

LAMPIRAN

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Program Overlapping;

uses crt;

function pangkat(x,z:real):real;

begin

pangkat:=exp(ln(x)*z);

end;

var m,n,nb,k,l,o,r,s,u

: integer;

p

: array [1..1000] of real;

y,y1,y2,y3,Q1,h1,h2,Qi,d,ms,ms1,ms2,temp,x,tmp2,t

: real;

lagi

: char;

begin

clrscr;

lagi:='Y';

while (lagi='Y') or (lagi='y') do

begin

clrscr;

write('Jumlah Stage = ');readln(m);

write('Jumlah Part = ');readln(n);

write('Dibagi berapa batch = ');readln(nb);

for k:= 1 to m do

begin

write('Waktu Proses ke ',k,' = ');readln(p[k]);

end;

if (p[k]>p[k-1]) and (p[k-1]>p[k-2]) then

begin

writeln;

writeln('INI ADALAH KASUS PERTAMA ');

writeln('yaitu jika ',p[k-2]:3:3,' < ', p[k-1]:3:3,' dan ', p[k-1]:3:3,' < ',
p[k]:3:3);

writeln;

y:=p[k]/p[k-1];

h1:=0;

for l:= 2 to nb do

begin

h1:=h1+(pangkat(y,(l-1)));

end;

Q1:=n/(1+h1);

write('Q 1 = ',Q1:3:3);readln;

for m:= 2 to nb do

begin

Qi:=Q1*(pangkat(y,(m-1)));

writeln('Q ',m,' = ',Qi:3:5);

end;

```

writeln;
ms:=0;
for n:= 2 to nb do
  begin
    ms:=ms+(Q1*(pangkat(y,(n-1))))*p[k];
  end;
d:=(Q1*p[k])+(Q1*p[k-1])+(Q1*p[k-2])+ms;
writeln;
writeln('Makespannya adalah = ',d:3:5);read;
end
else
if (p[k]<p[k-1]) and (p[k-1]<p[k-2]) then
  begin
    writeln;
    writeln('INI ADALAH KASUS KEDUA ');
    writeln('yaitu jika ',p[k]:3:3,' < ',p[k-1]:3:3,' dan ',p[k-1]:3:3,' < ',p[k-2]:3:3);
    writeln;
    y:=p[k-1]/p[k-2];
    h1:=0;
    for l:= 2 to nb do
      begin
        h1:=h1+(pangkat(y,(l-1)));
      end;
    Q1:=n/(1+h1);
    write('Q 1 = ',Q1:3:3);readln;
    for m:= 2 to nb do
      begin
        Qi:=Q1*(pangkat(y,(m-1)));
        writeln('Q '.m,' = ',Qi:3:5);
      end;
    ms:=0;
    for n:= 2 to nb do      {tengah}
      begin
        ms:=ms+(Q1*(pangkat(y,(n-1))))*p[k-1];
      end;
    for o:= 2 to nb do
      begin
        ms1:=(Q1*(pangkat(y,(o-1))))*p[k];
      end;
    d:=(Q1*p[k-2])+(Q1*p[k-1])+ms+ms1;
    writeln;
    writeln('Makespannya adalah = ',d:3:5);read;
  end
end
else

```

```

if (p[k]>p[k-1]) and (p[k-1]<p[k-2]) then
begin
  writeln;
  writeln('INI ADALAH KASUS KETIGA ');
  writeln('yaitu jika ',p[k]:3:3,' > ',p[k-1]:3:3,' dan ',p[k-1]:3:3,' < ',p[k-2]:3:3);
  writeln;
  y:=(p[k-2]+p[k-1])/(p[k-1]+p[k]);
  h1:=0;
  for l:= 2 to nb do
    begin
      h1:=h1+(pangkat(y,(l-1)));
    end;
  Q1:=n/(1+h1);
  write('Q 1 = ',Q1:3:3);readln;
  for m:= 2 to nb do
    begin
      Qi:=Q1*(pangkat(y,(m-1)));
      writeln('Q ',m,' = ',Qi:3:5);
    end;
  ms:=0;
  for n:= 2 to nb do
    begin
      ms:=ms+(Q1*(pangkat(y,(n-1))))*p[k-2];
    end;
  for o:= 2 to nb do
    begin
      ms1:=(Q1*(pangkat(y,(o-1))))*p[k-1];
    end;
  for r:= 2 to nb do
    begin
      ms2:=(Q1*(pangkat(y,(r-1))))*p[k];
    end;

  d:=(Q1*p[k-2])+ms+ms1+ms2;
  writeln;
  writeln('Makespannya adalah = ',d:3:5);read;

end

else

if (p[k]<p[k-1]) and (p[k-1]>p[k-2]) then
begin
  writeln;
  writeln('INI ADALAH KASUS KEEMPAT ');

```

```

writeln('yaitu jika 'p[k]:3:3,' < 'p[k-1]:3:3,' dan 'p[k-1]:3:3,' > 'p[k-
2]:3:3);
writeln;
y:=p[k-1]/p[k-2];
y1:=(p[k-2]/(p[k-2]+p[k]))*(nb-1);
y2:=(nb-1)-y1;
y3:=p[k]/p[k-1];
h1:=0;
for l:= 2 to round(y1) do
begin
h1:=h1+(pangkat(y,(l)));
end;
temp:=pangkat(y,round(y1));
x:=0;
for m:= 1 to round(y2) do
begin
h2:=temp*y3;
temp:=h2;
x:=x+temp;
end;
Q1:=n/(1+h1+x);
write('Q 1 = ',Q1:5:5);readln;
for n:= 2 to (round(y1)+1) do
begin
Qi:=Q1*(pangkat(y,(n-1)));
writeln('Q ',n,' = ',Qi:5:5);
end;
temp:=pangkat(y,round(y1));
for o:= (round(y1)+2) to (round(y1)+1)+round(y2) do
begin
temp:=temp*y3;
Qi:=Q1*temp;
writeln('Q ',o,' = ',Qi:3:3);
tmp2:=Qi;
end;
ms:=0;
for r:= 2 to round(y1) do
begin
ms:=ms+(Q1*(pangkat(y,(r))))*p[k-2];
end;
ms1:=0;
temp:=pangkat(y,round(y1));
for s:= 2 to round(y2) do
begin
temp:=temp*y3;
ms1:=ms1+((Q1*temp)*p[k-1]);

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        end;
temp:=pangkat(y,round(y1));
t:=Q1*temp*p[k-1];
for u:= 1 to round(y2) do
    begin
        h2:=temp*y3;
        temp:=h2;
    end;
d:=(Q1*p[k-2])+ms+ms1+t+(Q1*temp*p[k]);
writeln;
writeln('Makespannya adalah = ',d:3:3);read;

    end;
writeln;
writeln;
write('Apakah ANDA akan menghitung lagi ( Y/T ) ? ');readln(lagi);

end;
end.

```

VERSION 5.00

Begin VB.Form FrmAlgolCDS

AutoRedraw = -1 'True
BorderStyle = 3 'Fixed Dialog
Caption = "Algoritma CDS"
ClientHeight = 7365
ClientLeft = 45
ClientTop = 315
ClientWidth = 10335
Icon = "FrmCDS.frx":0000
LinkTopic = "Form1"
MaxButton = 0 'False
MinButton = 0 'False
ScaleHeight = 7365
ScaleWidth = 10335
ShowInTaskbar = 0 'False
StartupPosition = 3 'Windows Default

Begin VB.Timer Timer1

Interval = 5
Left = 2295
Top = 1845

End

Begin VB.Frame Frame1

Caption = "Status"
Height = 2040
Left = 2475
TabIndex = 38
Top = 585
Width = 3165

Begin VB.CheckBox ChkNilai

Caption = "Ada nilai terkecil yang sama"
Height = 240
Left = 135
TabIndex = 60
TabStop = 0 'False
Top = 1710
Width = 2535

End

Begin VB.Label Label2

AutoSize = -1 'True
Caption = "MakeSpan :"
Height = 195
Left = 135
TabIndex = 59
Top = 1080
Width = 870

```

End
Begin VB.Label Label7
    AutoSize      = -1 'True
    Caption       = "K2 ="
    Height        = 195
    Left          = 1710
    TabIndex      = 58
    Top           = 1395
    Width         = 330
End
Begin VB.Label LblK2
    Appearance    = 0 'Flat
    BackColor     = &H0000C000&
    BorderStyle   = 1 'Fixed Single
    ForeColor     = &H80000008&
    Height        = 285
    Left          = 2160
    TabIndex      = 57
    Top           = 1350
    Width         = 510
End
Begin VB.Label Label8
    AutoSize      = -1 'True
    Caption       = "K1 ="
    Height        = 195
    Left          = 270
    TabIndex      = 56
    Top           = 1395
    Width         = 330
End
Begin VB.Label LblK1
    Appearance    = 0 'Flat
    BackColor     = &H0000C000&
    BorderStyle   = 1 'Fixed Single
    ForeColor     = &H80000008&
    Height        = 285
    Left          = 720
    TabIndex      = 55
    Top           = 1350
    Width         = 510
End
Begin VB.Label LblAwal
    Alignment     = 2 'Center
    BorderStyle   = 1 'Fixed Single
    Height        = 255
    Index         = 5

```

```

Left          = 1920
TabIndex     = 54
Top          = 315
Visible      = 0 'False
Width       = 375
End
Begin VB.Label LblAwal
Alignment    = 2 'Center
BorderStyle = 1 'Fixed Single
Height      = 255
Index       = 6
Left        = 2280
TabIndex   = 53
Top        = 315
Visible    = 0 'False
Width     = 375
End
Begin VB.Label LblAwal
Alignment    = 2 'Center
BorderStyle = 1 'Fixed Single
Height      = 255
Index       = 7
Left        = 2640
TabIndex   = 52
Top        = 315
Visible    = 0 'False
Width     = 375
End
Begin VB.Label LblAwal
Alignment    = 2 'Center
BorderStyle = 1 'Fixed Single
Height      = 255
Index       = 4
Left        = 1560
TabIndex   = 51
Top        = 315
Width     = 375
End
Begin VB.Label LblAwal
Alignment    = 2 'Center
BorderStyle = 1 'Fixed Single
Height      = 255
Index       = 3
Left        = 1200
TabIndex   = 50
Top        = 315

```

```
    Width      = 375
End
Begin VB.Label LblAwal
    Alignment   = 2 'Center
    BorderStyle = 1 'Fixed Single
    Height      = 255
    Index       = 2
    Left        = 840
    TabIndex    = 49
    Top         = 315
    Width       = 375
End
Begin VB.Label LblAwal
    Alignment   = 2 'Center
    BorderStyle = 1 'Fixed Single
    Height      = 255
    Index       = 1
    Left        = 480
    TabIndex    = 48
    Top         = 315
    Width       = 375
End
Begin VB.Label Label11
    AutoSize    = -1 'True
    Caption     = "K1"
    Height      = 195
    Left        = 135
    TabIndex    = 47
    Top         = 315
    Width       = 195
End
Begin VB.Label LblAkhir
    Alignment   = 2 'Center
    BorderStyle = 1 'Fixed Single
    Height      = 255
    Index       = 7
    Left        = 2640
    TabIndex    = 46
    Top         = 675
    Visible     = 0 'False
    Width       = 375
End
Begin VB.Label LblAkhir
    Alignment   = 2 'Center
    BorderStyle = 1 'Fixed Single
    Height      = 255
```

```

Index          = 5
Left           = 1920
TabIndex       = 45
Top            = 675
Visible        = 0 'False
Width          = 375
End
Begin VB.Label LblAkhir
Alignment      = 2 'Center
BorderStyle    = 1 'Fixed Single
Height         = 255
Index          = 6
Left           = 2280
TabIndex       = 44
Top            = 675
Visible        = 0 'False
Width          = 375
End
Begin VB.Label Label13
AutoSize       = -1 'True
Caption        = "K2"
Height         = 195
Left           = 135
TabIndex       = 43
Top            = 720
Width          = 195
End
Begin VB.Label LblAkhir
Alignment      = 2 'Center
BorderStyle    = 1 'Fixed Single
Height         = 255
Index          = 4
Left           = 1560
TabIndex       = 42
Top            = 675
Width          = 375
End
Begin VB.Label LblAkhir
Alignment      = 2 'Center
BorderStyle    = 1 'Fixed Single
Height         = 255
Index          = 3
Left           = 1200
TabIndex       = 41
Top            = 675
Width          = 375

```

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End
Begin VB.Label LblAkhir
    Alignment      = 2 'Center
    BorderStyle    = 1 'Fixed Single
    Height         = 255
    Index         = 2
    Left          = 840
    TabIndex      = 40
    Top           = 675
    Width         = 375
End
Begin VB.Label LblAkhir
    Alignment      = 2 'Center
    BorderStyle    = 1 'Fixed Single
    Height         = 255
    Index         = 1
    Left          = 480
    TabIndex      = 39
    Top           = 675
    Width         = 375
End
End
Begin VB.Frame Frame2
    Caption        = "Perintah"
    Height         = 1335
    Left          = 2610
    TabIndex      = 36
    Top           = 2745
    Width         = 2895
Begin VB.CommandButton CmdAcak
    Caption        = "Acak"
    Height         = 255
    Left          = 1350
    TabIndex      = 23
    Top           = 585
    Width         = 1455
End
Begin VB.CommandButton CmdKeluar
    Caption        = "Keluar"
    Height         = 315
    Left          = 1320
    TabIndex      = 24
    Top           = 960
    Width         = 1455
End
Begin VB.ComboBox Combo1

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Height          = 315
ItemData        = "FrmCDS.frx":030A
Left            = 240
List           = "FrmCDS.frx":0320
TabIndex       = 0
Text           = "---Pilih--"
Top            = 720
Width          = 855
End
Begin VB.CommandButton CmdLagi
Caption        = "GO !"
Height        = 255
Left          = 1320
TabIndex     = 22
Top          = 240
Width        = 1455
End
Begin VB.Label Label9
AutoSize      = -1 'True
Caption       = "Jumlah Job"
Height       = 195
Left         = 240
TabIndex     = 37
Top          = 360
Width        = 795
End
End
Begin VB.TextBox Text1
Alignment     = 2 'Center
BackColor     = &H00E0E0E0&
Height       = 375
Index        = 7
Left         = 600
MaxLength    = 2
MultiLine    = -1 'True
TabIndex     = 19
Top          = 3720
Visible      = 0 'False
Width        = 495
End
Begin VB.TextBox Text2
Alignment     = 2 'Center
BackColor     = &H00C0C0FF&
Height       = 375
Index        = 7
Left         = 1200

```

```

MaxLength      = 2
MultiLine      = -1 'True
TabIndex       = 20
Top            = 3720
Visible        = 0 'False
Width          = 495
End
Begin VB.TextBox Text3
  Alignment     = 2 'Center
  BackColor    = &H0080FFFF&
  Height        = 375
  Index        = 7
  Left         = 1800
  MaxLength    = 2
  MultiLine    = -1 'True
  TabIndex     = 21
  ToolTipText  = "Tekan Enter"
  Top          = 3690
  Visible      = 0 'False
  Width        = 495
End
Begin VB.TextBox Text1
  Alignment     = 2 'Center
  BackColor    = &H00E0E0E0&
  Height        = 375
  Index        = 6
  Left         = 600
  MaxLength    = 2
  MultiLine    = -1 'True
  TabIndex     = 16
  Top          = 3240
  Visible      = 0 'False
  Width        = 495
End
Begin VB.TextBox Text2
  Alignment     = 2 'Center
  BackColor    = &H00C0C0FF&
  Height        = 375
  Index        = 6
  Left         = 1200
  MaxLength    = 2
  MultiLine    = -1 'True
  TabIndex     = 17
  Top          = 3240
  Visible      = 0 'False
  Width        = 495

```

End

Begin VB.TextBox Text3

Alignment = 2 'Center
BackColor = &H0080FFFF&
Height = 375
Index = 6
Left = 1800
MaxLength = 2
MultiLine = -1 'True
TabIndex = 18
ToolTipText = "Tekan Enter"
Top = 3240
Visible = 0 'False
Width = 495

End

Begin VB.TextBox Text1

Alignment = 2 'Center
BackColor = &H00E0E0E0&
Height = 375
Index = 5
Left = 600
MaxLength = 2
MultiLine = -1 'True
TabIndex = 13
Top = 2760
Visible = 0 'False
Width = 495

End

Begin VB.TextBox Text2

Alignment = 2 'Center
BackColor = &H00C0C0FF&
Height = 375
Index = 5
Left = 1200
MaxLength = 2
MultiLine = -1 'True
TabIndex = 14
Top = 2760
Visible = 0 'False
Width = 495

End

Begin VB.TextBox Text3

Alignment = 2 'Center
BackColor = &H0080FFFF&
Height = 375
Index = 5

```

Left           = 1800
MaxLength      = 2
MultiLine     = -1 'True
TabIndex      = 15
ToolTipText   = "Tekan Enter"
Top           = 2760
Visible       = 0 'False
Width        = 495
End
Begin VB.TextBox Text3
Alignment     = 2 'Center
BackColor    = &H0080FFFF&
Height       = 375
Index        = 4
Left         = 1800
MaxLength    = 2
MultiLine    = -1 'True
TabIndex     = 12
ToolTipText  = "Tekan Enter"
Top          = 2280
Width       = 495
End
Begin VB.TextBox Text2
Alignment     = 2 'Center
BackColor    = &H00C0C0FF&
Height       = 375
Index        = 4
Left         = 1200
MaxLength    = 2
MultiLine    = -1 'True
TabIndex     = 11
Top          = 2280
Width       = 495
End
Begin VB.TextBox Text1
Alignment     = 2 'Center
BackColor    = &H00E0E0E0&
Height       = 375
Index        = 4
Left         = 600
MaxLength    = 2
MultiLine    = -1 'True
TabIndex     = 10
Top          = 2280
Width       = 495
End

```

```
Begin VB.TextBox Text3
  Alignment      = 2 'Center
  BackColor     = &H0080FFFF&
  Height        = 375
  Index         = 3
  Left          = 1800
  MaxLength     = 2
  MultiLine     = -1 'True
  TabIndex      = 9
  Top           = 1800
  Width         = 495
```

End

```
Begin VB.TextBox Text2
  Alignment      = 2 'Center
  BackColor     = &H00C0C0FF&
  Height        = 375
  Index         = 3
  Left          = 1200
  MaxLength     = 2
  MultiLine     = -1 'True
  TabIndex      = 8
  Top           = 1800
  Width         = 495
```

End

```
Begin VB.TextBox Text1
  Alignment      = 2 'Center
  BackColor     = &H00E0E0E0&
  Height        = 375
  Index         = 3
  Left          = 600
  MaxLength     = 2
  MultiLine     = -1 'True
  TabIndex      = 7
  Top           = 1800
  Width         = 495
```

End

```
Begin VB.TextBox Text3
  Alignment      = 2 'Center
  BackColor     = &H0080FFFF&
  Height        = 375
  Index         = 2
  Left          = 1800
  MaxLength     = 2
  MultiLine     = -1 'True
  TabIndex      = 6
  Top           = 1320
```

```
Width          = 495
End
Begin VB.TextBox Text2
  Alignment     = 2 'Center
  BackColor    = &H00C0C0FF&
  Height       = 375
  Index        = 2
  Left         = 1200
  MaxLength    = 2
  MultiLine    = -1 'True
  TabIndex     = 5
  Top          = 1320
  Width        = 495
End
Begin VB.TextBox Text1
  Alignment     = 2 'Center
  BackColor    = &H00E0E0E0&
  Height       = 375
  Index        = 2
  Left         = 600
  MaxLength    = 2
  MultiLine    = -1 'True
  TabIndex     = 4
  Top          = 1320
  Width        = 495
End
Begin VB.TextBox Text3
  Alignment     = 2 'Center
  BackColor    = &H0080FFFF&
  Height       = 375
  Index        = 1
  Left         = 1800
  MaxLength    = 2
  MultiLine    = -1 'True
  TabIndex     = 3
  Top          = 840
  Width        = 495
End
Begin VB.TextBox Text2
  Alignment     = 2 'Center
  BackColor    = &H00C0C0FF&
  Height       = 375
  Index        = 1
  Left         = 1200
  MaxLength    = 2
  MultiLine    = -1 'True
```

```

    TabIndex      = 2
    Top           = 840
    Width        = 495
End
Begin VB.TextBox Text1
    Alignment     = 2 'Center
    BackColor    = &H00E0E0E0&
    Height       = 375
    Index        = 1
    Left         = 600
    MaxLength    = 2
    MultiLine    = -1 'True
    TabIndex     = 1
    Top          = 840
    Width        = 495
End
Begin VB.Label Label
    AutoSize     = -1 'True
    Caption      = "Job 7"
    Height       = 195
    Index       = 7
    Left        = 45
    TabIndex    = 35
    Top         = 3795
    Visible     = 0 'False
    Width       = 390
End
Begin VB.Label Label
    AutoSize     = -1 'True
    Caption      = "Job 6"
    Height       = 195
    Index       = 6
    Left        = 45
    TabIndex    = 34
    Top         = 3345
    Visible     = 0 'False
    Width       = 390
End
Begin VB.Label Label
    AutoSize     = -1 'True
    Caption      = "Job 5"
    Height       = 195
    Index       = 5
    Left        = 45
    TabIndex    = 33
    Top         = 2880

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```

Visible          = 0 'False
Width           = 390
End
Begin VB.Line Line2
X1              = 2340
X2              = 2340
Y1              = 120
Y2              = 2640
End
Begin VB.Line Line1
BorderColor     = &H00000000&
BorderWidth    = 2
X1              = 600
X2              = 3000
Y1              = 435
Y2              = 435
End
Begin VB.Label Label1
Alignment       = 2 'Center
AutoSize       = -1 'True
BackStyle      = 0 'Transparent
Caption        = "Mesin"
BeginProperty Font
Name           = "MS Sans Serif"
Size          = 12
Charset       = 0
Weight       = 400
Underline    = 0 'False
Italic       = 0 'False
Strikethrough = 0 'False
EndProperty
Height        = 300
Left         = 1200
TabIndex     = 32
Top          = 120
Width        = 705
End
Begin VB.Label Label
AutoSize      = -1 'True
Caption       = "Job 4"
Height       = 240
Index        = 4
Left         = 40
TabIndex     = 31
Top          = 2320
Width        = 495

```

```
End
Begin VB.Label Label
    AutoSize      = -1 'True
    Caption       = "Job 1"
    Height        = 195
    Index         = 1
    Left          = 45
    TabIndex      = 30
    Top           = 915
    Width         = 390
End
Begin VB.Label Label6
    AutoSize      = -1 'True
    Caption       = "C"
    Height        = 240
    Left          = 1980
    TabIndex      = 29
    Top           = 480
    Width         = 135
End
Begin VB.Label Label
    AutoSize      = -1 'True
    Caption       = "Job 2"
    Height        = 240
    Index         = 2
    Left          = 40
    TabIndex      = 28
    Top           = 1380
    Width         = 495
End
Begin VB.Label Label4
    AutoSize      = -1 'True
    Caption       = "A"
    Height        = 240
    Left          = 760
    TabIndex      = 27
    Top           = 480
    Width         = 135
End
Begin VB.Label Label3
    AutoSize      = -1 'True
    Caption       = "B"
    Height        = 240
    Left          = 1400
    TabIndex      = 26
    Top           = 480
```

```

        Width           = 135
    End
    Begin VB.Label Label
        AutoSize         = -1 'True
        Caption          = "Job 3"
        Height           = 240
        Index            = 3
        Left             = 40
        TabIndex         = 25
        Top              = 1840
        Width            = 495
    End
End
Attribute VB_Name = "FrmAlgoCDS"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = False
Attribute VB_PredeclaredId = True
Attribute VB_Exposed = False
Private Type Antrian
    NoJob As Byte
    Prioritas As Byte
End Type

Private Type Stack
    Isi(1 To 7) As Antrian
    Ekor As Byte
End Type

Dim Pir As Stack
Dim PetaMesin() As Byte
Dim Job() As Antrian, a As Byte, b As Byte, c As Byte, d As Byte, e As Byte, f
As Byte, g As Byte
Dim N As Byte, Dat() As Byte

Private Sub Flush()
    Dim a As Byte
    For a = 1 To 7
        Pir.Isi(a).NoJob = 0
    Next
    Pir.Ekor = 0
End Sub

Private Sub Push(ByVal Sim As Byte, ByVal Katel As Byte)
    With Pir
        If .Ekor < 7 Then
            .Ekor = .Ekor + 1
        End If
    End With
End Sub

```

```

        .Isi(.Ekor).NoJob = Sim
        .Isi(.Ekor).Prioritas = Katel
    End If
End With
End Sub

```

```

Private Sub Pop()

```

```

    With Pir

```

```

        If .Ekor > 0 Then

```

```

            .Isi(.Ekor).NoJob = 0

```

```

            .Isi(.Ekor).Prioritas = 0

```

```

            .Ekor = .Ekor - 1

```

```

        End If

```

```

    End With

```

```

End Sub

```

```

Function MakeSpan(ByVal Eka As Byte, ByVal Dwi As Byte, ByVal Tri As
Byte, ByVal Catur As Byte, ByVal Panca As Byte, ByVal Enam As Byte, ByVal
Sapta As Byte) As Byte

```

```

    MakeSpan = PetaMesin(Eka, 1) + PetaMesin(Dwi, 1) + PetaMesin(Tri, 1) +

```

```

    PetaMesin(Catur, 1) + PetaMesin(Panca, 1) + PetaMesin(Enam, 1) +

```

```

    PetaMesin(Sapta, 1)

```

```

    For i = 1 To 2

```

```

        If Tri = 0 Then

```

```

            If MakeSpan < (MakeSpan - PetaMesin(Dwi, i) + PetaMesin(Eka, i + 1))

```

```

            Then

```

```

                MakeSpan = MakeSpan - PetaMesin(Dwi, i) + PetaMesin(Eka, i + 1) +
                PetaMesin(Dwi, i + 1)

```

```

            Else: MakeSpan = MakeSpan + PetaMesin(Dwi, i + 1)

```

```

            End If

```

```

        ElseIf Catur = 0 Then

```

```

            If MakeSpan < (MakeSpan - PetaMesin(Tri, i) + PetaMesin(Dwi, i + 1))

```

```

            Then

```

```

                MakeSpan = MakeSpan - PetaMesin(Tri, i) + PetaMesin(Eka, i) +
                PetaMesin(Dwi, i + 1) + PetaMesin(Tri, i + 1)

```

```

            Else: MakeSpan = MakeSpan + PetaMesin(Dwi, i) + PetaMesin(Tri, i + 1)

```

```

            End If

```

```

        ElseIf Panca = 0 Then

```

```

            If MakeSpan < (MakeSpan - PetaMesin(Catur, i) + PetaMesin(Tri, i + 1))

```

```

            Then

```

```

                MakeSpan = MakeSpan - PetaMesin(Catur, i) + PetaMesin(Eka, i) +
                PetaMesin(Dwi, i + 1) + PetaMesin(Tri, i + 1) + PetaMesin(Catur, i + 1)

```

```

            Else: MakeSpan = MakeSpan + PetaMesin(Dwi, i) + PetaMesin(Tri, i + 1) +

```

```

                PetaMesin(Catur, i + 1)

```

```

            End If

```

```

        ElseIf Enam = 0 Then

```

```

    If MakeSpan < (MakeSpan - PetaMesin(Panca, i) + PetaMesin(Catur, i + 1))
Then
    MakeSpan = MakeSpan - PetaMesin(Panca, i) + PetaMesin(Eka, i) +
PetaMesin(Dwi, i + 1) + PetaMesin(Tri, i + 1) + PetaMesin(Catur, i + 1) +
PetaMesin(Panca, i + 1)
    Else: MakeSpan = MakeSpan + PetaMesin(Dwi, i + 1) + PetaMesin(Tri, i +
1) + PetaMesin(Catur, i + 1) + PetaMesin(Panca, i + 1)
    End If
Else
    If MakeSpan < (MakeSpan - PetaMesin(Enam, i) + PetaMesin(Panca, i + 1))
Then
    MakeSpan = MakeSpan - PetaMesin(Enam, i) + PetaMesin(Eka, i) +
PetaMesin(Dwi, i + 1) + PetaMesin(Tri, i + 1) + PetaMesin(Catur, i + 1) +
PetaMesin(Panca, i + 1) + PetaMesin(Enam, i + 1)
    Else: MakeSpan = MakeSpan + PetaMesin(Dwi, i) + PetaMesin(Tri, i + 1) +
PetaMesin(Catur, i + 1) + PetaMesin(Panca, i + 1) + PetaMesin(Enam, i + 1)
    End If
    End If
Next
End Function

```

```

Private Sub Ijol(ByRef z As Byte, ByRef x As Byte)
Dim temp As Byte
    temp = z
    z = x
    x = temp
End Sub

```

```

Private Sub CetakAkhir()
    LblAkhir(1).Caption = a
    LblAkhir(2).Caption = b
    LblAkhir(3).Caption = c
    LblAkhir(4).Caption = d
    LblAkhir(5).Caption = e
    LblAkhir(6).Caption = f
    LblAkhir(7).Caption = g
End Sub

```

```

Private Sub KosongKan(ByRef Apa, ByVal Atas As Byte, ByVal Bawah As
Byte)
Dim i As Byte, j As Byte
For i = 0 To Atas
    For j = 1 To Bawah
        Apa(i, j) = 0
    Next
Next
Next

```

```
For i = 1 To N
    Job(i).NoJob = 0
    Job(i).Prioritas = 0
Next
End Sub
```

```
Private Sub Susun(ByVal Tipe As String)
Dim i As Byte, j As Byte, k As Byte
Flush
'If Tipe = "K1" Then
With Pir
    For i = 1 To N
        If Val(Text1(i).Text) < Val(Text2(i).Text) Then
            For j = 1 To (N - 1)
                If .Isi(j).Prioritas = 0 Then
                    Call Push(i, Val(Text1(i).Text))
                    Exit For
                ElseIf .Isi(j).Prioritas > Val(Text1(i).Text) Then
                    For k = (.Ekor + 1) To j

                        Next
                        Exit For
                    ElseIf Job(j).Prioritas = Val(Text1(i).Text) Then ChkNilai.Value = 2
                    End If
                Next
            End If
        Next
    End With
End If
'End If
End Sub
```

```
Private Sub CmdAcak_Click()
If N > 0 Then
    Randomize
    For i = 1 To N
        Text1(i).Text = Int(Rnd * 10 + 1)
        Text2(i).Text = Int(Rnd * 10 + 2)
        Text3(i).Text = Int(Rnd * 10 + 3)
    Next
    CmdLagi.Enabled = True
    CmdLagi.SetFocus
    CmdLagi.Caption = "G O !"
End If
End Sub
```

```
Private Sub CmdKeluar_Click()
```

```
End  
End Sub
```

```
Private Sub Bersih()  
Dim i As Byte  
For i = 1 To 7  
    Text1(i) = ""  
    Text2(i) = ""  
    Text3(i) = ""  
    LblAwal(i).Caption = ""  
    LblAkhir(i).Caption = ""  
    CmdLagi.Caption = "G O !"  
Next  
ChkNilai.Value = 0  
Text1(1).SetFocus  
End Sub
```

```
Private Sub CmdLagi_Click()  
Dim i As Byte, j As Byte, Tanda As Byte  
If CmdLagi.Caption = "Lagi" Then  
    Bersih  
    CmdLagi.Enabled = False  
Else  
    ReDim Job(1 To N)  
    ReDim PetaMesin(0 To N, 1 To 3)  
    Call KosongKan(PetaMesin, N, 3)  
    CmdLagi.Caption = "Lagi"  
    For i = 1 To N  
        PetaMesin(i, 1) = Val(Text1(i).Text)  
        PetaMesin(i, 2) = Val(Text2(i).Text)  
        PetaMesin(i, 3) = Val(Text3(i).Text)  
    Next  
  
    Call Susun("K1")  
    For i = 1 To Pir.Ekor  
        LblAwal(i).Caption = Pir.Isi(i).NoJob  
    Next  
    'CariMakeSpan  
    CmdLagi.SetFocus  
End If  
End Sub
```

```
Private Sub Nyala(ByVal ok As Boolean, ByVal i As Byte)  
    Label(i).Visible = ok  
    Text1(i).Visible = ok  
    Text2(i).Visible = ok
```

```
Text3(i).Visible = ok
LblAwal(i).Visible = ok
LblAkhir(i).Visible = ok
End Sub
```

```
Private Sub Combo1_Click()
Dim i As Byte, Tanda As Byte
For i = 1 To 7
    If i <= Val(Combo1.Text) Then
        Call Nyala(True, i)
    Else
        Call Nyala(False, i)
    End If
Next i
```

```
Bersih
CmdLagi.Enabled = False
End Sub
```

```
Private Sub Form_Load()
ReDim Job(1 To 4)
ReDim PetaMesin(0 To 4, 1 To 3)
CmdLagi.Enabled = False
End Sub
```

```
Private Sub Text1_GotFocus(Index As Integer)
Text1(Index).Text = ""
End Sub
```

```
Private Sub Text2_GotFocus(Index As Integer)
Text2(Index).Text = ""
End Sub
```

```
Private Sub Text3_GotFocus(Index As Integer)
Text3(Index).Text = ""
End Sub
```

```
Private Sub Text3_LostFocus(Index As Integer)
If Index = N Then
    CmdLagi.Enabled = True
    CmdLagi.SetFocus
End If
End Sub
```

```
Private Sub Text4_Change()
```

```
End Sub
```

```
Private Sub Timer1_Timer()
```

```
Dim Num As Byte
```

```
N = 0
```

```
For Num = 1 To 7
```

```
    If Text3(Num).Visible = True Then N = Num
```

```
Next
```

```
End Sub
```

```

// program algoritma genetika
#include <conio.h>
#include <stdio.h>
#include <stdlib.h>

/* ----- KONSTANTA ----- */
// Batas untuk jumlah JOB
const unsigned char JOB=200;
// Batas untuk jumlah MESIN
const unsigned char MESIN=20;
const unsigned char A=2;
const unsigned char B=13;

/* ----- VARIABEL GLOBAL ----- */
FILE *f;

int Job;
unsigned char SumMesin;
unsigned char SaveNGenPopulasi1[B][JOB];
unsigned char SaveNGenPopulasi2[B][JOB];
double SaveMakespanPopulasi[B][A];
unsigned char NGen;
// Tempat Simpan Waktu Proses Tiap Job
// TimeProses[banyak job][banyak mesin]
double TimeProses[JOB][MESIN];
// Urutan Job (parent)
unsigned char SortJob[A][JOB];
// Urutan Anak Job
unsigned char ChildSort[A][JOB];

/* ----- DAFTAR FUNGSI ----- */
void SetSumJob();
void SetTimeProses();
void SetSortJobAwal();
void SetBentukPopulasi(unsigned char SubPopulasi[JOB][JOB], unsigned char
pos);
void SetMakespan(unsigned char SubPopulasi[JOB][JOB], unsigned char pos);
void SetCrossOver();
void SetNewParentCrossOver();
void SetMutasi();
void UbahMenu1(unsigned char menu);
void UbahMenu2(unsigned char menu);
double HitungMakespan(unsigned char SubPopulasi[JOB][JOB], unsigned char
sub);
double HitungMakespan1(unsigned char SubPopulasi[A][JOB], unsigned char
sub);

```



```

        {
            UbahMenu1(menu);
            menu--;
            UbahMenu2(menu);
        }
        break;
case 80 : if (menu<4)
        {
            UbahMenu1(menu);
            menu++;
            UbahMenu2(menu);
        }
        break;
    }
}
}
switch (menu)
{
case 1 :
    clrscr();
    CekData=1;
    _setcursortype(_NORMALCURSOR);
    /* ----- TAHAP 1 ----- */
    // Set Banyak Job;
    SetSumJob();
    // Set Waktu Proses Setiap Job
    SetTimeProses();
    // Set Urutan Job Awal
    SetSortJobAwal();
    for (i=0; i<A; i++)
        for (j=0; j<Job; j++)
            TEMP[i][j]=SortJob[i][j];
    break;
case 2 :
    if (CekData!=0)
    if ((f=fopen("DATA.TXT", "w+"))!=NULL)
    {
        Awal();
        CekData=2;
        /* ----- TAHAP 2 ----- */
        NGen=0;
        fprintf(f,"NGen = %d\n",NGen);
        do
        {
            /* ----- TAHAP 3 ----- */
            // Membantuk Subpopulasi 1 dan 2

```

```

SetBentukPopulasi(SubPopulasi1,1);
SetBentukPopulasi(SubPopulasi2,2);
/* ----- TAHAP 4 ----- */
// Cari Makespan Terkecil Tiap populasi
SetMakespan(SubPopulasi1,1);
SetMakespan(SubPopulasi2,2);
/* ----- TAHAP 5 ----- */
NGen+=1;
fprintf(f,"\n\nNGen = %d\n",NGen);
if ((NGen<10)||((NGen==11)))
{
/* ----- TAHAP 10&8 ----- */
/* ----- TAHAP 6 ----- */
// Lakukan CrossOver untuk membentuk anak
SetCrossOver();
/* ----- TAHAP 7 ----- */
// Bentuk Parent Baru Berdasarkan CrossOver
SetNewParentCrossOver();
}
else
if (NGen==10)
{
/* ----- TAHAP 9 ----- */
SetMutasi();
}
}while (NGen<B-1);
/* ----- TAHAP 11 ----- */
// Sub populasi 1
for (i=0; i<Job; i++)
SaveNGenPopulasi1 [NGen][i]=SaveNGenPopulasi1 [0][i];
SaveMakespanPopulasi [NGen][0]=SaveMakespanPopulasi [0][0];
for (j=1; j<B-1; j++)
{
if
(SaveMakespanPopulasi [j][0]<SaveMakespanPopulasi [NGen][0])
{
for (i=0; i<Job; i++)
SaveNGenPopulasi1 [NGen][i]=SaveNGenPopulasi1 [j][i];
SaveMakespanPopulasi [NGen][0]=SaveMakespanPopulasi [j][0];
}
}
// Sub populasi 2
for (j=1; j<B-1; j++)
{

```

```

        if
        (SaveMakespanPopulasi[j][1]<SaveMakespanPopulasi[NGen][0])
        {
            for (i=0; i<Job; i++)
                SaveNGenPopulasi1[NGen][i]=SaveNGenPopulasi1[j][i];

        SaveMakespanPopulasi[NGen][0]=SaveMakespanPopulasi[j][1];
        }
    }
    for (i=0; i<Job; i++)
        SortJob[0][i]=SaveNGenPopulasi1[NGen][i];
    /* ----- TAHAP 12 ----- */
    // Membantu Subpopulasi 1
    SetBentukPopulasi(SubPopulasi1,1);
    /* ----- TAHAP 4 ----- */
    // Cari Makespan Terkecil Tiap populasi
    SetMakespan(SubPopulasi1,1);
    for (i=0; i<A; i++)
        for (j=0; j<Job; j++)
            SortJob[i][j]=TEMP[i][j];
    fclose(f);
}
break;
case 3 : if (CekData==2)          ListHasilPerhitungan();
        else
        {
            gotoxy(1,24);
            if (CekData==1) printf("Data Belum Di proses !!!! ");
            else          printf("Data Belum Ada !!!! ");
            gotoxy(1,25); printf("Tekan Sembarang Tombol");
            getch();
        }
    break;
}
}
_setcursortype(_NORMALCURSOR);
gotoxy(35,24); printf("Terima Kasih");
gotoxy(30,25); printf("Tekan Sembarang Tombol");
getch();
clrscr();
}

//////////
/* ISI FUNGSI */
//////////
void SetSumJob()

```

```

{
int temp;
do
{
fflush(stdin);
printf("Berapa Mesin < Max %3d> : ",MESIN);
scanf("%d",&temp);
}while((temp<1)||((temp>MESIN)));
SumMesin=temp;
do
{
fflush(stdin);
printf("Berapa Job < Max %3d> : ",JOB);
scanf("%d",&Job);
}while((Job<1)||((Job>JOB)));
}

void UbahMenu1(unsigned char menu)
{
switch (menu)
{
case 1 : gotoxy(30,15); printf(" Masukkan Data "); break;
case 2 : gotoxy(30,16); printf(" Jalankan Program "); break;
case 3 : gotoxy(30,17); printf(" Lihat Hasil "); break;
case 4 : gotoxy(30,18); printf(" Keluar "); break;
}
}

void UbahMenu2(unsigned char menu)
{
switch (menu)
{
case 1 : gotoxy(30,15); printf("< Masukkan Data >"); break;
case 2 : gotoxy(30,16); printf("< Jalankan Program >"); break;
case 3 : gotoxy(30,17); printf("< Lihat Hasil >"); break;
case 4 : gotoxy(30,18); printf("< Keluar >"); break;
}
}

void Awal()
{
unsigned char i,j;
fprintf(f,"Data Perhitungan Berdasarkan Algoritma Genetika\n\n\n" );
fprintf(f,"Jumlah Job : %d\n",Job);
fprintf(f,"Jumlah Mesin : %d\n\n",SumMesin);
fprintf(f,"Waktu Proses Tiap Job\n");

```

```

fprintf(f,"-----");
for (i=1; i<=SumMesin; i++)    fprintf(f,"-----");
fprintf(f,"\nJob \ Job |");
for (i=1; i<=SumMesin; i++)    fprintf(f,"%10d",i);
fprintf(f,"\n-----");
for (i=1; i<=SumMesin; i++)    fprintf(f,"-----");
fprintf(f,"\n");
for (i=1; i<=Job; i++)
{
    fprintf(f,"%7d  |",i);
    for (j=1; j<=SumMesin; j++)    fprintf(f,"%15.4lf",TimeProses[i-1][j-1]);
    fprintf(f,"\n");
}
fprintf(f,"-----");
for (i=1; i<=SumMesin; i++)    fprintf(f,"-----");
fprintf(f,"\n\n");
fprintf(f,"Urutan Job Awal\n");
fprintf(f,"-----");
for (i=1; i<=Job; i++)        fprintf(f,"----");
fprintf(f,"\nNo \ Job |");
for (i=1; i<=Job; i++)        fprintf(f,"%5d",i);
fprintf(f,"\n-----");
for (i=1; i<=Job; i++)        fprintf(f,"----");
fprintf(f,"\n");
for (i=1; i<=A; i++)
{
    fprintf(f,"%6d  |",i);
    for (j=1; j<=Job; j++)    fprintf(f,"%5d",SortJob[i-1][j-1]);
    fprintf(f,"\n");
}
fprintf(f,"-----");
for (i=1; i<=Job; i++)        fprintf(f,"----");
fprintf(f,"\n\n");
}

```

```

void SetTimeProses()

```

```

{
    unsigned char i,j;
    printf("Inputkan Data Waktu Proses Setiap Job Pada Setiap Mesin\n");
    for (i=1; i<=Job; i++)
    {
        for (j=1; j<=SumMesin; j++)
        {
            do
            { fflush(stdin);
              printf("Job Ke %3d dan Mesin Ke %3d : ",i,j);
            }
        }
    }
}

```

```

        scanf("%lf",&TimeProses[i-1][j-1]);
    }while (TimeProses[i-1][j-1]<=0);
    }
}

```

```

void SetSortJobAwal()
{
    int temp;
    unsigned char i,j,k,cek;
    printf("Inputkan Urutan Job Awal\n");
    for (i=1; i<=A; i++)
    {
        for (j=1; j<=Job; j++)
        {
            fflush(stdin);
            printf("Parent %3d dan urutan ke %3d : ",i,j);
            scanf("%d",&temp);
            if ((temp<=Job)&&(temp>0))
            {
                cek=0;
                for (k=0; k<j-1; k++)
                    if (SortJob[i-1][k]==temp) { cek=1; break; }
                if (cek==0)
                    SortJob[i-1][j-1]=temp;
                else
                {
                    j--;
                    printf("JOB INI SUDAH DISET\n");
                }
            }
            else
            {
                j--;
                printf("JOB TIDAK ADA\n");
            }
        }
    }
}

```

```

void SetBentukPopulasi(unsigned char SubPopulasi[JOB][JOB], unsigned char
pos)
{
    pos--;
    unsigned char i,j;
    for (i=0; i<Job; i++)

```

```

    SubPopulasi[0][i]=SortJob[pos][i];
for (i=1; i<Job; i++)
{
    for (j=0; j<Job; j++)
        if (j==i-1)
            {
                SubPopulasi[i][j]=SortJob[pos][j+1];
                SubPopulasi[i][j+1]=SortJob[pos][j];
                j++;
            }
        else
            SubPopulasi[i][j]=SortJob[pos][j];
}
// Tulis Di file
if (NGen!=12) fprintf(f,"nSub Populasi Ke %d\n",pos+1);
else      fprintf(f,"nPopulasi\n");
fprintf(f,"-----");
for (i=1; i<=Job; i++)      fprintf(f,"-----");
fprintf(f,"n No | J o b\n");
fprintf(f,"-----");
for (i=1; i<=Job; i++)      fprintf(f,"-----");
fprintf(f,"n");
for (i=0; i<Job; i++)
{
    fprintf(f,"%5d |",i+1);
    for (j=0; j<Job; j++)      fprintf(f,"%5d",SubPopulasi[i][j]);
    fprintf(f,"n");
}
fprintf(f,"-----");
for (i=1; i<=Job; i++)      fprintf(f,"-----");
fprintf(f,"n");
}

```

```

void SetMakespan(unsigned char SubPopulasi[JOB][JOB], unsigned char pos)
{
    double temp;
    unsigned char i,j;
    if (NGen!=12)
        fprintf(f,"nMakespan Untuk Sub Populasi %d\n",pos);
    else
        fprintf(f,"nMakespan Untuk Populasi\n");
    fprintf(f,"-----\n");
    fprintf(f," No | Makespan \n");
    fprintf(f,"-----\n");
    pos--;
    temp=HitungMakespan(SubPopulasi,0);
}

```

```

if (pos==0)
    for (i=0; i<Job; i++)
        SaveNGenPopulasi1[NGen][i]=SubPopulasi[0][i];
else
    for (i=0; i<Job; i++)
        SaveNGenPopulasi2[NGen][i]=SubPopulasi[0][i];
SaveMakespanPopulasi[NGen][pos]=temp;
fprintf(f,"%7d |%15.4lf\n",1,temp);
for (j=1; j<Job; j++)
{
    temp=HitungMakespan(SubPopulasi,j);
    fprintf(f,"%7d |%15.4lf\n",j+1,temp);
    if (temp<SaveMakespanPopulasi[NGen][pos])
    {
        if (pos==0)
            for (i=0; i<Job; i++)
                SaveNGenPopulasi1[NGen][i]=SubPopulasi[j][i];
        else
            for (i=0; i<Job; i++)
                SaveNGenPopulasi2[NGen][i]=SubPopulasi[j][i];
        SaveMakespanPopulasi[NGen][pos]=temp;
    }
}
}
fprintf(f,"-----\n");
if (NGen!=12)
    fprintf(f,"Minimum Makespan Sub Populasi %d =
%.4lf\n",pos+1,SaveMakespanPopulasi[NGen][pos]);
else
    fprintf(f,"Minimum Makespan Populasi =
%.4lf\n",SaveMakespanPopulasi[NGen][pos]);
if (NGen!=12)
    fprintf(f,"Urutan Job : ");
else
    fprintf(f,"Urutan Job Terbaik : ");
if (pos==0)
    for (i=0; i<Job; i++)
        fprintf(f,"%5d",SaveNGenPopulasi1[NGen][i]);
else
    for (i=0; i<Job; i++)
        fprintf(f,"%5d",SaveNGenPopulasi2[NGen][i]);
fprintf(f,"\n\n");
}

```

```

double HitungMakespan(unsigned char SubPopulasi[JOB][JOB], unsigned char
sub)
{

```

```

unsigned char i,j;
long int temp[JOB][MESIN];
// Mesin Pertama
temp[0][0]=TimeProses[SubPopulasi[sub][0]-1][0];
for (i=1; i<Job; i++)
    temp[i][0]=temp[i-1][0]+TimeProses[SubPopulasi[sub][i]-1][0];
// Mesin Kedua dan Ketiga
for (j=1; j<SumMesin; j++)
{
    temp[0][j]=TimeProses[SubPopulasi[sub][0]-1][j] + temp[0][j-1];
    for (i=1; i<Job; i++)
    {
        if (temp[i][j-1]<=temp[i-1][j])
            temp[i][j]=temp[i-1][j]+TimeProses[SubPopulasi[sub][i]-1][j];
        else
            temp[i][j]=temp[i][j-1]+TimeProses[SubPopulasi[sub][i]-1][j];
    }
}
return(temp[Job-1][SumMesin-1]);
}

```

```

double HitungMakespan1(unsigned char SubPopulasi[A][JOB], unsigned char
sub)

```

```

{
    unsigned char i,j;
    long int temp[JOB][MESIN];
    // Mesin Pertama
    temp[0][0]=TimeProses[SubPopulasi[sub][0]-1][0];
    for (i=1; i<Job; i++)
        temp[i][0]=temp[i-1][0]+TimeProses[SubPopulasi[sub][i]-1][0];
    // Mesin Kedua dan Ketiga
    for (j=1; j<SumMesin; j++)
    {
        temp[0][j]=TimeProses[SubPopulasi[sub][0]-1][j] + temp[0][j-1];
        for (i=1; i<Job; i++)
        {
            if (temp[i][j-1]<=temp[i-1][j])
                temp[i][j]=temp[i-1][j]+TimeProses[SubPopulasi[sub][i]-1][j];
            else
                temp[i][j]=temp[i][j-1]+TimeProses[SubPopulasi[sub][i]-1][j];
        }
    }
    return(temp[Job-1][SumMesin-1]);
}

```

```

void SetCrossOver()

```

```

{
  int acak1,acak2,i,j,k;
  acak1=random(Job)+1;
  acak2=random(Job)+1;
  fprintf(f,"\nCrossOver : ");
  fprintf(f,"\nBilangan Random 1 = %d",acak1);
  fprintf(f,"\nBilangan Random 2 = %d\n",acak2);
  // salin data antara parent dengan anak
  for (i=0; i<2; i++)
    for (j=0; j<Job; j++)
      ChildSort[i][j]=SortJob[i][j];
  // Crossorver tahap 1 (tukar)
  int pos1,pos2=-1,simpan;
  for (i=0; i<Job; i++)
    if (ChildSort[0][i]==acak1)
      {
        j=ChildSort[0][i];
        ChildSort[0][i]=ChildSort[1][i];
        ChildSort[1][i]=j;
        pos1=i;
        break;
      }
  for (i=0; i<Job; i++)
    if (ChildSort[1][i]==acak2)
      {
        j=ChildSort[1][i];
        ChildSort[1][i]=ChildSort[0][i];
        ChildSort[0][i]=j;
        pos2=i;
        break;
      }
  if (pos2== -1) pos2=pos1;
  // Crossorver tahap 2 (cek ada urutan job ganda atau tidak)
  int cek1,cek2,temp1[JOB][A],temp2[JOB][A];
  unsigned char temp;
  for (i=0; i<Job; i++)
    {
      temp1[i][0]=i+1; temp1[i][1]=1;
      temp2[i][0]=i+1; temp2[i][1]=1;
    }
  cek2=random(2);
  if (cek2==0)
    {
      // Parent 1
      for (i=0; i<Job; i++)
        for (j=0; j<Job; j++)

```

```

if (temp1[j][0]==ChildSort[0][i])
{
    if ((i==pos1)||(i==pos2))
    {
        cek1=0;
        for (k=0; k<Job; k++)
            if (ChildSort[0][i]==ChildSort[0][k])
                cek1++;
        if (cek1!=1)
            temp1[j][0]=0;
        temp1[i][1]=-1;
    }
    else
    {
        if ((ChildSort[0][i]!=ChildSort[0][pos1])&&
            (ChildSort[0][i]!=ChildSort[0][pos2]))
        {
            cek1=0;
            for (k=0; k<Job; k++)
                if (ChildSort[0][i]==ChildSort[0][k])
                    cek1++;
            temp1[j][0]=0;
            temp1[i][1]=-1;
        }
    }
}
// Parent 2
for (i=Job-1; i>=0; i--)
    for (j=0; j<Job; j++)
        if (temp2[j][0]==ChildSort[1][i])
        {
            if ((i==pos1)||(i==pos2))
            {
                cek1=0;
                for (k=0; k<Job; k++)
                    if (ChildSort[1][i]==ChildSort[1][k])
                        cek1++;
                if (cek1!=1)
                    temp2[j][0]=0;
                temp2[i][1]=-1;
            }
            else
            {
                if ((ChildSort[1][i]!=ChildSort[1][pos1])&&
                    (ChildSort[1][i]!=ChildSort[1][pos2]))
                {

```

```

        cek1=0;
        for (k=0; k<Job; k++)
            if (ChildSort[1][i]==ChildSort[1][k])
                cek1++;
        temp2[j][0]=0;
        temp2[i][1]=-1;
    }
}
}
else
{
// Parent 1
for (i=0; i<Job; i++)
    for (j=0; j<Job; j++)
        if (temp1[j][0]==ChildSort[0][i])
            {
                if ((i==pos1)||(i==pos2))
                    {
                        cek1=0;
                        for (k=0; k<Job; k++)
                            if (ChildSort[0][i]==ChildSort[0][k])
                                cek1++;
                        if (cek1!=1)
                            temp1[j][0]=0;
                        temp1[i][1]=-1;
                    }
                else
                    {
                        if ((ChildSort[0][i]!=ChildSort[0][pos1])&&
                            (ChildSort[0][i]!=ChildSort[0][pos2]))
                            {
                                cek1=0;
                                for (k=0; k<Job; k++)
                                    if (ChildSort[0][i]==ChildSort[0][k])
                                        cek1++;
                                temp1[j][0]=0;
                                temp1[i][1]=-1;
                            }
                    }
            }
}
// Parent 2
for (i=0; i<Job; i++)
    for (j=0; j<Job; j++)
        if (temp2[j][0]==ChildSort[1][i])
            {

```

```

    if ((i==pos1)||(i==pos2))
    {
        cek1=0;
        for (k=0; k<Job; k++)
            if (ChildSort[1][i]==ChildSort[1][k])
                cek1++;
        if (cek1!=1)
            temp2[j][0]=0;
            temp2[i][1]=-1;
    }
    else
    {
        if ((ChildSort[1][i]!=ChildSort[1][pos1])&&
            (ChildSort[1][i]!=ChildSort[1][pos2]))
        {
            cek1=0;
            for (k=0; k<Job; k++)
                if (ChildSort[1][i]==ChildSort[1][k])
                    cek1++;
            temp2[j][0]=0;
            temp2[i][1]=-1;
        }
    }
}

if (cek2==0)
{
    for (i=0; i<Job; i++)
        if (temp1[i][1]==1)
            for (j=0; j<Job; j++)
                if (temp2[j][1]==1)
                {
                    temp2[j][1]=-1;
                    temp=ChildSort[0][i];
                    ChildSort[0][i]=ChildSort[1][j];
                    ChildSort[1][j]=temp;
                    break;
                }
}
else
{
    for (i=Job-1; i>=0; i--)
        if (temp1[i][1]==1)
            for (j=0; j<Job; j++)
                if (temp2[j][1]==1)

```

```

        {
            temp2[j][1]=-1;
            temp=ChildSort[0][i];
            ChildSort[0][i]=ChildSort[1][j];
            ChildSort[1][j]=temp;
            break;
        }
    }
    fprintf(f,"\nParent Lama Yang dihasilkan : ");
    fprintf(f,"\nParent 1 : ");
    for (i=0; i<Job; i++)        fprintf(f,"%5d",SortJob[0][i]);
    fprintf(f,"\nParent 2 : ");
    for (i=0; i<Job; i++)        fprintf(f,"%5d",SortJob[1][i]);
    fprintf(f,"\nChild Yang dihasilkan : ");
    fprintf(f,"\nChild 1 : ");
    for (i=0; i<Job; i++)        fprintf(f,"%5d",ChildSort[0][i]);
    fprintf(f,"\nChild 2 : ");
    for (i=0; i<Job; i++)        fprintf(f,"%5d",ChildSort[1][i]);
    fprintf(f,"\n");
}

```

```
void SetNewParentCrossOver()
```

```

{ // Bandingkan mana yg terbaik antara artu dgn anak yg makespan paling kecil
    unsigned char i,j;
    double temp1,temp2;
    fprintf(f,"\nPerhitungan Untuk Membentuk Parent Baru\n");
    for (j=0; j<A; j++)
    {
        temp1=HitungMakespan1(ChildSort,j);
        temp2=HitungMakespan1(SortJob,j);
        fprintf(f,"Makespan Parent %d : %.4f\n",j+1,temp2);
        fprintf(f,"Makespan Child %d : %.4f\n",j+1,temp1);
        if (temp1<=temp2)
            for (i=0; i<Job; i++)    SortJob[j][i]=ChildSort[j][i];
    }
    fprintf(f,"\nParent Baru Yang dihasilkan : ");
    fprintf(f,"\nParent 1 : ");
    for (i=0; i<Job; i++)        fprintf(f,"%5d",SortJob[0][i]);
    fprintf(f,"\nParent 2 : ");
    for (i=0; i<Job; i++)        fprintf(f,"%5d",SortJob[1][i]);
    fprintf(f,"\n");
}

```

```
void SetMutasi()
```

```

{
    int acak1,acak2;

```


