

## LAMPIRAN

Perhitungan nilai konsentrasi serum menggunakan output tegangan Vd

### 1. Sampel 1 (160 mg/dl)

#### a. Pengukuran 1

$$V = 1,25$$

$$Y = mx + c$$

$$Y = -162.962 (1.25) + 362.072$$

$$= -203,7025 + 362.072$$

$$= 158.36$$

#### b. Pengukuran 2

$$V = 1,24$$

$$Y = mx + c$$

$$Y = -162.962 (1.24) + 362.072$$

$$= -202,0728 + 362.072$$

$$= 159,09$$

#### c. Pengukuran 1

$$V = 1,23$$

$$Y = mx + c$$

$$Y = -162.962 (1.23) + 362.072$$

$$= -200,443 + 362.072$$

$$= 161,62$$

2. Sampel 2 (160 mg/dl)

a. Pengukuran 1

$$V = 1,29$$

$$Y = mx + c$$

$$Y = -162.962 (1.29) + 362.072$$

$$= -210.220 + 362.072$$

$$= 151.85$$

b. Pengukuran 2

$$V = 1,27$$

$$Y = mx + c$$

$$Y = -162.962 (1.27) + 362.072$$

$$= -206.9617 + 362.072$$

$$= 155,11$$

c. Pengukuran 3

$$V = 1,28$$

$$Y = mx + c$$

$$Y = -162.962 (1.28) + 362.072$$

$$= -208.591 + 362.072$$

$$= 153.48$$

3. Sampel 3 (160 mg/dl)

a. Pengukuran 1

$$V = 1,32$$

$$Y=mx+c$$

$$\begin{aligned} Y &= -162.962 (1.32) + 362.072 \\ &= -215.1098 + 362.072 \\ &= 146,96 \end{aligned}$$

b. Pengukuran 2

$$V= 1,27$$

$$Y=mx+c$$

$$\begin{aligned} Y &= -162.962 (1.27) + 362.072 \\ &= -206.9617 + 362.072 \\ &= 155,11 \end{aligned}$$

c. Pengukuran 3

$$V= 1,28$$

$$Y=mx+c$$

$$\begin{aligned} Y &= -162.962 (1.28) + 362.072 \\ &= -208.591 + 362.072 \\ &= 153.48 \end{aligned}$$

4. Sampel 4 (159 mg/dl)

a. Pengukuran 1

$$V= 1,31$$

$$Y=mx+c$$

$$\begin{aligned} Y &= -162.962 (1.31) + 362.072 \\ &= -213,4802 + 362.072 \end{aligned}$$

$$= 148,59$$

b. Pengukuran 2

$$V= 1,29$$

$$Y=mx+c$$

$$Y= -162.962 (1.29) + 362.072$$

$$= -210.220 + 362.072$$

$$= 151,85$$

c. Pengukuran 3

$$V= 1,30$$

$$Y=mx+c$$

$$Y= -162.962 (1.30) + 362.072$$

$$= -211.8506 + 362.072$$

$$= 150.22$$

5. Sampel 5 (156 mg/dl)

a. Pengukuran 1

$$V= 1,32$$

$$Y=mx+c$$

$$Y= -162.962 (1.32) + 362.072$$

$$= -215.1098 + 362.072$$

$$= 155,11$$

b. Pengukuran 2

$$V= 1,32$$

$$Y=mx+c$$

$$\begin{aligned} Y &= -162.962 (1.32) + 362.072 \\ &= -215.1098 + 362.072 \\ &= 155,11 \end{aligned}$$

c. Pengukuran 3

$$V= 1,31$$

$$Y=mx+c$$

$$\begin{aligned} Y &= -162.962 (1.31) + 362.072 \\ &= -213,4802 + 362.072 \\ &= 148,59 \end{aligned}$$

6. Sampel 6 (135 mg/dl)

a. Pengukuran 1

$$V= 1,37$$

$$Y=mx+c$$

$$\begin{aligned} Y &= -162.962 (1.37) + 362.072 \\ &= -223,2579 + 362.072 \\ &= 138,81 \end{aligned}$$

b. Pengukuran 2

$$V= 1,40$$

$$Y=mx+c$$

$$\begin{aligned} Y &= -162.962 (1,40) + 362.072 \\ &= -228,1468 + 362.072 \end{aligned}$$

$$= 133,92$$

c. Pengukuran 3

$$V= 1,34$$

$$Y=mx+c$$

$$Y= -162.962 (1.34) + 362.072$$

$$= -218,3690 + 362.072$$

$$= 143,70$$

7. Sampel 7 (132 mg/dl)

a. Pengukuran 1

$$V= 1,39$$

$$Y=mx+c$$

$$Y= -162.962 (1.39) + 362.072$$

$$= -226,5171 + 362.072$$

$$= 135,55$$

b. Pengukuran 2

$$V= 1,38$$

$$Y=mx+c$$

$$Y= -162.962 (1.38) + 362.072$$

$$= -224,8875 + 362.072$$

$$= 137,18$$

c. Pengukuran 3

$$V = 1,39$$

$$Y = mx + c$$

$$Y = -162.962 (1.39) + 362.072$$

$$= -226,5171 + 362.072$$

$$= 135,55$$

8. Sampel 8 (125 mg/dl)

a. Pengukuran 1

$$V = 1,49$$

$$Y = mx + c$$

$$Y = -162.962 (1.49) + 362.072$$

$$= -242,8133 + 362.072$$

$$= 119,25$$

b. Pengukuran 2

$$V = 1,48$$

$$Y = mx + c$$

$$Y = -162.962 (1.48) + 362.072$$

$$= -241,1837 + 362.072$$

$$= 120,88$$

c. Pengukuran 3

$$V = 1,47$$

$$Y = mx + c$$

$$Y = -162.962 (1.47) + 362.072$$

$$= -239,5541 + 362.072$$

$$= 122,51$$

9. Sampel 9 (128 mg/dl)

a. Pengukuran 1

$$V = 1,49$$

$$Y = mx + c$$

$$Y = -162.962 (1.49) + 362.072$$

$$= -242,8133 + 362.072$$

$$= 119,25$$

b. Pengukuran 2

$$V = 1,49$$

$$Y = mx + c$$

$$Y = -162.962 (1.49) + 362.072$$

$$= -242,8133 + 362.072$$

$$= 119,25$$

c. Pengukuran 3

$$V = 1,48$$

$$Y = mx + c$$

$$Y = -162.962 (1.48) + 362.072$$

$$= -241,1837 + 362.072$$

$$= 120,88$$

10. Sampel 10 (116 mg/dl)



## a. Pengukuran 1

$$V = 1,49$$

$$Y = mx + c$$

$$Y = -162.962 (1.49) + 362.072$$

$$= -242,8133 + 362.072$$

$$= 119,25$$

## b. Pengukuran 2

$$V = 1,51$$

$$Y = mx + c$$

$$Y = -162.962 (1.51) + 362.072$$

$$= -246,0726 + 362.072$$

$$= 115,99$$

## c. Pengukuran 3

$$V = 1,52$$

$$Y = mx + c$$

$$Y = -162.962 (1.52) + 362.072$$

$$= -247,7022 + 362.072$$

$$= 114,36$$

## Perhitungan Statistik

## 1. Perhitungan Serum 1 (160 mg/dl)

$$a. \text{ Rata-rata } \bar{X} = \frac{\sum Xn}{n}$$

Diketahui :

$$\bar{X} = \text{rata-rata} \dots ?$$

$$\sum X_n = 479,07 \text{ (hasil penjumlahan 3 pengukuran)}$$

$$n = 3$$

Dimana :

$$\bar{X} = \frac{479,07}{3} = 159,69 \text{ mg/dl}$$

b. Simpangan  $Y - \bar{X}$

Diketahui :

$$Y = 160 \text{ (nilai konsentrasi serum)}$$

$$\bar{X} = 159,69 \text{ (rerata hasil pengukuran)}$$

Dimana :

$$\text{Simpangan} = 160 - 159,69 = 0,31$$

c. % Error

$$\% \text{ Error} = \frac{x_n - \bar{X}}{x_n} \times 100$$

Diketahui:

$$\% \text{ Error} = \dots ?$$

$$X_n = 160$$

$$\bar{X} = 159,69$$

Dimana:

$$\% \text{ Error} = \frac{160 - 159,69}{160} \times 100 = 01 \%$$

2. Perhitungan Serum 2 (160 mg/dl)

1. Rata-rata  $\bar{X} = \frac{\sum Xn}{n}$

Diketahui :

$$\bar{X} = \text{rata-rata} \dots ?$$

$$\sum Xn = 460,44 \text{ (hasil penjumlahan 3 pengukuran)}$$

$$n = 3$$

Dimana :

$$\bar{X} = \frac{460,44}{3} = 153,48 \text{ mg/dl}$$

2. Simpangan  $Y - \bar{X}$

Diketahui :

$$Y = 160 \text{ (nilai konsentrasi serum)}$$

$$\bar{X} = 153,48 \text{ (rerata hasil pengukuran)}$$

Dimana :

$$\text{Simpangan} = 160 - 153,48 = 6,52$$

3. % Error

$$\% \text{ Error} = \frac{x_n - \bar{X}}{x_n} \times 100$$

Diketahui:

$$\% \text{ Error} = \dots?$$

$$X_n = 160$$

$$\bar{X} = 159,69$$

Dimana:

$$\% \text{ Error} = \frac{160 - 153,48}{160} \times 100 = 4,07 \%$$

### 3. Perhitungan Serum 3 (160 mg/dl)

a. Rata-rata  $\bar{X} = \frac{\sum X_n}{n}$

Diketahui :

$$\bar{X} = \text{rata-rata} \dots?$$

$$\sum X_n = 455,55 \text{ (hasil penjumlahan 3 pengukuran)}$$

$$n = 3$$

Dimana :

$$\bar{X} = \frac{455,55}{3} = 151,85 \text{ mg/dl}$$

### b. Simpangan Y- $\bar{X}$

Diketahui :

$Y = 160$  (nilai konsentrasi serum)

$\bar{X} = 159,69$  (rerata hasil pengukuran)

Dimana :

Simpangan =  $160 - 151,85 = 8,15$

c. % Error

$$\% \text{ Error} = \frac{x_n - \bar{X}}{x_n} \times 100$$

Diketahui:

% Error = ....?

$X_n = 160$

$\bar{X} = 151,85$

Dimana:

$$\% \text{ Error} = \frac{160 - 151,85}{160} \times 100 = 5,09 \%$$

4. Perhitungan Serum 4 (159 mg/dl)

a. Rata-rata  $\bar{X} = \frac{\sum X_n}{n}$

Diketahui :

$\bar{X}$  = rata-rata.....?

$\sum X_n = 450,66$  (hasil penjumlahan 3 pengukuran)

$n = 3$

Dimana :

$$\bar{X} = \frac{450,66}{3} = 150,22 \text{ mg/dl}$$

b. Simpangan  $Y - \bar{X}$

Diketahui :

$Y = 159$  (nilai konsentrasi serum)

$\bar{X} = 150,22$  ( rerata hasil pengukuran)

Dimana :

$$\text{Simpangan} = 159 - 150,22 = 8,78$$

c. % Error

$$\% \text{ Error} = \frac{x_n - \bar{X}}{x_n} \times 100$$

Diketahui:

$$\% \text{ Error} = \dots?$$

$$X_n = 159$$

$$\bar{X} = 150,22$$

Dimana:

$$\% \text{ Error} = \frac{159 - 150,22}{159} \times 100 = 5,52\%$$

5. Perhitungan Serum 5 (156 mg/dl)

a. Rata-rata  $\bar{X} = \frac{\sum X_n}{n}$

Diketahui :

$$\bar{X} = \text{rata-rata} \dots ?$$

$$\sum X_n = 458,81 \text{ (hasil penjumlahan 3 pengukuran)}$$

$$n = 3$$

Dimana :

$$\bar{X} = \frac{458,81}{3} = 152,93 \text{ mg/dl}$$

b. Simpangan  $Y - \bar{X}$

Diketahui :

$$Y = 156 \text{ (nilai konsentrasi serum)}$$

$$\bar{X} = 152,93 \text{ (rerata hasil pengukuran)}$$

Dimana :

$$\text{Simpangan} = 156 - 152,93 = 3,07$$

c. % Error

$$\% \text{ Error} = \frac{X_n - \bar{X}}{X_n} \times 100$$

Diketahui:

$$\% \text{ Error} = \dots ?$$

$$X_n = 156$$

$$\bar{X} = 152,93$$

Dimana:

$$\% \text{ Error} = \frac{156 - 152,93}{156} \times 100 = 1,96 \%$$

6. Perhitungan Serum 6 (135 mg/dl)

a. Rata-rata  $\bar{X} = \frac{\sum Xn}{n}$

Diketahui :

$$\bar{X} = \text{rata-rata} \dots ?$$

$$\sum Xn = 416,43 \text{ (hasil penjumlahan 3 pengukuran)}$$

$$n = 3$$

Dimana :

$$\bar{X} = \frac{416,43}{3} = 138,81 \text{ mg/dl}$$

b. Simpangan  $Y - \bar{X}$

Diketahui :

$$Y = 135 \text{ (nilai konsentrasi serum)}$$

$$\bar{X} = 138,81 \text{ (rerata hasil pengukuran)}$$

Dimana :

$$\text{Simpangan} = 135 - 138,81 = 3,81$$

c. % Error

$$\% \text{ Error} = \frac{Xn - \bar{X}}{Xn} \times 100$$



Diketahui:

$$\% \text{ Error} = \dots?$$

$$X_n = 135$$

$$\bar{X} = 138,81$$

Dimana:

$$\% \text{ Error} = \frac{135 - 138,81}{135} \times 100 = 2,82 \%$$

#### 7. Perhitungan Serum 7 (132 mg/dl)

a. Rata-rata  $\bar{X} = \frac{\sum X_n}{n}$

Diketahui :

$$\bar{X} = \text{rata-rata} \dots?$$

$$\sum X_n = 408,28 \text{ (hasil penjumlahan 3 pengukuran)}$$

$$n = 3$$

Dimana :

$$\bar{X} = \frac{408,28}{3} = 136,09 \text{ mg/dl}$$

b. Simpangan  $Y - \bar{X}$

Diketahui :

$$Y = 132 \text{ (nilai konsentrasi serum)}$$

$$\bar{X} = 136,09 \text{ (rerata hasil pengukuran)}$$

Dimana :

$$\text{Simpangan} = 132 - 136,09 = 4,09$$

c. % Error

$$\% \text{ Error} = \frac{x_n - \bar{X}}{x_n} \times 100$$

Diketahui:

$$\% \text{ Error} = \dots?$$

$$X_n = 132$$

$$\bar{X} = 136,09$$

Dimana:

$$\% \text{ Error} = \frac{132 - 136,09}{132} \times 100 = 3,09 \%$$

8. Perhitungan Serum 8 (125 mg/dl)

a. Rata-rata  $\bar{X} = \frac{\sum X_n}{n}$

Diketahui :

$$\bar{X} = \text{rata-rata} \dots?$$

$$\sum X_n = 362,64 \text{ (hasil penjumlahan 3 pengukuran)}$$

$$n = 3$$

Dimana :

$$\bar{X} = \frac{362,64}{3} = 120,88 \text{ mg/dl}$$

b. Simpangan  $Y - \bar{X}$

Diketahui :

$Y = 125$  (nilai konsentrasi serum)

$\bar{X} = 120,88$  ( rerata hasil pengukuran)

Dimana :

Simpangan =  $125 - 120,88 = 4,12$

c. % Error

$$\% \text{ Error} = \frac{x_n - \bar{X}}{x_n} \times 100$$

Diketahui:

$\% \text{ Error} = \dots?$

$X_n = 125$

$\bar{X} = 120,88$

Dimana:

$$\% \text{ Error} = \frac{125 - 120,88}{125} \times 100 = 3,29 \%$$

9. Perhitungan Serum 9 (118 mg/dl)

a. Rata-rata  $\bar{X} = \frac{\sum X_n}{n}$

Diketahui :

$\bar{X}$  = rata-rata.....?

$$\sum X_n = 359,38 \text{ (hasil penjumlahan 3 pengukuran)}$$

$$n = 3$$

Dimana :

$$\bar{X} = \frac{359,38}{3} = 119,79 \text{ mg/dl}$$

b. Simpangan  $Y - \bar{X}$

Diketahui :

$$Y = 118 \text{ (nilai konsentrasi serum)}$$

$$\bar{X} = 119,79 \text{ (rerata hasil pengukuran)}$$

Dimana :

$$\text{Simpangan} = 118 - 119,79 = 1,73$$

c. % Error

$$\% \text{ Error} = \frac{x_n - \bar{X}}{x_n} \times 100$$

Diketahui:

$$\% \text{ Error} = \dots?$$

$$X_n = 118$$

$$\bar{X} = 119,79$$

Dimana:

$$\% \text{ Error} = \frac{118 - 119,79}{118} \times 100 = 1,46 \%$$

## 10. Perhitungan Serum 10 (116 mg/dl)

a. Rata-rata  $\bar{X} = \frac{\sum Xn}{n}$

Diketahui :

$$\bar{X} = \text{rata-rata} \dots ?$$

$$\sum Xn = 349,6 \text{ (hasil penjumlahan 3 pengukuran)}$$

$$n = 3$$

Dimana :

$$\bar{X} = \frac{349,6}{3} = 116,53 \text{ mg/dl}$$

b. Simpangan  $Y - \bar{X}$ 

Diketahui :

$$Y = 116 \text{ (nilai konsentrasi serum)}$$

$$\bar{X} = 116,53 \text{ (rerata hasil pengukuran)}$$

Dimana :

$$\text{Simpangan} = 116 - 116,53 = 0,53$$

## c. % Error

$$\% \text{ Error} = \frac{Xn - \bar{X}}{Xn} \times 100$$

Diketahui:

$$\% \text{ Error} = \dots ?$$

$$X_n = 116$$

$$\bar{X} = 116,53$$

Dimana:

$$\% \text{ Error} = \frac{116 - 116,53}{160} \times 100 = 0,45 \%$$

### Coding Program

```
#include <LiquidCrystal.h>
```

```
#include <TimerOne.h>
```

```
LiquidCrystal lcd(2, 3, 4, 5, 6, 7);
```

```
int analog_phtrans=0,temp_analog=0,phtrans_hsl=0;
```

```
int last_phtrans=0;
```

```
char indeks_dsp=0,idks_run=0,idks_lop=0;
```

```
char Cek,Cek_Btn,last_Cek;
```

```
const int Set_pin = 8,Cek_pin = 9,lamp_pin = 12;
```

```
long lastDebounceTime = 0;
```

```
long debounceDelay = 50;
```

```
int msec,sec;
```

```
int dat_filt=0;
float hsl_kalibrasi=0;
void setup()
{
    Serial.begin(9600);
    lcd.begin(16,2);
    pinMode(Cek_pin, INPUT_PULLUP);
    pinMode(lamp_pin, OUTPUT);
    digitalWrite(lamp_pin,LOW);
    Timer1.initialize(8000);
    Timer1.attachInterrupt( timerIsr );
    lcd.setCursor(0,0);
    lcd.print(" TUGAS AKHIR");
    lcd.setCursor(0,1);
    lcd.print(" Filter Optic");
    delay(2000);
    lcd.clear();
}
void loop()
{
    analog_phtrans = analogRead(A0);
    if(last_phtrans>analog_phtrans)
    {
        if(idks_lop==0)
        {
            phtrans_hsl = (phtrans_hsl + last_phtrans) / 2;
```

```

if(analog_phtrans<=0){hsl_kalibrasi=0;}
else if(analog_phtrans>0)
{
hsl_kalibrasi =
(float)((float)0.0029*phtrans_hsl) + 4.4676;
}
idks_lop=1;
}
}
if(last_phtrans<analog_phtrans){idks_lop=0;}
last_phtrans=analog_phtrans;
}
Cek = digitalRead(Cek_pin);
if(Cek!=last_Cek){lastDebounceTime = millis();}
if((millis() - lastDebounceTime) > debounceDelay)
{
if(Cek != Cek_Btn)
{
Cek_Btn = Cek;
if(Cek_Btn == LOW)
{
lcd.clear();
if(++indeks_dsp>1){indeks_dsp=0;}
if(++idks_run>1){idks_run=0;}

if(idks_run==1){phtrans_hsl=0;msec=0;sec=0;digitalWrite(lamp_pin,HIGH);}

```



```
    }  
  }  
}  
if(indeks_dsp==0)  
{  
  lcd.setCursor(0,0);  
  lcd.print("Photo: ");  
  lcd.setCursor(0,1);  
  lcd.print(analog_phtrans);  
  lcd.print(" ");  
  lcd.print(phtrans_hsl);lcd.print(" ");  
  lcd.print(hsl_kalibrasi);lcd.print(" ");  
}  
else if(indeks_dsp==1)  
{  
  lcd.setCursor(0,0);  
  lcd.print("RUN...: ");  
  lcd.setCursor(0,1);  
  lcd.print(analog_phtrans);  
  lcd.print(" ");  
  lcd.print(phtrans_hsl);lcd.print(" ");  
  lcd.print(hsl_kalibrasi);lcd.print(" ");  
}  
  delay(1);  
void timerIsr()  
{
```

```
if(idks_run==1)
{
  if(++msec>200)
  {if(++sec>4)
  {
    digitalWrite(lamp_pin,LOW);
    idks_run=0;indeks_dsp=0;sec=0;
  }
  msec=0;
}
```