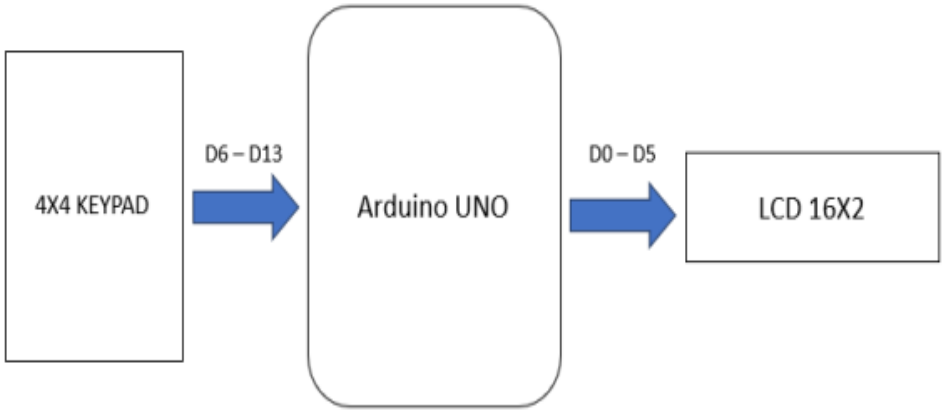
PROJECT 1
AURDINO CALCULATOR USING 4X4 KEYPAD

➢ INTRODUCTION:

An Arduino Calculator using a 4x4 Keypad is a captivating project that combines both hardware and software to create a basic calculator. This project allows you to use an Arduino microcontroller, a 4x4 keypad, and an LCD display to build a simple calculator that can perform arithmetic operations like addition, subtraction, multiplication, and division. It's an excellent project for both beginners and intermediate Arduino enthusiasts, as it involves various aspects of electronics and programming.

➢ BLOCK DIAGRAM:



➢ MATERIALS REQUIRED:

1. Arduino Uno (Any version will work)
2. 16×2 LCD Display
3. 4×4 Keypad
4. 9V Battery
5. Breadboard and Connecting wires

➢ PROJECT OVERVIEW:

In this project, we will take input from the user using a keypad and perform the operation using Arduino UNO and display the result on an LCD display.

- **Arduino UNO** - It is used for performing calculation-related operations, other user-related operations like interfacing with keypad module and LCD module.
- **16x4 LCD module**- It is used to display user-related messages such as input digits and selected arithmetical operations and calculated results.
- **4x4 Keypad**- It is used for user input. From this module, the user can enter the numerical values and arithmetic operations.

➢ PROGRAM:

```
#include <Keypad.h>
#include <LiquidCrystal.h>

// Initialize the LCD
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);
```

```
// Define the keypad matrix
const byte ROWS = 4; //four rows
const byte COLS = 4; //four columns
char keys[ROWS][COLS] = {
  {'1','2','3','+'},
  {'4','5','6','-'},
  {'7','8','9','*'},
  {'C','0','=','/'}
};
byte rowPins[ROWS] = {A0, A1, A2, A3}; //connect to the row pinouts of the keypad
byte colPins[COLS] = {9, 8, 7, 6}; //connect to the column pinouts of the keypad

// Create an instance of the Keypad class
Keypad keypad = Keypad( makeKeymap(keys), rowPins, colPins, ROWS, COLS );

// Variables to store user input and calculation result
String userInput = "";
float result = 0;

void setup() {
  lcd.begin(16, 2); // Initialize the LCD
  lcd.setCursor(0,0);
  lcd.print("Calculator");
  lcd.setCursor(0,1);
```

```
  lcd.print("Ready...");
  delay(1000);
  lcd.clear();
}

void loop() {
  char key = keypad.getKey(); // Get the pressed key

  if (key != NO_KEY) {
    if (key == '=') {
      if (userInput.length() > 0) {
        evaluateExpression();
        lcd.setCursor(0, 1);
        lcd.print("Result:       ");
        lcd.setCursor(8, 1);
        lcd.print(result);
        userInput = "";
        delay(2000);
        lcd.clear();
      }
    } else if (key == 'C') {
      userInput = "";
      lcd.setCursor(0, 1);
      lcd.print("                "); // Clear the line
    } else {
      userInput += key;
      lcd.setCursor(0, 1);
```

```
      lcd.print(userInput);
    }
  }
}

void evaluateExpression() {
  int operatorIndex = -1;

  // Check for the operator (+, -, *, /) and find its position
  for (int i = 0; i < userInput.length(); i++) {
    if (userInput[i] == '+' || userInput[i] == '-' || userInput[i] == '*' || userInput[i]
== '/') {
      operatorIndex = i;
      break;
    }
  }

  if (operatorIndex != -1) {
    float operand1 = userInput.substring(0, operatorIndex).toFloat();
    float operand2 = userInput.substring(operatorIndex + 1).toFloat();
    char op = userInput[operatorIndex];

    switch (op) {
      case '+':
        result = operand1 + operand2;
        break;
      case '-':
```

```
        result = operand1 - operand2;
        break;
      case '*':
        result = operand1 * operand2;
        break;
      case '/':
        if (operand2 != 0) {
          result = operand1 / operand2;
        } else {
          result = 0; // Division by zero, handle error as you like
        }
        break;
    }
  }
}
```

➢ PROCEDURE:

1. Connect the 4x4 keypad and LCD display to the Arduino according to the defined pins in the code.
2. Install the required libraries, Keypad and Liquid Crystal, through the Arduino IDE's Library Manager.
3. Upload the code to your Arduino board using the Arduino IDE.
4. Once the code is uploaded, open the Serial Monitor, and you should see the "Calculator Ready..." message on the LCD display.
5. Use the 4x4 keypad to enter your calculations, such as "2+3=" or "10/2=".

6. Press the '=' key to see the result displayed on the LCD.
7. Press 'C' to clear the input and start a new calculation.

➢ SCHEMATIC DIAGRAM: