

**Wania Zanib**  
**23-NTU-CS-1289**  
**BSAI 5th**  
**Embedded IOT**  
**Week 3 – Assignment 1**

**Code:**

```
//Week 3 - Assisgment
// Embedded IoT System Fall-2025

// Name: wania zanib           Reg#: 1289

#include <Arduino.h>

//pins
#define LED1_PIN      2
#define LED2_PIN      15
#define SWITCH1_PIN   25
#define SWITCH2_PIN   14

#define DEBOUNCE_MS   50
#define DEBOUNCE_US   (DEBOUNCE_MS * 1000UL)

//Timer Handles
hw_timer_t* debounceTimer1 = nullptr;
hw_timer_t* debounceTimer2 = nullptr;

//Debounce Flags
volatile bool debounceActive1 = false;
volatile bool debounceActive2 = false;

//Timer ISR for Switch 1
void ARDUINO_ISR_ATTR onDebounceTimer1() {
    if (digitalRead(SWITCH1_PIN) == LOW) { //still pressed?
        digitalWrite(LED1_PIN, !digitalRead(LED1_PIN)); //toggle LED1
    }
    debounceActive1 = false; //ready for next press
}
```

```
//Timer ISR for Switch 2
void ARDUINO_ISR_ATTR onDebounceTimer2() {
    if (digitalRead(SWITCH2_PIN) == LOW) { //still pressed?
        digitalWrite(LED2_PIN, !digitalRead(LED2_PIN)); //toggle LED2
    }
    debounceActive2 = false; //ready for next press
}

//External interrupt for Switch 1
void ARDUINO_ISR_ATTR onSwitch1ISR() {
    if (!debounceActive1) {
        debounceActive1 = true;
        timerAlarm(debounceTimer1, DEBOUNCE_US, false, 0); //start one-shot timer
    }
}

//External interrupt for Switch 2
void ARDUINO_ISR_ATTR onSwitch2ISR() {
    if (!debounceActive2) {
        debounceActive2 = true;
        timerAlarm(debounceTimer2, DEBOUNCE_US, false, 0); //start one-shot timer
    }
}

void setup() {
    Serial.begin(115200);

    //LEDs
    pinMode(LED1_PIN, OUTPUT);
    pinMode(LED2_PIN, OUTPUT);
    digitalWrite(LED1_PIN, LOW);
    digitalWrite(LED2_PIN, LOW);

    //Configure switches with internal pull-ups
    pinMode(SWITCH1_PIN, INPUT_PULLUP);
    pinMode(SWITCH2_PIN, INPUT_PULLUP);

    //Attached external interrupts (on button press)
    attachInterrupt(SWITCH1_PIN, onSwitch1ISR, FALLING);
    attachInterrupt(SWITCH2_PIN, onSwitch2ISR, FALLING);

    //Created 1 MHz timers
    debounceTimer1 = timerBegin(1000000);
    debounceTimer2 = timerBegin(1000000);
```

```

//Attached debounce ISRs
timerAttachInterrupt(debounceTimer1, &onDebounceTimer1);
timerAttachInterrupt(debounceTimer2, &onDebounceTimer2);

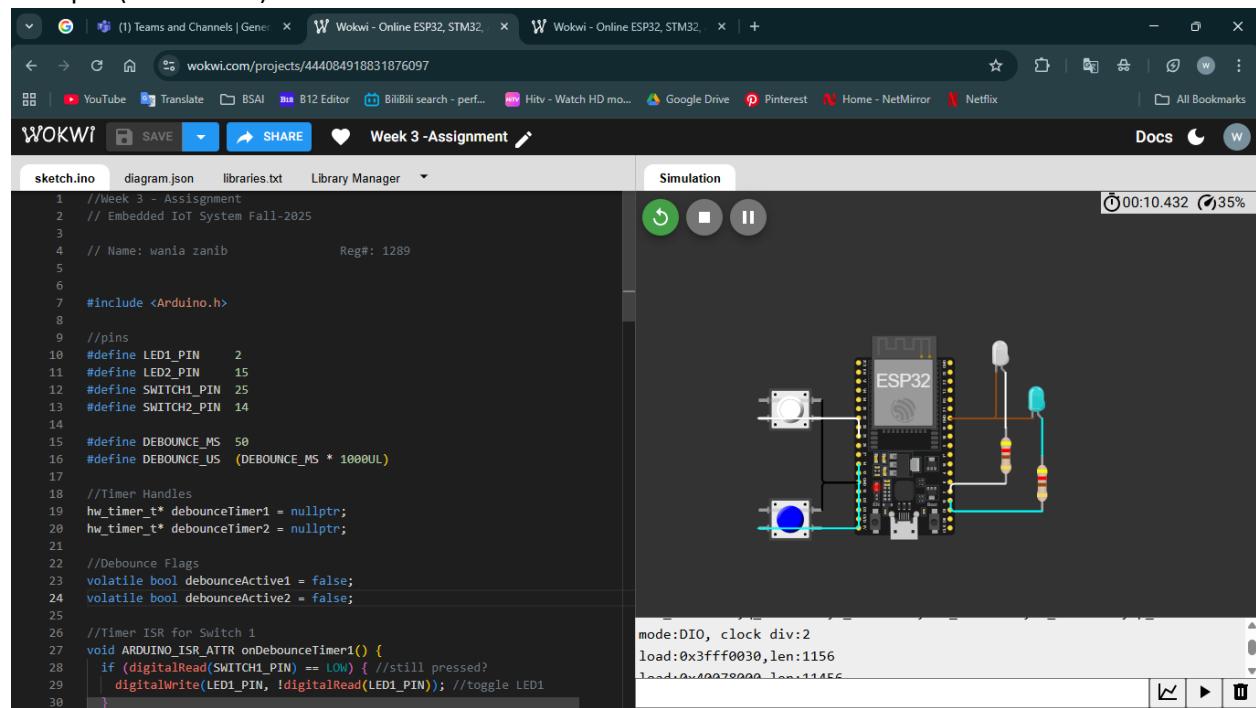
Serial.println("System Ready – Press Buttons to Toggle LEDs");
}

void loop() {
    // Nothing needed here; interrupts do all the work.
}

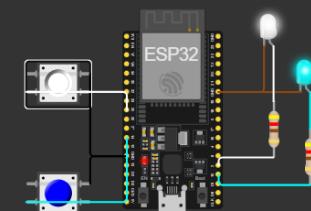
```

## Output:

no input (initial state):



LED 1 turned on:

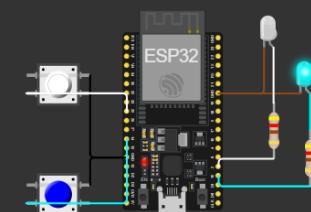


The screenshot shows the Wokwi online simulation interface. On the left is the code editor with the file 'sketch.ino' containing the provided Arduino sketch. On the right is the simulation window showing the ESP32 board with its pins and external components. A digital switch is connected between pin D10 and ground. An LED is connected between pin D2 and ground via a resistor. The LED is illuminated. At the bottom of the simulation window, there is a terminal output showing the state of the pins.

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30     }
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```

```
mode:DIO, clock div:2
load:0x3fff0030,len:1156
load:0x4000780000_len:114cc
```

LED 2 turned on:



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**Project Link:**

<https://wokwi.com/projects/444084918831876097>