Embedded Systems Lab
Prelab (2)

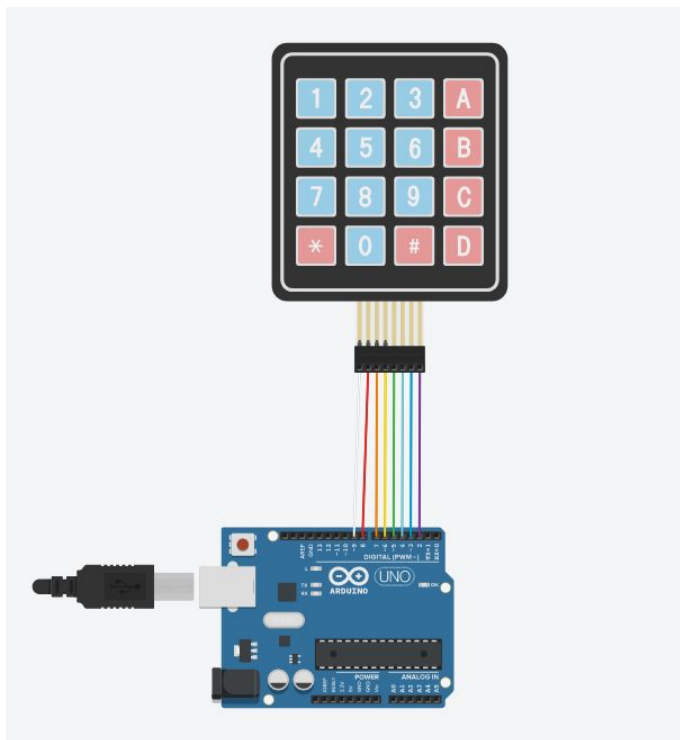**Student Name & ID: SewarKhalifeh / 20160147**

Instructor: Eng. Remah Younis

23/10/2020

Programming Arduino with TinkerCad

Study the 12-button keypad and design a system which includes the following specifications:

1- The keypad is connected to Arduino.

2- The Arduino reads and decodes the input from the keypad.

3- The Arduino decides whether the input is odd or even.

Code (For a 4x4 Keypad):

```
const char rows = 4;
const char cols = 4;

const char keys[rows][cols] = {
        {'1','2','3','A'},
        {'4','5','6','B'},
        {'7','8','9','C'},
        {'*','0','#','D'}
        };

char rowPins[rows] = {9,8, 7, 6};
char colPins[cols] = {5,4, 3, 2};

void setup () {
    Serial.begin(9600);

  for(char r = 0; r < rows; r++){
      pinMode(rowPins[r], INPUT);
      digitalWrite(rowPins[r], HIGH);
}

  for (char c = 0; c < cols; c++){
      pinMode(colPins[c], OUTPUT);
  }

}

void loop() {
    char key = getKey();

    if(key != 0){
  Serial.println(key);
    if (key=='*' || key=='#' || key=='A' || key=='B'
      || key=='C' || key=='D'){
    Serial.println("This is not a number");
    }
    else if(key%2 != 0){
    Serial.println("Odd");
    }
    else if (key%2 == 0){
    Serial.println("Even");
    }
  }
}
```

```
char getKey(){
    char k = 0;

    for(char c = 0; c < cols; c++){
      digitalWrite(colPins[c], LOW);
       for(char r = 0; r < rows; r++){
         if(digitalRead(rowPins[r]) == LOW){
         delay(20);    //20ms debounce time
         while(digitalRead(rowPins[r])== LOW);
         k = keys[r][c];
         }
       }
  digitalWrite(colPins[c], HIGH);
     }
     return k;
}
```

getKey Function:

The getKey() function is the one which scans and detects which key is pressed and returns the key that is pressed. In the function getKey(), using a for loop, the three columns are sequentially made low(set low using the digitalWrite())function). For each column that is currently made low, we read the state of the four rows using a for loop. If anyone of the row being read is low then we wait for 20ms(debounce time), wait for that row to go back to high state using the while() function for checking the state of that row. Once that row goes high we pass that particular row and that particular column to the 2-D keys array and save it as the key pressed in a variable k. Finally before returning our detected k from the getKey() function we make the column high again using the digitalWrite() function.