

$$\begin{aligned}
& \frac{31+32+32+32+33+33+33+34+34+34+34+35+35+35+35+35+35+35+35+35}{20} \\
& = 33,85 \text{ } ^\circ\text{C}
\end{aligned}$$

$$\begin{aligned}
\text{Rata – Rata } (\bar{X}) \text{ Pasien 4} &= \frac{\sum Xi}{n} \\
& \frac{31+31+32+32+33+33+33+33+34+34+34+34+35+35+35+35+35+35+35+35}{20} \\
& = 35,6 \text{ } ^\circ\text{C}
\end{aligned}$$

$$\begin{aligned}
\text{Rata – Rata } (\bar{X}) \text{ Pasien 5} &= \frac{\sum Xi}{n} \\
& \frac{30+32+33+33+34+34+35+35+35+35+35+35+35+35+36+36+36+36+36+36}{20} \\
& = 33,85 \text{ } ^\circ\text{C}
\end{aligned}$$

$$\begin{aligned}
\text{Rata – Rata } (\bar{X}) \text{ Pasien 6} &= \frac{\sum Xi}{n} \\
& \frac{32+32+33+34+34+34+35+35+35+35+35+35+35+35+35+35+35+35+36+36}{20} \\
& = 34,5 \text{ } ^\circ\text{C}
\end{aligned}$$

$$\text{Rata – Rata } (\bar{X}) \text{ Pasien 7} = \frac{\sum Xi}{n}$$

$$\frac{31+32+32+32+33+33+33+33+33+34+34+34+34+34+34+34+35+35+35+35}{20}$$

$$= 34,1 \text{ } ^\circ\text{C}$$

$$\text{Rata – Rata } (\bar{X}) \text{ Pasien 8} = \frac{\sum Xi}{n}$$

$$\frac{32+32+32+32+33+33+33+33+33+33+34+35+35+35+35+35+35+35+35+35}{20}$$

$$= 33,70 \text{ } ^\circ\text{C}$$

$$\text{Rata – Rata } (\bar{X}) \text{ Pasien 9} = \frac{\sum Xi}{n}$$

$$\frac{30+32+33+33+34+34+34+34+34+35+35+35+35+35+35+35+35+35+35+35}{20}$$

$$= 33,45 \text{ } ^\circ\text{C}$$

$$\text{Rata – Rata } (\bar{X}) \text{ Pasien 10} = \frac{\sum Xi}{n}$$

$$\frac{30+32+32+33+33+33+33+34+34+34+34+35+35+35+35+35+35+35+35+35}{20}$$

$$= 33,75 \text{ } ^\circ\text{C}$$

a. Perhitungan rata-rata parameter Respirasi

$$\text{Rata – Rata } (\bar{X}) \text{ Pasien 1} = \frac{\sum Xi}{n}$$

$$\begin{aligned}
& \frac{20+19+18+21+18+13+16+14+15+18+17+18+14+15+12+18+20+17+20+21}{20} \\
& = 17,2 \text{ BPM}
\end{aligned}$$

$$\begin{aligned}
\text{Rata – Rata } (\bar{X}) \text{ Pasien 2} &= \frac{\sum Xi}{n} \\
&= \frac{19+19+23+17+19+14+18+20+21+18+19+18+19+15+20+16+13+18+19+17}{20} \\
&= 18,1 \text{ BPM}
\end{aligned}$$

$$\begin{aligned}
\text{Rata – Rata } (\bar{X}) \text{ Pasien 3} &= \frac{\sum Xi}{n} \\
&= \frac{19+24+23+20+21+19+14+18+21+18+17+18+21+20+18+21+20+24+19+18}{20} \\
&= 18,65 \text{ BPM}
\end{aligned}$$

$$\begin{aligned}
\text{Rata – Rata } (\bar{X}) \text{ Pasien 4} &= \frac{\sum Xi}{n} \\
&= \frac{20+19+20+21+18+18+21+14+21+21+18+14+16+14+13+24+20+18+18+21}{20} \\
&= 18,45 \text{ BPM}
\end{aligned}$$

$$\text{Rata – Rata } (\bar{X}) \text{ Pasien 5} = \frac{\sum Xi}{n}$$

$$24+21+21+20+18+23+22+18+21+20+28+19+17+16+23+21+18+18+20+21$$

$$= \frac{\quad}{20}$$

$$= 21,55 \text{ BPM}$$

$$\text{Rata – Rata } (\bar{X}) \text{ Pasien 6} = \frac{\sum Xi}{n}$$

$$28+25+23+21+19+20+18+22+20+18+22+17+19+18+19+22+17+23+21+19$$

$$= \frac{\quad}{20}$$

$$= 20,55 \text{ BPM}$$

$$\text{Rata – Rata } (\bar{X}) \text{ Pasien 7} = \frac{\sum Xi}{n}$$

$$21+24+16+15+17+21+20+18+16+20+21+23+23+17+15+14+18+17+21+24$$

$$= \frac{\quad}{20}$$

$$= 18,85 \text{ BPM}$$

$$\text{Rata – Rata } (\bar{X}) \text{ Pasien 8} = \frac{\sum Xi}{n}$$

$$21+19+14+28+28+19+18+18+11+16+20+15+19+20+23+18+14+12+23+24$$

$$= \frac{\quad}{20}$$

$$= 18,5 \text{ BPM}$$

$$\text{Rata – Rata } (\bar{X}) \text{ Pasien 9} = \frac{\sum Xi}{n}$$

$$\frac{24+23+23+17+19+21+19+18+20+24+20+19+18+16+18+19+21+23+21+18}{20}$$

$$= \frac{\quad}{20}$$

$$= 20,05 \text{ BPM}$$

$$\text{Rata - Rata } (\bar{X}) \text{ Pasien 10} = \frac{\sum Xi}{n}$$

$$\frac{23+20+23+17+19+16+13+15+18+13+21+17+14+16+18+17+14+24+19+17}{20}$$

$$= \frac{\quad}{20}$$

$$= 17,7 \text{ BPM}$$

2. Perhitungan *Error*

$$\%Error = \frac{Xn - Yn}{Xn} \times 100\%$$

Dimana : Xn = rata-rata data pembanding

Yn = rata-rata data alat

a. Perhitungan *error* parameter Suhu

$$\begin{aligned} \%Error \text{ Pasien 1} &= \frac{Xn - Yn}{Xn} \times 100\% \\ &= \frac{33,93 - 33,45}{33,93} \times 100\% \\ &= \frac{0,48}{33,93} \times 100\% \\ &= 1,41 \% \end{aligned}$$

$$\begin{aligned} \%Error \text{ Pasien 2} &= \frac{Xn - Yn}{Xn} \times 100\% \\ &= \frac{34,67 - 34,25}{34,67} \times 100\% \\ &= \frac{0,42}{34,67} \times 100\% \end{aligned}$$

$$= 1,21 \%$$

$$\begin{aligned} \%Error \text{ Pasien 3} &= \frac{Xn - Yn}{Xn} \times 100\% \\ &= \frac{34,375 - 33,85}{34,375} \times 100\% \\ &= \frac{0,525}{33,375} \times 100\% \\ &= 1,527 \% \end{aligned}$$

$$\begin{aligned} \%Error \text{ Pasien 4} &= \frac{Xn - Yn}{Xn} \times 100\% \\ &= \frac{34,285 - 33,7}{34,285} \times 100\% \\ &= \frac{0,585}{34,285} \times 100\% \\ &= 1,5606 \% \end{aligned}$$

$$\begin{aligned} \%Error \text{ Pasien 5} &= \frac{Xn - Yn}{Xn} \times 100\% \\ &= \frac{35,055 - 34,6}{35,055} \times 100\% \\ &= \frac{0,455}{35,055} \times 100\% \\ &= 1,297 \% \end{aligned}$$

$$\begin{aligned} \%Error \text{ Pasien 6} &= \frac{Xn - Yn}{Xn} \times 100\% \\ &= \frac{35,11 - 34,5}{35,11} \times 100\% \\ &= \frac{0,61}{35,11} \times 100\% \\ &= 1,7373 \% \end{aligned}$$

$$\begin{aligned} \%Error \text{ Pasien 7} &= \frac{Xn - Yn}{Xn} \times 100\% \\ &= \frac{34,875 - 33,45}{34,875} \times 100\% \end{aligned}$$

$$= \frac{0,425}{33,875} \times 100\%$$

$$= 1,254 \%$$

$$\%Error \text{ Pasien 8} = \frac{Xn - Yn}{Xn} \times 100\%$$

$$= \frac{33,715 - 33,7}{33,715} \times 100\%$$

$$= \frac{0,015}{33,715} \times 100\%$$

$$= 0,044 \%$$

$$\%Error \text{ Pasien 9} = \frac{Xn - Yn}{Xn} \times 100\%$$

$$= \frac{34,52 - 34,1}{34,52} \times 100\%$$

$$= \frac{0,42}{35,52} \times 100\%$$

$$= 1,216 \%$$

$$\%Error \text{ Pasien 10} = \frac{Xn - Yn}{Xn} \times 100\%$$

$$= \frac{34,275 - 33,55}{34,275} \times 100\%$$

$$= \frac{0,425}{33,275} \times 100\%$$

$$= 1,239 \%$$

b. Perhitungan *error* parameter Respirasi

$$\%Error \text{ Pasien 1} = \frac{Xn - Yn}{Xn} \times 100\%$$

$$= \frac{18,65 - 17,2}{18,65} \times 100\%$$

$$= \frac{1,45}{18,65} \times 100\%$$

$$= 7,74 \%$$

$$\begin{aligned}
 \%Error \text{ Pasien 2} &= \frac{Xn - Yn}{Xn} \times 100\% \\
 &= \frac{19,4 - 18,1}{19,4} \times 100\% \\
 &= \frac{1,3}{19,4} \times 100\% \\
 &= 6,701 \%
 \end{aligned}$$

$$\begin{aligned}
 \%Error \text{ Pasien 3} &= \frac{Xn - Yn}{Xn} \times 100\% \\
 &= \frac{20,5 - 18,65}{20,5} \times 100\% \\
 &= \frac{1,85}{20,5} \times 100\% \\
 &= 9,024 \%
 \end{aligned}$$

$$\begin{aligned}
 \%Error \text{ Pasien 4} &= \frac{Xn - Yn}{Xn} \times 100\% \\
 &= \frac{18,75 - 18,45}{18,75} \times 100\% \\
 &= \frac{0,3}{18,75} \times 100\% \\
 &= 1,6 \%
 \end{aligned}$$

$$\begin{aligned}
 \%Error \text{ Pasien 5} &= \frac{Xn - Yn}{Xn} \times 100\% \\
 &= \frac{21,8 - 21,55}{21,8} \times 100\% \\
 &= \frac{0,25}{21,8} \times 100\% \\
 &= 1,1467 \%
 \end{aligned}$$

$$\begin{aligned}
 \%Error \text{ Pasien 6} &= \frac{Xn - Yn}{Xn} \times 100\% \\
 &= \frac{21,6 - 20,55}{21,6} \times 100\% \\
 &= \frac{1,05}{21,6} \times 100\% \\
 &= 4,861 \%
 \end{aligned}$$

$$\begin{aligned} \%Error \text{ Pasien 7} &= \frac{Xn-Yn}{Xn} \times 100\% \\ &= \frac{19,9-18,85}{19,9} \times 100\% \\ &= \frac{1,05}{19,9} \times 100\% \\ &= 5,276 \% \end{aligned}$$

$$\begin{aligned} \%Error \text{ Pasien 8} &= \frac{Xn-Yn}{Xn} \times 100\% \\ &= \frac{20,5-18,5}{20,5} \times 100\% \\ &= \frac{2}{20,5} \times 100\% \\ &= 9,756 \% \end{aligned}$$

$$\begin{aligned} \%Error \text{ Pasien 9} &= \frac{Xn-Yn}{Xn} \times 100\% \\ &= \frac{20,9-20,05}{20,9} \times 100\% \\ &= \frac{0,85}{20,9} \times 100\% \\ &= 4,066 \% \end{aligned}$$

$$\begin{aligned} \%Error \text{ Pasien 10} &= \frac{Xn-Yn}{Xn} \times 100\% \\ &= \frac{18,1-17,7}{18,1} \times 100\% \\ &= \frac{0,4}{18,1} \times 100\% \\ &= 2,209 \% \end{aligned}$$

3. Perhitungan Simpangan

Simpangan = $Xn-Yn$

Dimana :

Xn = rata-rata data pembanding

Y_n = rata-rata data alat

a. Perhitungan simpangan parameter suhu

$$\text{Simpangan Pasien 1} = X_n - Y_n$$

$$= 33,93 - 33,45$$

$$= 0,48$$

$$\text{Simpangan Pasien 2} = X_n - Y_n$$

$$= 34,67 - 34,25$$

$$= 0,42$$

$$\text{Simpangan Pasien 3} = X_n - Y_n$$

$$= 34,375 - 33,85$$

$$= 0,525$$

$$\text{Simpangan Pasien 4} = X_n - Y_n$$

$$= 34,285 - 33,7$$

$$= 0,585$$

$$\text{Simpangan Pasien 5} = X_n - Y_n$$

$$= 35,055 - 34,6$$

$$= 0,455$$

$$\text{Simpangan Pasien 6} = X_n - Y_n$$

$$= 35,11 - 34,5$$

$$= 0,61$$

$$\text{Simpangan Pasien 7} = X_n - Y_n$$

$$= 33,875 - 33,45$$

$$= 0,425$$

$$\text{Simpangan Pasien 8} = X_n - Y_n$$

$$= 33,715 - 33,7$$

$$= 0,015$$

$$\text{Simpangan Pasien 9} = X_n - Y_n$$

$$= 34,52-34,1$$

$$= 0,42$$

$$\text{Simpangan Pasien 10} = X_n - Y_n$$

$$= 34,275-33,85$$

$$= 0,425$$

b. Perhitungan simpangan parameter Respirasi

$$\text{Simpangan Pasien 1} = X_n - Y_n$$

$$= 18,65-17,2$$

$$= 1,45$$

$$\text{Simpangan Pasien 2} = X_n - Y_n$$

$$= 19,4-18,1$$

$$= 1,3$$

$$\text{Simpangan Pasien 3} = X_n - Y_n$$

$$= 20,5-18,65$$

$$= 1,85$$

$$\text{Simpangan Pasien 4} = X_n - Y_n$$

$$= 18,75-18,45$$

$$= 0,3$$

$$\text{Simpangan Pasien 5} = X_n - Y_n$$

$$= 21,8-21,55$$

$$= 0,25$$

$$\text{Simpangan Pasien 6} = X_n - Y_n$$

$$= 21,6-20,55$$

$$= 1,05$$

$$\text{Simpangan Pasien 7} = X_n - Y_n$$

$$= 19,9-18,85$$

$$= 1,05$$

$$\text{Simpangan Pasien 8} = X_n - Y_n$$

$$= 20,5 - 18,5$$

$$= 2$$

$$\text{Simpangan Pasien 9} = X_n - Y_n$$

$$= 20,9 - 20,05$$

$$= 0,85$$

$$\text{Simpangan Pasien 10} = X_n - Y_n$$

$$= 18,1 - 17,7$$

$$= 0,4$$

B. Program Arduino

```
#include <OneWire.h>
#include <DallasTemperature.h>

#define ONE_WIRE_BUS 3

OneWire oneWire
(ONE_WIRE_BUS);

DallasTemperature
sensor(&oneWire);

float suhu;
float data, detik, rumus;
int Reset=14;

void setup() {
  Serial.begin(115200);
  sensor.begin();
  attachInterrupt(0, baca, FALLING
);
  InitTimer();
  digitalWrite(Reset, HIGH);
  pinMode(Reset, OUTPUT);
}

void baca(){
  data++;
  if (data >= 6){
    rumus = data/detik*60;
    data = 0;
    detik = 0;
  } }

void loop() {
  digitalWrite(Reset, LOW);
  Serial.print("A ");
  Serial.print(rumus, 0);
  suhu = ambilsuhu();
  Serial.print("B ");
  Serial.print(suhu);
  Serial.println();
}

float ambilsuhu()
{
  sensor.requestTemperatures();
  float hasil =
  sensor.getTempCByIndex(0);
  return hasil;
}

ISR (TIMER1_OVF_vect){
  TCNT1H=0xBDC >> 8;
  TCNT1L=0xBDC & 0xff;
  detik++;
}
```

```

void InitTimer(){
    TCCR1A=(0<<COM1A1) |
(0<<COM1A0) | (0<<COM1B1) |
(0<<COM1B0) | (0<<WGM11) |
(0<<WGM10);
    TCCR1B=(0<<ICNC1) |
(0<<ICES1) | (0<<WGM13) |
(0<<WGM12) | (1<<CS12) |
(0<<CS11) | (0<<CS10);
    TCNT1H=0x0B;
    TCNT1L=0xDC;
    ICR1H=0x00;
    ICR1L=0x00;
    OCR1AH=0x00;
    OCR1AL=0x00;
    OCR1BH=0x00;
    OCR1BL=0x00;
    TIMSK1=0x01;
    sei();
}

#define BLUE    0x001F
#define RED     0xF800
#define GREEN   0x07E0
#define CYAN    0x07FF
#define MAGENTA 0xF81F
#define YELLOW  0xFFE0
#define WHITE   0xFFFF

Messenger message =
Messenger();
Messenger message1 =
Messenger();
Messenger message2 =
Messenger();
Messenger message3 =
Messenger();

int dataIn,
dataIn2,dataIn3,dataIn4,dataIn
5,dataIn6;

#include <Messenger.h>
#include "Adafruit_GFX.h"//
Hardware-specific library
#include <MCUFRIEND_kbv.h>
MCUFRIEND_kbv tft;

#define BLACK 0x0000

void message1Completed() {
    if (
message1.checkString("C") )
    {
        dataIn =
message1.readInt();
        tft.setTextColor(WHITE);
}
}

```

```

        tft.setTextSize(3);
        tft.setCursor(360, 15);
        tft.print(dataIn);

        dataIn2 =
message1.readInt();

        tft.setTextColor(WHITE);
        tft.setTextSize(3);
        tft.setCursor(360, 60);
        tft.print(dataIn2);
    }
}

void message2Completed()
{
if ( message2.checkString("E")
)
{
dataIn3 = message2.readInt();
tft.setTextColor(WHITE);
tft.setTextSize(3);
tft.setCursor(120, 155);
tft.print(dataIn3);
} }

void message3Completed()
{
if ( message3.checkString("F")

```

```

)
{
dataIn4 = message3.readInt();
tft.setTextColor(WHITE);
tft.setTextSize(3);
tft.setCursor(360, 155);
tft.print(dataIn4);
} }

void messageCompleted()
{
if ( message.checkString("A")
)
{
dataIn5 = message.readInt();
tft.setTextColor(WHITE);
tft.setTextSize(3);
tft.setCursor(120, 265);
tft.print(dataIn5);
dataIn6 = message.readInt();
tft.setTextColor(WHITE);
tft.setTextSize(3);
tft.setCursor(360, 265);
tft.print(dataIn6);
} }

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

```



```

Serial1.begin(115200);
Serial2.begin(115200);
Serial3.begin(115200);

message1.attach(message1Completed);
message2.attach(message2Completed);
message3.attach(message3Completed);
message.attach(messageCompleted);

uint16_t ID = tft.readID();
tft.begin(ID);
tft.setRotation(3);
tft.fillScreen(BLACK);
tft.setTextColor(WHITE);
tft.setTextSize(4);
tft.setCursor(60, 140);
tft.print("ASSALAMUALAIKUM");
delay(2000);
tft.fillScreen(BLACK);
tft.setTextColor(WHITE);
tft.setTextSize(4);
tft.setCursor(110, 70);
tft.print("VITAL SIGNS");
tft.setTextColor(WHITE);
tft.setTextSize(3);

tft.setCursor(70, 200);
tft.print("ARIF.R.");
tft.setTextColor(WHITE);
tft.setTextSize(2);
tft.setCursor(55, 250);
tft.print("(20163010003)");
tft.setTextColor(WHITE);
tft.setTextSize(3);
tft.setCursor(250, 200);
tft.print("FERIYAN.A.");
tft.setTextColor(WHITE);
tft.setTextSize(2);
tft.setCursor(260, 250);
tft.print("(20163010041)");
delay(5000);
tft.fillScreen(BLACK);
}

void loop() {
tft.fillRect(350,5,100,40,BLACK); //data C
tft.fillRect(350,50,100,40,BLACK); //data D
tft.fillRect(110,145,100,40,BLACK); //data E
tft.fillRect(350,145,100,40,BLACK); //data F
tft.fillRect(110,

```

```

255,100,40,BLACK);//data A
tft.fillRect(350,
255,100,40,BLACK);//data B

while ( Serial1.available() )
{
message1.process(
Serial1.read() );
if ( Serial2.available() )
{
message2.process(
Serial2.read() );
}
if ( Serial3.available() )
{
message3.process(
Serial3.read() ); }
if ( Serial.available() )
{
message.process( Serial.read()
);
} }

tft.setTextColor(BLUE);
tft.setTextSize(3);
tft.setCursor(10, 40);
tft.print(" VITAL SIGNS ");
tft.setTextColor(BLUE);
tft.setTextSize(3);

tft.setCursor(250, 10);
tft.print("SIS :");
tft.setTextColor(BLUE);
tft.setTextSize(3);
tft.setCursor(250, 60);
tft.print("DIA :");
tft.setTextColor(BLUE);
tft.setTextSize(3);
tft.setCursor(10, 155);
tft.print("BPM :");
tft.setTextColor(BLUE);
tft.setTextSize(3);
tft.setCursor(250, 155);
tft.print("SPO2 :");
tft.setTextColor(BLUE);
tft.setTextSize(3);
tft.setCursor(10, 260);
tft.print("RESP :");
tft.setTextColor(BLUE);
tft.setTextSize(3);
tft.setCursor(250, 260);
tft.print("SUHU :");

tft.drawLine(0,110,479,110,WHI
TE);
tft.drawLine(0,220,479,220,WHI
TE);
tft.drawLine(240,0,240,319,WHI
TE); }

```

C. Rangkaian Keseluruhan

