## Name: Laiba Fatima

## Reg# 23-ntu-cs-1257

# Code:

```
/*
  Project Title: Dual LED Toggle using External Interrupts with Timer Debouncing
  Name: Laiba Fatima
  Registration No: [23-ntu-cs-1257]
  Course: Embedded Systems (ESP32 - Wokwi Project)
*/

#include <Arduino.h>

#define LED1_PIN     2
#define LED2_PIN     5
#define BUTTON1_PIN  4
#define BUTTON2_PIN  18
```

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

hw_timer_t *debounceTimer1 = NULL;
hw_timer_t *debounceTimer2 = NULL;

volatile bool debounceActive1 = false;
volatile bool debounceActive2 = false;

void ARDUINO_ISR_ATTR onDebounceTimer1() {
  if (digitalRead(BUTTON1_PIN) == LOW) {
    digitalWrite(LED1_PIN, !digitalRead(LED1_PIN));
  }
  debounceActive1 = false;
}

void ARDUINO_ISR_ATTR onDebounceTimer2() {
  if (digitalRead(BUTTON2_PIN) == LOW) {
    digitalWrite(LED2_PIN, !digitalRead(LED2_PIN));
  }
  debounceActive2 = false;
}

void ARDUINO_ISR_ATTR onButton1Press() {
  if (!debounceActive1) {
    debounceActive1 = true;
```

```
   timerAlarm(debounceTimer1, DEBOUNCE_US, false, 0);
  }
}

void ARDUINO_ISR_ATTR onButton2Press() {
  if (!debounceActive2) {
    debounceActive2 = true;
    timerAlarm(debounceTimer2, DEBOUNCE_US, false, 0);
  }
}

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

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



  pinMode(BUTTON1_PIN, INPUT_PULLUP);
  pinMode(BUTTON2_PIN, INPUT_PULLUP);

  attachInterrupt(BUTTON1_PIN, onButton1Press, FALLING);
  attachInterrupt(BUTTON2_PIN, onButton2Press, FALLING);
```

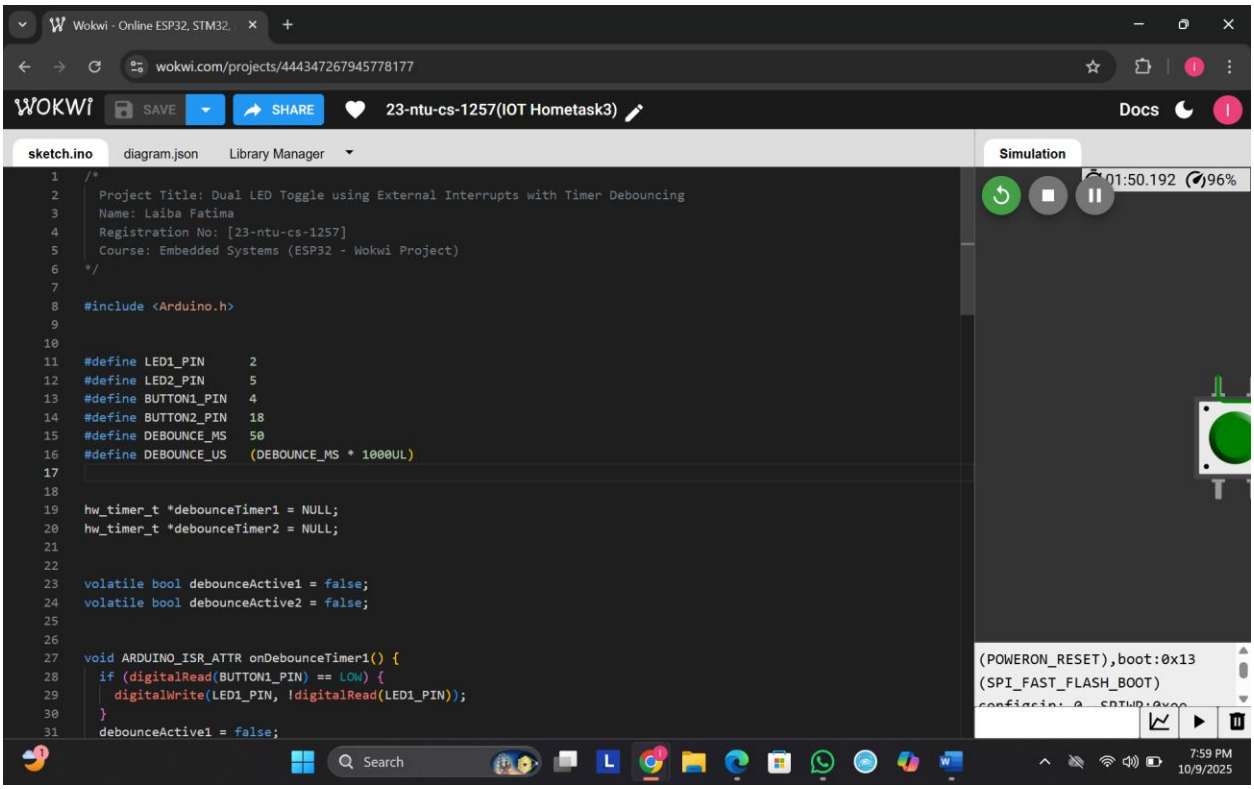
```
  debounceTimer1 = timerBegin(1000000);
  debounceTimer2 = timerBegin(1000000);


  timerAttachInterrupt(debounceTimer1, &onDebounceTimer1);
  timerAttachInterrupt(debounceTimer2, &onDebounceTimer2);

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

void loop() {

}
```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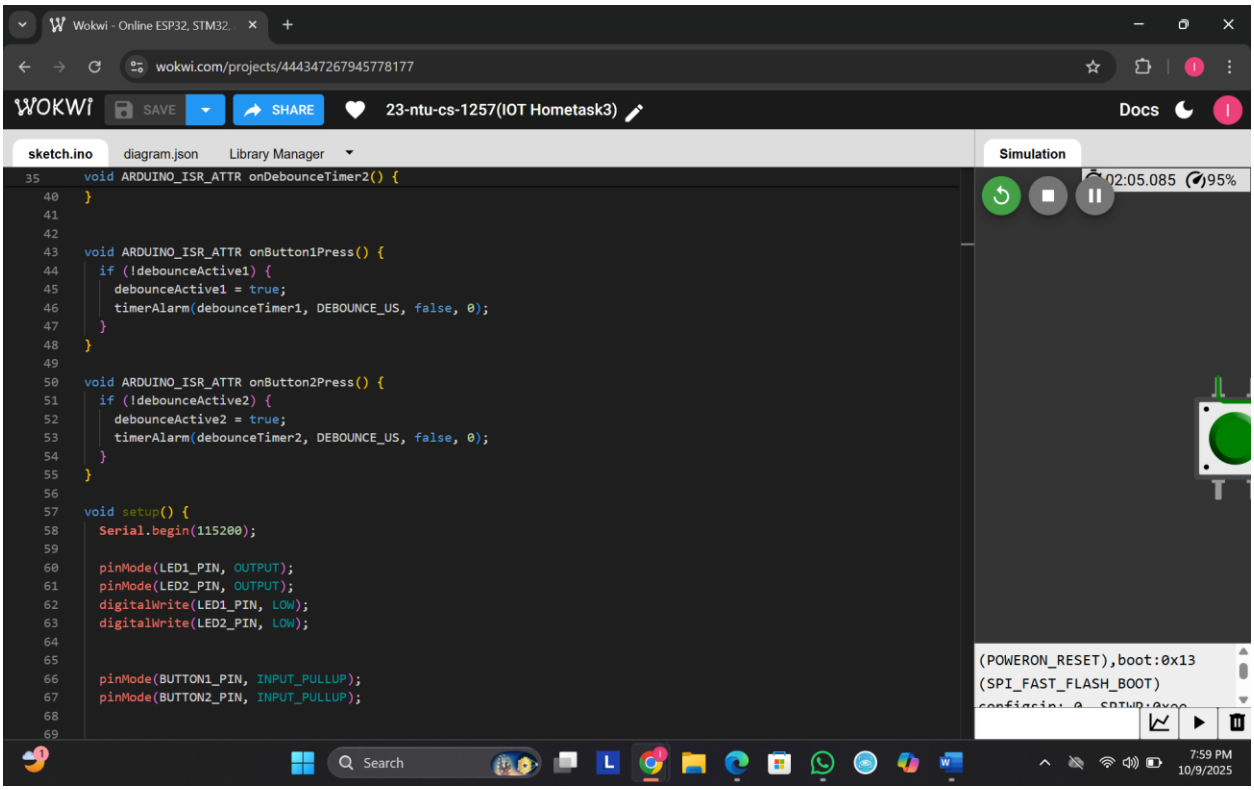
wokwi.com/projects/444347267945778177
WOKWI
SAVE
SHARE
23-ntu-cs-1257(IOT Hometask3)
Docs
sketch.ino
diagram.json
Library Manager
Simulation
01:50.192
96%
/*
Project Title: Dual LED Toggle using External Interrupts with Timer Debouncing
Name: Laiba Fatima
Registration No: [23-ntu-cs-1257]
Course: Embedded Systems (ESP32 - Wokwi Project)
*/
#include <Arduino.h>
#define LED1_PIN 2
#define LED2_PIN 5
#define BUTTON1_PIN 4
#define BUTTON2_PIN 18
#define DEBOUNCE_MS 50
#define DEBOUNCE_US (DEBOUNCE_MS * 1000UL)
hw_timer_t *debounceTimer1 = NULL;
hw_timer_t *debounceTimer2 = NULL;
volatile bool debounceActive1 = false;
volatile bool debounceActive2 = false;
void ARDUINO_ISR_ATTR onDebounceTimer1() {
if (digitalRead(BUTTON1_PIN) == LOW) {
digitalWrite(LED1_PIN, !digitalRead(LED1_PIN));
}
debounceActive1 = false;
(POWERON_RESET),boot:0x13
(SPI_FAST_FLASH_BOOT)
Search
7:59 PM
10/9/2025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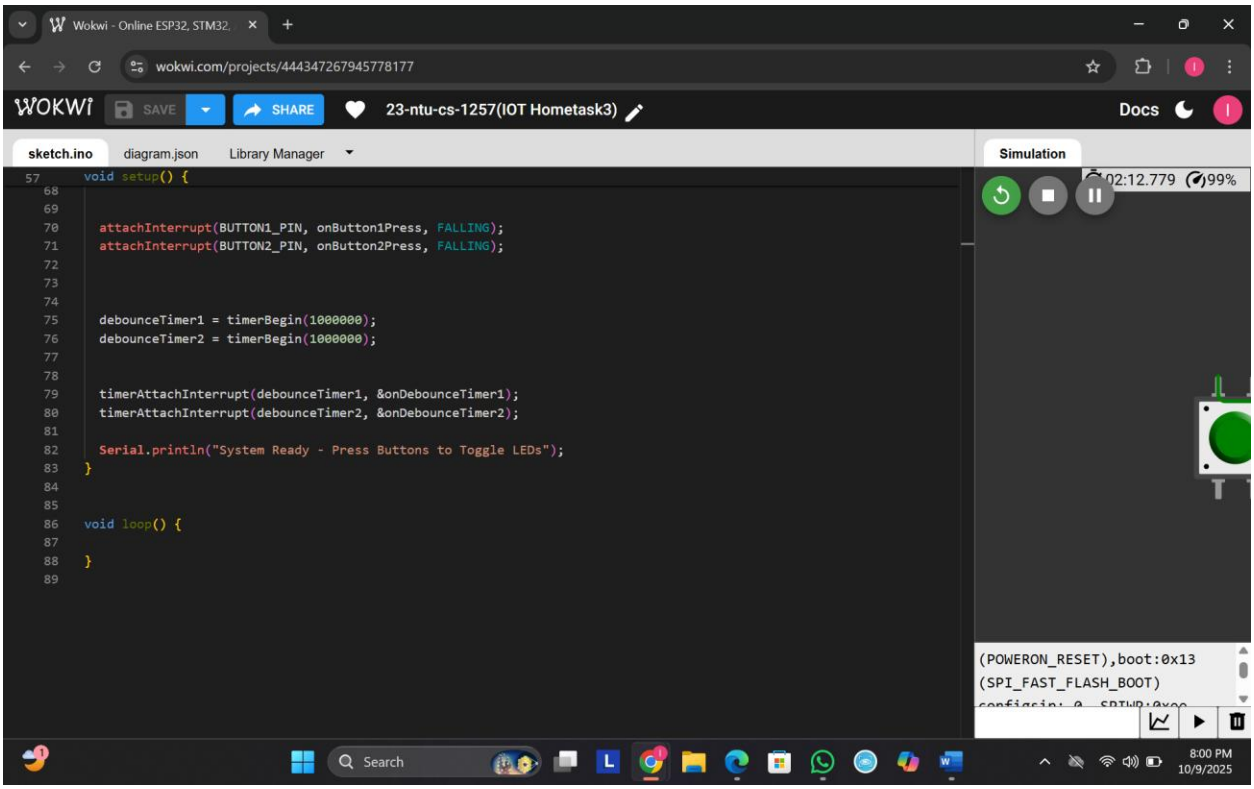
23-ntu-cs-1257(IOT Hometask3)
Docs
sketch.ino
diagram.json
Library Manager
Simulation
02:05.085
95%
void ARDUINO_ISR_ATTR onDebounceTimer2() {
}
void ARDUINO_ISR_ATTR onButton1Press() {
if (!debounceActive1) {
debounceActive1 = true;
timerAlarm(debounceTimer1, DEBOUNCE_US, false, 0);
}
}
void ARDUINO_ISR_ATTR onButton2Press() {
if (!debounceActive2) {
debounceActive2 = true;
timerAlarm(debounceTimer2, DEBOUNCE_US, false, 0);
}
}
void setup() {
Serial.begin(115200);
pinMode(LED1_PIN, OUTPUT);
pinMode(LED2_PIN, OUTPUT);
digitalWrite(LED1_PIN, LOW);
digitalWrite(LED2_PIN, LOW);
pinMode(BUTTON1_PIN, INPUT_PULLUP);
pinMode(BUTTON2_PIN, INPUT_PULLUP);
(POWERON_RESET),boot:0x13
(SPI_FAST_FLASH_BOOT)
Search
7:59 PM
10/9/2025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23-ntu-cs-1257(IOT Hometask3)
Docs
sketch.ino
diagram.json
Library Manager
Simulation
02:12.779
99%
void setup() {
attachInterrupt(BUTTON1_PIN, onButton1Press, FALLING);
attachInterrupt(BUTTON2_PIN, onButton2Press, FALLING);
debounceTimer1 = timerBegin(1000000);
debounceTimer2 = timerBegin(1000000);
timerAttachInterrupt(debounceTimer1, &onDebounceTimer1);
timerAttachInterrupt(debounceTimer2, &onDebounceTimer2);
Serial.println("System Ready - Press Buttons to Toggle LEDs");
}
void loop() {
}
(POWERON_RESET),boot:0x13
(SPI_FAST_FLASH_BOOT)
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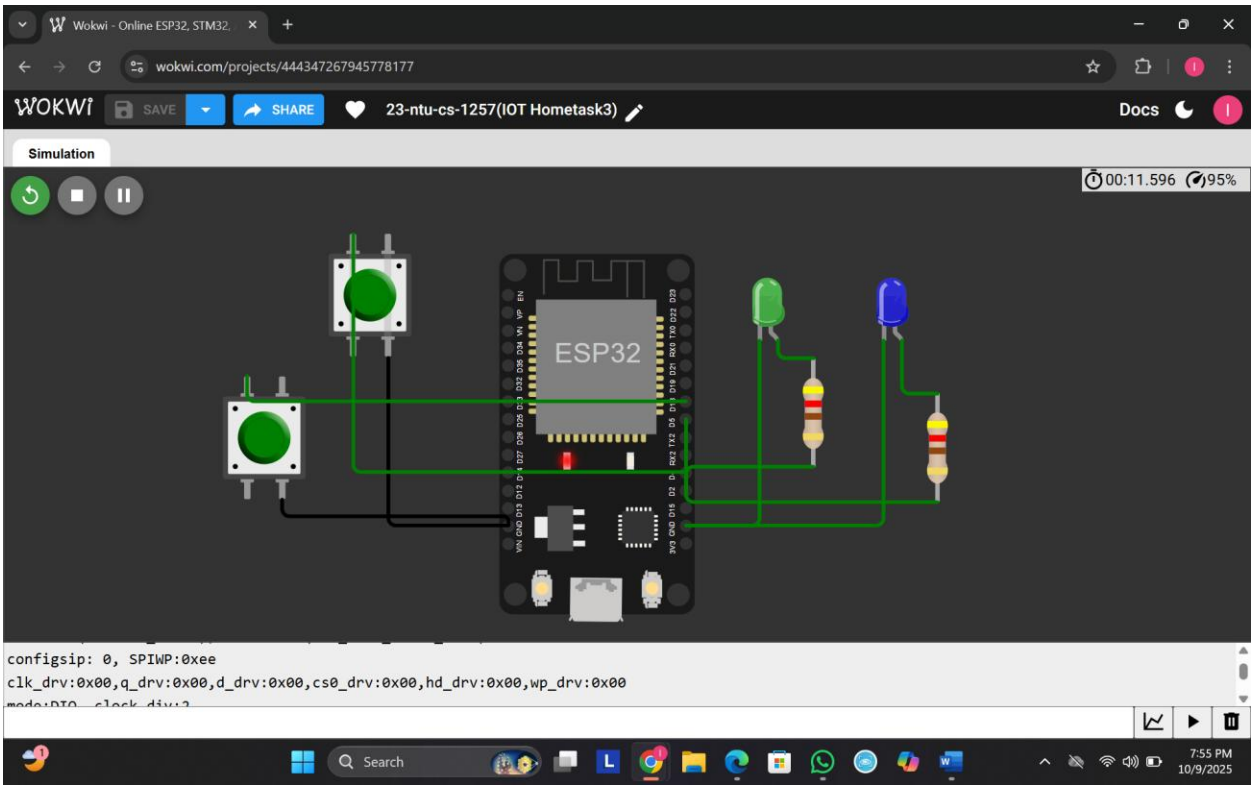
# Working: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23-ntu-cs-1257(IOT Hometask3)
Docs
Simulation
00:11.596
95%
ESP32
configsip: 0, SPIWP:0xee
clk_drv:0x00,q_drv:0x00,d_drv:0x00,cs0_drv:0x00,hd_drv:0x00,wp_drv:0x00
Search
7:55 PM
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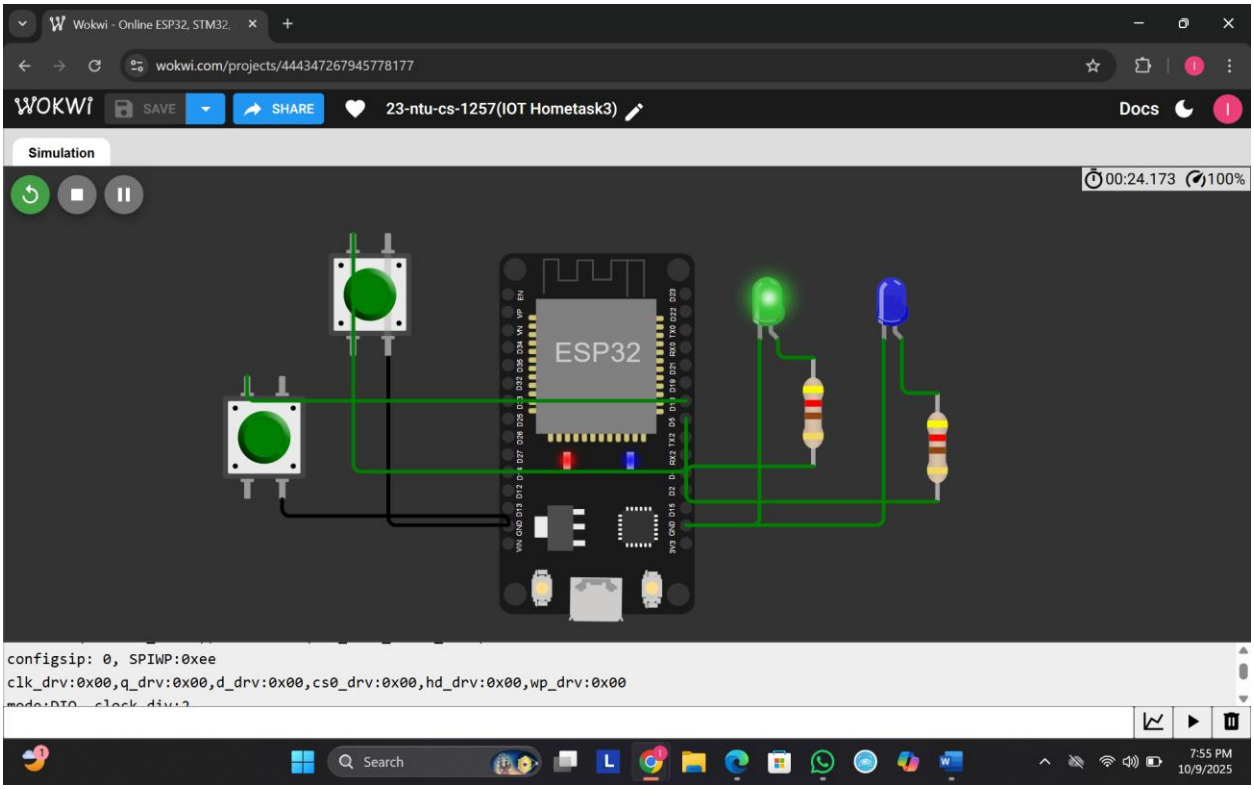
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WOKWI
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23-ntu-cs-1257(IOT Hometask3)
Docs
Simulation
00:24.173
100%
ESP32
configsip: 0, SPIWP:0xee
clk_drv:0x00,q_drv:0x00,d_drv:0x00,cs0_drv:0x00,hd_drv:0x00,wp_drv:0x00
Search
7:55 PM
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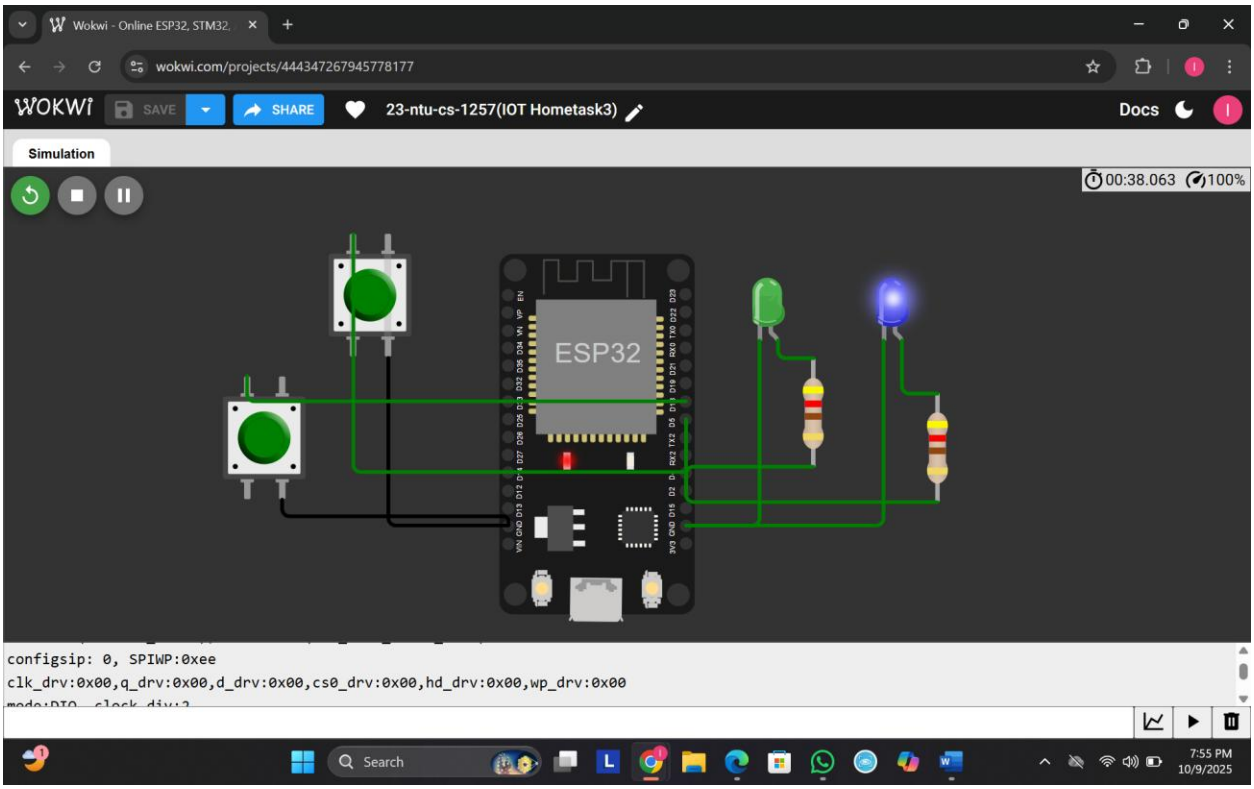
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WOKWI
SAVE
SHARE
23-ntu-cs-1257(IOT Hometask3)
Docs
Simulation
00:38.063
100%
ESP32
configsip: 0, SPIWP:0xee
clk_drv:0x00,q_drv:0x00,d_drv:0x00,cs0_drv:0x00,hd_drv:0x00,wp_drv:0x00
Search
7:55 PM
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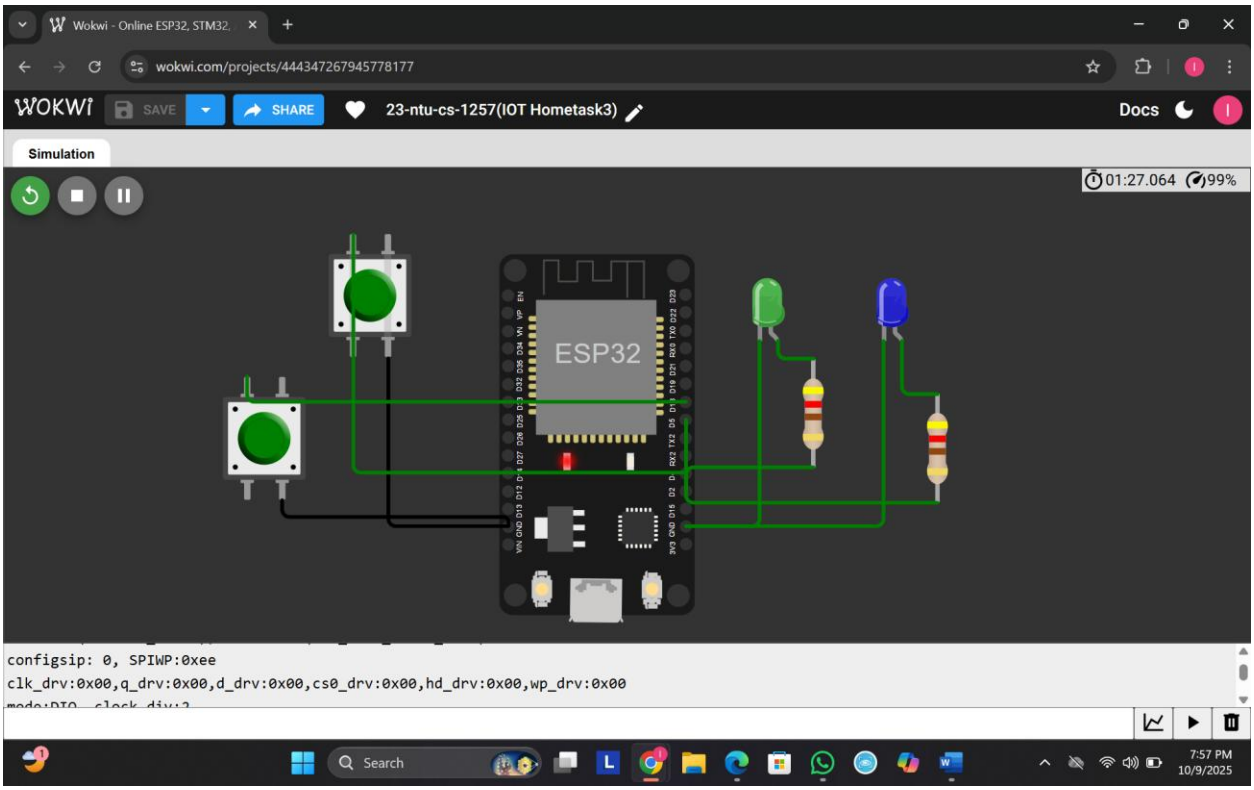
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WOKWI
SAVE
SHARE
23-ntu-cs-1257(IOT Hometask3)
Docs
Simulation
01:27.064
99%
ESP32
configsip: 0, SPIWP:0xee
clk_drv:0x00,q_drv:0x00,d_drv:0x00,cs0_drv:0x00,hd_drv:0x00,wp_drv:0x00
Search
7:57 PM
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