

LAMPIRAN 1

1. Source Code

```
#include <max6675.h>

#include <Wire.h>

float voltage;

float pHvalue;

float sangatasam,asam,kurangasam,konversi;

float Trendah,Tsedang,Ttinggi,konversi2;

float z1,z2,z3,z4,z5,z6,z7,z8,z9;

float pred1,pred2,pred3,pred4,pred5,pred6,pred7,pred8,pred9;

float penjumlah,pembagi,zt;

int thermoDO = 4;

int thermoCS = 5;

int thermoCLK = 6;

int sensorPin = A0;

int sensorValue = 0;

int adcPH;

MAX6675 thermocouple(thermoCLK, thermoCS, thermoDO);

int vccPin = 3;

int gndPin = 2;
```

```

// make a cute degree symbol

uint8_t degree[8] = {140,146,146,140,128,128,128,128};

//===== LCD ===== I2C

//LiquidCrystal lcd(18, 13, 22, 21, 20, 19);

#include <Wire.h>

#include <LCD.h>

#include <LiquidCrystal_I2C.h>

#define I2C_ADDR 0x27 // Jika 0x3F tidak mau coba gunakan 0x27
atau 0x20

#define BACKLIGHT_PIN 3

#define En_pin 2

#define Rw_pin 1

#define Rs_pin 0

#define D4_pin 4

#define D5_pin 5

#define D6_pin 6

#define D7_pin 7

LiquidCrystal_I2C

lcd(I2C_ADDR,En_pin,Rw_pin,Rs_pin,D4_pin,D5_pin,D6_pin,D7_pi
n);

```

```

void setup() {

  Serial.begin(9600);

  pinMode(vccPin, OUTPUT); digitalWrite(vccPin, HIGH);
  pinMode(gndPin, OUTPUT); digitalWrite(gndPin, LOW);

  // wait for MAX chip to stabilize
  delay(500);

  lcd.begin (16,2);
  // Nyalakan lampu backlight
  lcd.setBacklightPin(BACKLIGHT_PIN,POSITIVE);
  lcd.setBacklight(HIGH);
}

void loop() {

  // basic readout test, just print the current temp

  lcd.clear();

  Serial.println(" <===== temperatur & pH
=====>");

  Serial.print("celsius :");

  Serial.println(thermocouple.readCelsius());

```

```

lcd.print("C=");

lcd.print(thermocouple.readCelsius());

adcPH = analogRead(A0);

voltage = adcPH*5.0/1023;

pHvalue = (-2.8*adcPH+2355.2)/96;

Serial.println(adcPH);

Serial.println(voltage);

lcd.print(" pH =");

lcd.println(pHvalue);

Serial.print("Nilai pH =");

Serial.println(pHvalue);

konversi = pHvalue;

konversi2 = (thermocouple.readCelsius());

//fuzzyfikasi_sangatasm()

if (konversi<=1)

{

  sangatasm = 1;

}

else if ((konversi>1)&&(konversi<5.1))

{

  sangatasm = ((5.1-konversi)/(5.1-1));

```

```
}  
  
else if (konversi>=5.1)  
{  
    sangatasam = 0;  
}
```

```
//void fuzzyfikasi_asam()  
  
if ((konversi<=4.8)||(konversi>=5.6))  
{  
    asam = 0;  
}  
  
else if ((konversi>4.8)&&(konversi<5))  
{  
    asam = ((konversi-4.8)/(5-4.8));  
}  
  
else if (konversi==5)  
{  
    asam = 1;  
}  
  
else if ((konversi>5)&&(konversi<5.6))  
{  
    asam = ((5.6-konversi)/(5.6-5));
```

```
}
```

```
//void fuzzyfikasi_kurangasam()
```

```
if (konversi<=5.3)
```

```
{
```

```
kurangasam = 0;
```

```
}
```

```
else if ((konversi>5.3)&&(konversi<6.1))
```

```
{
```

```
kurangasam = ((konversi-5.3)/(6.1-5.3));
```

```
}
```

```
else if (konversi>=6.1)
```

```
{
```

```
kurangasam = 1;
```

```
}
```

```
//void fuzzyfikasi_Trendah()
```

```
if (konversi2<=20)
```

```
{
```

```
Trendah = 1;
```

```
}
```

```

else if ((konversi2>20)&&(konversi2<86))
{
Trendah = ((86-konversi2)/(86-20));
}
else if (konversi2>=86)
{
Trendah = 0;
}

//void fuzzyfikasi_Tsedang()
if ((konversi2<=83)||((konversi2>=93))
{
Tsedang = 0;
}
else if ((konversi2>83)&&(konversi2<88))
{
Tsedang = ((konversi2-83)/(88-83));
}
else if (konversi2==88)
{
Tsedang = 1;
}
else if ((konversi2>88)&&(konversi2<93))

```

```
{  
  
Tsedang = ((93-konversi2)/(93-88));  
  
}
```

```
//void fuzzyfikasi_suhutinggi()
```

```
if (konversi2<=90)
```

```
{  
  
Ttinggi = 0;  
  
}
```

```
else if ((konversi2>90)&&(konversi2<94))
```

```
{  
  
Ttinggi = ((konversi2-90)/(94-90));  
  
}
```

```
else if (konversi2>=94)
```

```
{  
  
Ttinggi = 1;  
  
}
```

```
//void rule1()// buruk
```

```
{  
  
if (sangatasm<Trendah)
```



```

{
pred1 = sangatasam;
z1 = 30;
}
else if ((sangatasam>Trendah)||((sangatasam==Trendah))
{
pred1 = Trendah;
z1 = 30;
}
}
//void rule2()// buruk
if (sangatasam<Tsedang)
{
pred2 = sangatasam;
z2 = 30;
}
else if ((sangatasam>Tsedang)||((sangatasam==Tsedang))
{
pred2 = Tsedang;
z2 = 30;
}
}

```

```
//void rule3()// buruk
```

```
if (sangatasam<Ttinggi)
```

```
{
```

```
pred3 = sangatasam;
```

```
z3 = 30;
```

```
}
```

```
else if ((sangatasam>Ttinggi)||((sangatasam==Ttinggi))
```

```
{
```

```
pred3 = Ttinggi;
```

```
z3 = 30;
```

```
}
```

```
//void rule4()// buruk
```

```
if (asam<Trendah)
```

```
{
```

```
pred4 = asam;
```

```
z4 = 30;
```

```
}
```

```
else if ((asam>Trendah)||((asam==Trendah))
```

```
{
```

```
pred4 = Trendah;
```

```
z4 = 30;
```

```
}
```

```
//void rule5()// bagus
```

```
if (asam<Tsedang)
```

```
{
```

```
pred5 = asam;
```

```
z5 = 60;
```

```
}
```

```
else if ((asam>Tsedang)||(asam==Tsedang))
```

```
{
```

```
pred5 = Tsedang;
```

```
z5 = 60;
```

```
}
```

```
//void rule6()// bagus
```

```
if (asam<Ttinggi)
```

```
{
```

```
pred6 = asam;
```

```
z6 = 60;
```

```
}
```

```
else if ((asam>Ttinggi)||(asam==Ttinggi))
```

```
{  
  
pred6 = Ttinggi;  
  
z6 = 60;  
  
}
```

```
//void rule7()// bagus
```

```
if (kurangasam<Trendah)  
{  
pred7 = kurangasam;  
z7 = 60;  
}  
else if ((kurangasam>Trendah)||  
(kurangasam==Trendah))  
{  
pred7 = Trendah;  
z7 = 60;  
}
```

```
//void rule8()// bagus
```

```
if (kurangasam<Tsedang)  
{  
  
pred8 = kurangasam;
```

```
z8 = 60;
}
else if ((kurangasam>Tsedang)|| (kurangasam==Tsedang))
{
pred8 = Tsedang;
z8 = 60;
}

//void rule9()// sangat bagus

if (kurangasam<Ttinggi)
{
pred9 = kurangasam;
z9 = 90;
}
else if ((kurangasam>Ttinggi)|| (kurangasam==Ttinggi))
{
pred9 = Ttinggi;
z9 = 90;
}

//void defuzzyfikasi()
```

```

penjumlah =
((pred1*z1)+(pred2*z2)+(pred3*z3)+(pred4*z4)+(pred5*z5)+(pred6*z
6)+(pred7*z7)+(pred8*z8)+(pred9*z9));

pembagi =
(pred1+pred2+pred3+pred4+pred5+pred6+pred7+pred8+pred9);

zt = penjumlah/pembagi;

```

```

lcd.setCursor ( 0, 1 );
lcd.print("kualitas =");
lcd.println(zt);
Serial.print("kualitas=");
Serial.println(zt);
delay(5000);

```

```

}

```

