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LAMPIRAN A

Listing Program Arduino IDE

```
#include "GravityTDS.h"
#include <Wire.h>
#include <RtcDS3231.h>
#include <OneWire.h>
#include <DallasTemperature.h>
#include <LiquidCrystal_I2C.h>
#include <SoftwareSerial.h>
#define ph_pin A0
#define turbi_pin A1
#define TdsSensorPin A2
#define t1 4
#define t2 5
#define t3 6
#define t4 7

float temperature = 25;
unsigned long pre   fSD;
unsigned long pref;
unsigned long proveus;
char daysOfTheWeek[7][12] = {"minggu", "senin", "selasa", "rabu",
"kamis", "jumat", "sabtu"};
int detik, menit, jam, hari;
int data_ph, data_turbi;
float data_tds;
float  temp;
float  temp2;
int buton1, buton2, buton3, buton4;
//variable sensor ph
float phEquals;
double Vph;
double ph_stp;
double vph7 = 1.55;
double vph4 = 2.14;
//variable turbi
double voltTurbi;
double hasilKeruh;
float pengurangan;
String indikatorsuhu, indikatorph, indikatorturbi, indikatortds;

//for logic
int count_logic = 0;
int countTemp, countPh, countTurbi, countTds;
String idkTemp = " NO", idkPh = " NO", idkTurbi = " NO", idkTds = "
NO";
int timeSD = 1;
const int chipSelect = 10;
String updateTime;

float tempVal, tempVal2, phVal, turbiVal, tdsVal;

GravityTDS gravityTds;
RtcDS3231<TwoWire> Rtc(Wire);
OneWire pin_DS18B20(8);
DallasTemperature DS18B20(&pin_DS18B20);
LiquidCrystal_I2C lcd(0x27, 20, 4);
SoftwareSerial ss(2, 3);
void setup() {
  Serial.begin(9600);
  ss.begin(9600);//kecepatan komunikasi serial esp
  while (!Serial) {
    ;
  }
  lcd.init();
  lcd.backlight();
  rtcSet();
  DS18B20.begin();
  pinMode(ph_pin, INPUT);
  pinMode(turbi_pin, INPUT);
  gravityTds.setPin(TdsSensorPin);
  gravityTds.setAref(5.0);
  gravityTds.setAdcRange(1024);
  gravityTds.begin();  //initialization
  pinMode(t1, INPUT_PULLUP);
  pinMode(t2, INPUT_PULLUP);
  pinMode(t3, INPUT_PULLUP);
  pinMode(t4, INPUT_PULLUP);
}

void loop() {
  readingSensor();
  logicAll();
  printing();
  Serial.println("cek");
}

#define countof(a) (sizeof(a) / sizeof(a[0]))
void printDateTime(const RtcDateTime& dt)
{
  char datestring[20];

  snprintf_P(datestring,
             countof(datestring),
             PSTR("%02u/%02u/%04u %02u:%02u:%02u"),
             dt.Month(),
             dt.Day(),
             dt.Year(),
             dt.Hour(),
             dt.Minute(),
             dt.Second() );
  updateTime = datestring;
}
```

```
void printing() {
  ss.print("{");
  ss.print(String(temp));
  ss.print(",");
  ss.print(String(phEquals));
  ss.print(",");
  ss.print(String(hasilKeruh));
  ss.print(",");
  ss.print(String(data_tds));
  ss.print(",");
  ss.print(String(updateTime));
  ss.print(",");
  ss.print(String(timeSD));
  ss.println("}");
}

void readingSensor() {
  DS18B20.requestTemperatures();
  temp = DS18B20.getTempCByIndex(0);
  temp2 = DS18B20.getTempCByIndex(1);
  RtcDateTime now = Rtc.GetDateTime();
  printDateTime(now);
  buton1 = digitalRead(t1);
  buton2 = digitalRead(t2);
  buton3 = digitalRead(t3);
  buton4 = digitalRead(t4);

  //  printDateTime(now);
  jam = now.Hour();//jam saat ini
  menit = now.Minute();//menit saat ini
  detik = now.Second();//detik saat ini

  data_ph = analogRead(ph_pin);
  Vph = 5 / 1023.0 * data_ph;
  ph_stp = (vph4 - vph7) / (7 - 4);
  phEquals = 7.00 + ((vph7 - Vph) / ph_stp);

  data_turbi = analogRead(turbi_pin);
  voltTurbi = data_turbi * (5.0 / 1023);
  hasilKeruh = (110.00 - (voltTurbi / 4.21) * 100.00);

  gravityTds.setTemperature(temperature);
  gravityTds.update();
  data_tds = gravityTds.getTdsValue();
}

void logicAll() {
  if (buton4 == LOW) {
    count_logic = count_logic + 1;
    lcd.clear();
  }
  if (buton1 == LOW) {
    count_logic = count_logic - 1;
    lcd.clear();
  }

  switch (count_logic ) {
    case 0:
      lcd.setCursor(0, 1);
      lcd.print("     ALAT UKUR  ");
      lcd.setCursor(0, 2);
      lcd.print("    KUALITAS AIR  ");
      break;
    case 1:
      lcd.setCursor(0, 1);
      lcd.print("USERNAME :Ta anisatu ");
      lcd.setCursor(0, 2);
      lcd.print("Password : 00000000");
      break;
```

```
case 2:
  if (buton3 == LOW) {
    countTemp = countTemp + 1;
  }
  else if (buton2 == LOW) {
    countTemp = countTemp - 1;
  }
  if (countTemp >> 1) {
    countTemp = 0;
  }

  if (countTemp == 1) {
    idkTemp = " YES";
  }
  else if (countTemp == 0) {
    idkTemp = " NO ";
  }

  lcd.setCursor(0, 0);
  lcd.print(">Suhu Air&Udara" + String (idkTemp));
  lcd.setCursor(0, 1);
  lcd.print(" pH            " + String (idkPh));
  lcd.setCursor(0, 2);
  lcd.print(" Kekeruhan     " + String (idkTurbi));
  lcd.setCursor(0, 3);
  lcd.print(" Zat Padat     " + String (idkTds));
  break;

case 3:
  if (buton3 == LOW) {
    countPh = countPh + 1;
  }
  else if (buton2 == LOW) {
    countPh = countPh - 1;
  }
```

```
    if (countPh >> 1) {
      countPh = 0;
    }

    if (countPh == 1) {
      idkPh = " YES";
    }
    else if (countPh == 0) {
      idkPh = " NO ";
    }

    lcd.setCursor(0, 0);
    lcd.print(" Suhu Air&Udara" + String (idkTemp));
    lcd.setCursor(0, 1);
    lcd.print(">pH            " + String (idkPh));
    lcd.setCursor(0, 2);
    lcd.print(" Kekeruhan     " + String (idkTurbi));
    lcd.setCursor(0, 3);
    lcd.print(" Zat Padat     " + String (idkTds));
    break;

  case 4:
    if (buton3 == LOW) {
      countTurbi = countTurbi + 1;
    }
    else if (buton2 == LOW) {
      countTurbi = countTurbi - 1;
    }
    if (countTurbi >> 1) {
      countTurbi = 0;
    }

    if (countTurbi == 1) {
      idkTurbi = " YES";
    }
```

```
      else if (countTurbi == 0) {
        idkTurbi = " NO ";
      }

      lcd.setCursor(0, 0);
      lcd.print(" Suhu Air&Udara" + String (idkTemp));
      lcd.setCursor(0, 1);
      lcd.print(" pH            " + String (idkPh));
      lcd.setCursor(0, 2);
      lcd.print(">Kekeruhan     " + String (idkTurbi));
      lcd.setCursor(0, 3);
      lcd.print(" Zat Padat     " + String (idkTds));
      break;

    case 5:
      if (buton3 == LOW) {
        countTds = countTds + 1;
      }
      else if (buton2 == LOW) {
        countTds = countTds - 1;
      }
      if (countTds >> 1) {
        countTds = 0;
      }

      if (countTds == 1) {
        idkTds = " YES";
      }
      else if (countTds == 0) {
        idkTds = " NO ";
      }

      lcd.setCursor(0, 0);
      lcd.print(" Suhu Air&Udara" + String (idkTemp));
      lcd.setCursor(0, 1);
```

```
  lcd.print(" pH            " + String (idkPh));
  lcd.setCursor(0, 2);
  lcd.print(" Kekeruhan     " + String (idkTurbi));
  lcd.setCursor(0, 3);
  lcd.print(">Zat Padat     " + String (idkTds));
  break;

case 6:
  if (buton3 == LOW) {
    timeSD = timeSD + 1;
    //delay(250);
  }
  else if (buton2 == LOW) {
    timeSD = timeSD - 1;
    //delay(250);
  }
  lcd.setCursor(0, 0);
  lcd.print("  TIME DATA UPDATE  ");
  lcd.setCursor(0, 2);
  lcd.print("     val = " + String(timeSD) + " Sec ");
  break;

case 7:
  if (countTemp == 1) {
    tempVal = temp;
    tempVal2 = temp2;
  }
  else {
    tempVal = 0;
  }
  if (countPh == 1) {
    phVal = phEquals;
  }
  else {
    phVal = 0;
```

```
      }
      if (countTurbi == 1) {
        turbiVal = hasilKeruh;
      }
      else {
        hasilKeruh = 0;
      }
      if (countTds == 1) {
        tdsVal = data_tds;
      }
      else {
        tdsVal = 0;
      }
      if ((millis() - proveus) > 500) {
        lcd.setCursor(0, 0);
        lcd.print("Suhu Udara: " + String (tempVal) + char(223) + "C");
        lcd.setCursor(0, 1);
        lcd.print("Suhu Air  : " + String (tempVal2) + char(223) + "C");
        lcd.setCursor(0, 2);
        lcd.print("Selisih   : " + String (tempVal - tempVal2) + char(223) +
"C");
        lcd.setCursor(0, 3);
        lcd.print("pH        : " + String (phVal));
        proveus = millis();
      }
      //send_sd_card(timeSD, tempVal, phVal, turbiVal, tdsVal);
      break;

    case 8:
      if (countTemp == 1) {
        tempVal = temp;
        tempVal2 = temp2;
      }
      else {
        tempVal = 0;
      }
      if (countPh == 1) {
        phVal = phEquals;
      }
      else {
        phVal = 0;
      }
      if (countTurbi == 1) {
        turbiVal = hasilKeruh;
      }
      else {
        hasilKeruh = 0;
      }
      if (countTds == 1) {
        tdsVal = data_tds;
      }
      else {
        tdsVal = 0;
      }
      if ((millis() - proveus) > 500) {
        lcd.setCursor(0, 0);
        lcd.print("Zat Padat: " + String (tdsVal) + " PPM ");
        lcd.setCursor(0, 1);
        lcd.print("Kekeruhan: " + String (turbiVal) + " NTU ");
        proveus = millis();
      }
      break;

    case 9:
      if (countTemp == 1) {
        tempVal = temp;
        tempVal2 = temp2;
        if (temp - temp2 >= 3 && temp - temp2 <= 4) {
          lcd.clear();
          indikatorsuhu = "Layak";
```

```
  }
  else {
    indikatorsuhu = "Tdk Layak";
  }
}
else {
  tempVal = 0;
  indikatorsuhu = " ----- ";
}
if (countPh == 1) {
  phVal = phEquals;
  if (phEquals >= 6, 5 && phEquals <= 8, 5) {
    lcd.clear();
    indikatorph = "Layak";
  }
  else {
    indikatorph = "Tdk Layak";
  }
}
else {
  phVal = 0;
  indikatorph = " ----- ";
}
if (countTurbi == 1) {
  turbiVal = hasilKeruh;
  if (hasilKeruh <= 3) {
    indikatorturbi = "Layak";
    lcd.clear();
  }
  else {
    indikatorturbi = "Tdk Layak";
  }
}
else {
  hasilKeruh = 0;
```

```
    indikatorturbi = " ----- ";
  }
  if ((millis() - proveus) > 500) {
    lcd.setCursor(0, 0);
    lcd.print("     Keterangan");
    lcd.setCursor(0, 1);
    lcd.print("Suhu     : " + String (indikatorsuhu));
    lcd.setCursor(0, 2);
    lcd.print("pH       : " + String (indikatorph));
    lcd.setCursor(0, 3);
    lcd.print("Kekeruhan: " + String (indikatorturbi));
    proveus = millis();
  }
  break;

case 10:
  if (countTds == 1) {
    tdsVal = data_tds;
    if (data_tds <= 300) {
      indikatortds = "Layak";
      lcd.clear();
    }
    else {
      indikatortds = "Tdk Layak";
    }
  }
  else {
    tdsVal = 0;
    indikatortds = " ----- ";
  }
  if ((millis() - proveus) > 500) {
    lcd.setCursor(0, 0);
    lcd.print("     Keterangan");
    lcd.setCursor(0, 1);
    lcd.print("Zat Padat: " + String (indikatortds));
```

```
        proveus = millis();
      }
      break;
  }
}

void rtcSet() {
  Rtc.Begin();
  RtcDateTime compiled = RtcDateTime(_DATE, __TIME_);
  printDateTime(compiled);
  Serial.println();
  if (!Rtc.IsDateTimeValid())
  {
    if (Rtc.LastError() != 0)
    {
      Serial.print("RTC communications error = ");
      Serial.println(Rtc.LastError());
    }
    else
    {
      Serial.println("RTC lost confidence in the DateTime!");
      Rtc.SetDateTime(compiled);
    }
  }
  if (!Rtc.GetIsRunning())
  {
    Serial.println("RTC was not actively running, starting now");
    Rtc.SetIsRunning(true);
  }

  RtcDateTime now = Rtc.GetDateTime();
  if (now < compiled)
  {
    Serial.println("RTC is older than compile time!  (Updating
DateTime)");
```

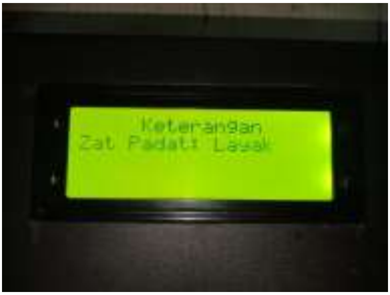
```
    Rtc.SetDateTime(compiled);
  }
  Rtc.Enable32kHzPin(false);
  Rtc.SetSquareWavePin(DS3231SquareWavePin_ModeNone);
}

//program esp32
#define BLYNK_PRINT Serial
#include <WiFi.h>
#include <WiFiClient.h>
#include <BlynkSimpleEsp32.h>
#include <SoftwareSerial.h>
#include "FS.h"
#include "SD.h"
#include <SPI.h>

#define SD_CS 5
String dataMessage;
unsigned long timeShow;
int flagRun;
char auth[] = "v-8idQza3yPOG56Q3MGaVqszAonmF7Wi";//kode
autentikasi blynk
char ssid[] = "cohc";//nama wifi
char pass[] = "00000000";

unsigned long  prefData;
unsigned long pref;
String dataSerial;
String tempStr, phStr, turbiStr, tdsStr, jamStr, timeStr;
float temp, ph , turbi , tds ;
int timeInt ;
SoftwareSerial uno;
BlynkTimer timer;
 WidgetLCD lcdh(V4);
```

```
void myTimerEvent()
{
  Blynk.virtualWrite(V0, temp);
  Blynk.virtualWrite(V1, ph);
  Blynk.virtualWrite(V2, turbi);
  Blynk.virtualWrite(V3, tds);
  show();//fungsi menampilkan lcd pada blynk
}

void setup() {
  Serial.begin(9600);
  Blynk.begin(auth, ssid, pass, "blynk.cloud", 80);
  timer.setInterval(1000L, myTimerEvent);
  uno.begin(9600, SWSERIAL_8N1, 17, 16, false);

  SD.begin(SD_CS);
  if (!SD.begin(SD_CS)) {
    Serial.println("Card Mount Failed");
    return;
  }
  uint8_t cardType = SD.cardType();
  if (cardType == CARD_NONE) {
    Serial.println("No SD card attached");
    return;
  }
  Serial.println("Initializing SD card...");
  if (!SD.begin(SD_CS)) {
    Serial.println("ERROR - SD card initialization failed!");
    return;
  }
  File file = SD.open("/data.txt");
  if (!file) {
    Serial.println("File doens't exist");
    Serial.println("Creating file...");
    writeFile(SD, "/data.txt", "ESP32 and SD Card \r\n");
  }
  else {
    Serial.println("File already exists");
  }
  file.close();
}

void loop() {
  Blynk.run();
  timer.run();
  SerialRead();
  logSDCard();
}

void SerialRead() {
  if (uno.available() > 0) {
    dataSerial = uno.readStringUntil('\n');
    int data1 = dataSerial.indexOf('{');
    int data2 = dataSerial.indexOf(',', data1 + 1);
    int data3 = dataSerial.indexOf(',', data2 + 1);
    int data4 = dataSerial.indexOf(',', data3 + 1);
    int data5 = dataSerial.indexOf(',', data4 + 1);
    int data6 = dataSerial.indexOf(",", data5 + 1);
    int data7 = dataSerial.indexOf("}", data6 + 1);

    tempStr = dataSerial.substring(data1 + 1, data2);
    phStr = dataSerial.substring(data2 + 1, data3);
    turbiStr = dataSerial.substring(data3 + 1, data4);
    tdsStr = dataSerial.substring(data4 + 1, data5);
    jamStr = dataSerial.substring(data5 + 1, data6);
    timeStr = dataSerial.substring(data6 + 1, data7);

  }
  temp = tempStr.toFloat();
  ph = phStr.toFloat();
  turbi = turbiStr.toFloat();
  tds = tdsStr.toFloat();
  timeInt = timeStr.toInt();

  if ((millis() - pref) > 1000) {
    //        Serial.println("temp=" + String(temp));
    Serial.println("temp=" + String(temp) + "C");
    Serial.println("ph_out=" + String(phStr));
    Serial.println("turbi=" + String(turbiStr) + "ntu");
    Serial.println("tds=" + String(tds) + "ppm");
    Serial.println("jam=" + String(jamStr));
    Serial.println("jam=" + String(timeInt));

Serial.println("++++++++++++++++++++++++++++++++++++++++++++
+++++++++=");
    pref = millis();
  }
}



void logSDCard() {
  dataMessage = "TIME = " + String(jamStr) + ", " +
                "TEMP = " + String(temp) + " C"  + ", " +
                "phVal = " + String(phStr) + ", " +
                "turbiVal = " + String(turbiStr) + " NTU"  + ", " +
                "tdsVal = " + String(tdsStr) + " PPM" +
                "\n";

  if (timeInt > 0) {
    if ((millis() - prefData) > timeInt * 1000) {
      Serial.print("Save data: ");
      Serial.println(dataMessage);
      appendFile(SD, "/data.txt", dataMessage.c_str());
      prefData = millis();
    }
  }
}
// Write to the SD card (DON'T MODIFY THIS FUNCTION)
void writeFile(fs::FS &fs, const char * path, const char * message) {
  Serial.printf("Writing file: %s\n", path);
  File file = fs.open(path, FILE_WRITE);
  if (!file) {
    Serial.println("Failed to open file for writing");
    return;
  }
  if (file.print(message)) {
    Serial.println("File written");
  } else {
    Serial.println("Write failed");
  }
  file.close();
}
void appendFile(fs::FS &fs, const char * path, const char * message) {
  Serial.printf("Appending to file: %s\n", path);
  File file = fs.open(path, FILE_APPEND);
  if (!file) {
    Serial.println("Failed to open file for appending");
    return;
  }
  if (file.print(message)) {
    Serial.println("Message appended");
  } else {
    Serial.println("Append failed");
  }
  file.close();
}

void show() {
  if (millis() - timeShow > 3000) {
    lcdh.print     (0, 1, " MONITORING DATA");
    flagRun++;
    timeShow = millis();
  }

  switch (flagRun) {

    case 0:
      break;
    case 1:
      lcdh.print     (0, 1, " TEMP=         " + String(char(223)) + "C ");
      lcdh.print(6, 1, String (temp));
      break;
    case 2:
      lcdh.print(0, 1, "   PH=           ");
      lcdh.print(6, 1, String(ph));

      break;
    case 3:
      lcdh.print(0, 1, "TURBI=      NTU ");
      lcdh.print(6, 1, String (turbi));
      break;
    case 4:
      lcdh.print(0, 1, "  TDS=      PPM ");
      lcdh.print(6, 1, String (tds));
      break;
    case 5:
      flagRun = 1;
      break;

  }
}
```

LAMPIRAN B

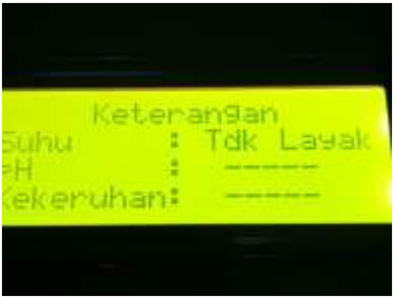
Dokumentasi

Gambar 1. Cairan *buffer* pH



```
    Keterangan
Zat Padat: Layak
```

Gambar 2. Tampilan Indikator Layak



```
    Keterangan
Suhu     : Tdk Layak
pH       : ------
Kekeruhan: ------
```

Gambar 3. Tampilan Indikator Tidak Layak

BIODATA PENULIS

Nama	:	Anisatu Zahroh
Tempat, Tanggal Lahir	:	Cilacap, 16 Desember 2002
Alamat	:	Jl. Anggrek RT 01 RW 07, Tritih Lor, Jeruklegi, Cilacap
Email	:	anisatuzahroh997@gmail.com
No telp/HP	:	088232083896
Hobi	:	Membaca
Motto	:	Sebaik-baiknya manusia adalah manusia yang bermanfaat untuk orang lain

Riwayat Pendidikan

• SD Negeri Tritih Lor 02	Tahun 2008-2014
• SMP Negeri 1 Jeruklegi	Tahun 2014-2017
• SMA Negeri 2 Cilacap Jurusan MIPA	Tahun 2017-2020
• Politeknik Negeri Cilacap Prodi D3 Teknik Elektronika	Tahun 2020-2023

Penulis telah mengikuti sidang Tugas Akhir pada tanggal 9 Agustus 2023 sebagai salah satu persyaratan untuk memperoleh gelar Ahli Madya (A.Md.)