
    else if(total== 14){
//14
digitalWrite(pin2,HIGH);
digitalWrite(pin3,HIGH);
digitalWrite(pin4,HIGH);
digitalWrite(pin5,LOW);
    delay(waitTime);}
    else if(total== 15){
//15
digitalWrite(pin2,HIGH);
digitalWrite(pin3,HIGH);
digitalWrite(pin4,HIGH);
digitalWrite(pin5,HIGH);
    delay(waitTime);}

    else{
digitalWrite(pin2,HIGH);
digitalWrite(pin3,HIGH);
digitalWrite(pin4,HIGH);
digitalWrite(pin5,HIGH);
delay(waitTime);
    }

    delay(5000);

```



```
    lcd.clear();  
}
```

A.2 Code for ps2

```
int y0,y1;

void setup()
{
  pinMode(3, OUTPUT);
  pinMode(7, OUTPUT);
  pinMode(6, OUTPUT);
  pinMode(5, OUTPUT);
  pinMode(4, OUTPUT);
  pinMode(8, OUTPUT);
  pinMode(9, OUTPUT);
  Serial.begin(9600); // open the serial port at 9600 bps:
}

void loop()
{
  digitalWrite(3, HIGH);
  delay(1000); // Wait for 1000 millisecond(s)
  delay(1000); // Wait for 1000 millisecond(s)
  int val1 = digitalRead(7);
  int val2 = digitalRead(6);
  int val3 = digitalRead(5);
  int val4 = digitalRead(4);
  Serial.print(val1);
  if(val1 == 1)
  {
    y0 = 1;
    y1 = 1;
  }
  if(val1 == 0 && val2 ==1)
  {
    y0 = 0;
    y1 = 1;
  }
  if(val1==0 && val2==0 && val3==1)
  {
    y0 = 1;
    y1 = 0;
  }
  if(val1==0 && val2==0 && val3==0 && val4==1)
  {
    y0 = 0;
    y1 = 0;
  }
  digitalWrite(8, y0);
  digitalWrite(9, y1);

  delay(500);
}
```

}

References

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- [4] *Copy of Arduino Baisc Calculator*. <https://www.tinkercad.com/things/i6PFgdRYKwJ-copy-of-arduino-baisc-calculator/editel?tenant=circuits>.
- [5] *Copy of LCD + KEYPAD + PASSWORD*. <https://www.tinkercad.com/things/i6PFgdRYKwJ-copy-of-arduino-baisc-calculator/editel?tenant=circuits>.
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