#define BLYNK\_TEMPLATE\_ID "TMPL38ZufXQuy"

#define BLYNK\_TEMPLATE\_NAME "Soil Monitoring for Smart Irrigation"

#define BLYNK\_AUTH\_TOKEN "s5kzqcNz78y7w5JlhKWMk0-waHH1xSEE"

#define BLYNK\_PRINT Serial

#include <WiFi.h>

#include <BlynkSimpleEsp32.h>

// --- Pin Definitions ---

#define SOIL\_MOISTURE\_PIN 34 // Analog pin for soil moisture sensor

#define PUMP\_PIN 25 // Digital pin for IN1 of 2-channel relay (controls pump) - Changed from 2 to 25

// --- Relay Configuration ---

#define RELAY\_ON LOW // Inverted: LOW turns relay ON

#define RELAY\_OFF HIGH // Inverted: HIGH turns relay OFF

// --- Virtual Pins ---

#define V\_MOISTURE V5 // Virtual pin for soil moisture percentage

#define V\_PUMP\_SWITCH V6 // Virtual pin for manual pump control

#define V\_MODE\_SWITCH V4 // Virtual pin for Auto/Manual mode

// --- WiFi Credentials ---

char auth[] = BLYNK\_AUTH\_TOKEN;

char ssid[] = "Redmi";

char pass[] = "poojasn123";

BlynkTimer timer;

// --- Variables ---

bool isPumpOn = false; // Track pump status

bool isAutoMode = true; // Default mode = Auto

int THRESHOLD\_MOISTURE = 40; // Moisture % threshold for auto mode

// --- Calibration Values (Adjust based on your sensor) ---

const int DRY\_VALUE = 4095; // Sensor value in dry air

const int WET\_VALUE = 1500; // Sensor value in water

// --- Function to Read and Send Sensor Data ---

void sendSensorData()

{

int rawValue = analogRead(SOIL\_MOISTURE\_PIN);

int moisturePercent = map(rawValue, DRY\_VALUE, WET\_VALUE, 0, 100);

moisturePercent = constrain(moisturePercent, 0, 100);

Serial.print("Soil Moisture: ");

Serial.print(rawValue);

Serial.print(" => ");

Serial.print(moisturePercent);

Serial.println("%");

Blynk.virtualWrite(V\_MOISTURE, moisturePercent); // Send data to Blynk

// --- Auto Mode Operation ---

if (isAutoMode)

{

if (moisturePercent < THRESHOLD\_MOISTURE)

{

digitalWrite(PUMP\_PIN, RELAY\_ON); // Turn pump ON

isPumpOn = true;

Blynk.virtualWrite(V\_PUMP\_SWITCH, 1); // Update Blynk switch

Serial.println("Auto Mode: Soil is dry. Pump ON.");

Blynk.logEvent("moisture\_alert", "Soil moisture low! Pump turned ON automatically.");

}

else

{

digitalWrite(PUMP\_PIN, RELAY\_OFF); // Turn pump OFF

isPumpOn = false;

Blynk.virtualWrite(V\_PUMP\_SWITCH, 0); // Update Blynk switch

Serial.println("Auto Mode: Soil is wet. Pump OFF.");

}

}

else

{

// Manual mode - pump state is controlled from Blynk switch

digitalWrite(PUMP\_PIN, isPumpOn ? RELAY\_ON : RELAY\_OFF);

}

}

// --- Handle Manual Pump Switch (V6) ---

BLYNK\_WRITE(V\_PUMP\_SWITCH)

{

if (!isAutoMode) // Only works in manual mode

{

isPumpOn = param.asInt();

digitalWrite(PUMP\_PIN, isPumpOn ? RELAY\_ON : RELAY\_OFF);

Serial.println(isPumpOn ? "Manual Mode: Pump ON" : "Manual Mode: Pump OFF");

}

else

{

// If user tries to toggle pump in auto mode, ignore it

Blynk.virtualWrite(V\_PUMP\_SWITCH, isPumpOn);

Serial.println("Ignored manual control - system in Auto Mode");

}

}

// --- Handle Mode Switch (V4) ---

BLYNK\_WRITE(V\_MODE\_SWITCH)

{

isAutoMode = param.asInt();

if (isAutoMode)

{

Serial.println("Switched to AUTO Mode");

Blynk.virtualWrite(V\_PUMP\_SWITCH, 0); // Reset manual control

isPumpOn = false;

digitalWrite(PUMP\_PIN, RELAY\_OFF); // Ensure pump is OFF when switching to auto

}

else

{

Serial.println("Switched to MANUAL Mode");

}

}

// --- Setup ---

void setup()

{

Serial.begin(115200); // Changed from 9600 to 115200

pinMode(PUMP\_PIN, OUTPUT);

digitalWrite(PUMP\_PIN, RELAY\_OFF); // Ensure pump is OFF initially

Serial.println("Starting Smart Irrigation System...");

Serial.println("Connecting to WiFi and Blynk...");

Blynk.begin(auth, ssid, pass);

// Wait for connection

int attempts = 0;

while (Blynk.connect() == false && attempts < 20) {

Serial.print(".");

delay(500);

attempts++;

}

if (Blynk.connected()) {

Serial.println("\nConnected to Blynk!");

} else {

Serial.println("\nFailed to connect to Blynk. Check credentials.");

}

timer.setInterval(3000L, sendSensorData); // Every 3 seconds

// Initialize dashboard

Blynk.virtualWrite(V\_MODE\_SWITCH, 1); // Start in Auto mode

Blynk.virtualWrite(V\_PUMP\_SWITCH, 0);

Serial.println("System Ready!");

Serial.println("--------------------------------");

// Test relay for 5 seconds

Serial.println("Testing relay...");

digitalWrite(PUMP\_PIN, RELAY\_ON);

Serial.println("Relay should be ON now");

delay(5000);

digitalWrite(PUMP\_PIN, RELAY\_OFF);

Serial.println("Relay should be OFF now");

delay(2000);

}

// --- Main Loop ---

void loop()

{

if (Blynk.connected()) {

Blynk.run();

} else {

Serial.println("Blynk disconnected. Reconnecting...");

Blynk.connect();

}

timer.run();

}