Lampiran 1 Data Hasil Produksi Perusahaan Filter Rokok

Produk	Hasil Produksi Tahun Juli 2016 – Juni 2017 (batang)					
	Juli	Ags	Sep	Okt	Nov	Des
Menthol	71.300.000	118.900.000	122.900.000	87.300.000	108.200.000	151.700.000
Dual Shape	84.200.000	64.600.000	79.300.000	66.100.000	74.900.000	67.800.000
ROA	507.200.000	535.400.000	657.900.000	479.200.000	420.700.000	641.000.000
Cavitek	1.500.000	2.700.000	100.000	2.500.000	0	1.500.000
CPA/CPS	64.000.000	76.000.000	142.600.000	94.100.000	19.700.000	35.500.000
NWA	146.300.000	110.100.000	195.900.000	266.000.000	133.300.000	224.300.000

Produk	Hasil Produksi Tahun Juli 2016 – Juni 2017 (batang)					
	Jan	Feb	Mar	Apr	Mei	Jun
Menthol	56.400.000	104.900.000	132.700.000	135.600.000	148.000.000	94.800.000
Dual Shape	36.900.000	56.400.000	99.900.000	112.300.000	84.400.000	57.200.000
ROA	475.800.000	453.900.000	714.900.000	742.000.000	600.400.000	674.700.000
Cavitek	1.900.000	3.000.000	38.200.000	49.500.000	68.600.000	70.500.000
CPA/CPS	21.200.000	30.000.000	42.200.000	36.000.000	66.800.000	15.300.000
NWA	136.400.000	175.500.000	291.400.000	221.500.000	162.700.000	253.700.000

Produk	Hasil Produksi Tahun Juli 2016 – Juni 2017 (tray, 1 tray= 40.000 batang)											
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Menthol	1782,5	2972,5	3072,5	2182,5	2705	3792,5	1410	2622,5	3317,5	3390	3700	2370
Dual Shape	2105	1615	1982,5	1652,5	1872,5	1695	922,5	1410	2497,5	2807,5	2110	1430
ROA	12680	13385	16447,5	11980	10517,5	16025	11895	11347,5	17872,5	18550	15010	16867,5
Cavitek	37,5	67,5	2,5	62,5	0	37,5	47,5	75	955	1237,5	1715	1762,5
CPA/CPS	1600	1900	3565	2352,5	492,5	887,5	530	750	1055	900	1670	382,5
NWA	3657,5	2752,5	4897,5	6650	3332,5	5607,5	3410	4387,5	7285	5537,5	4067,5	6342,5

Produk	Hasil Produksi Tahun Juli 2015 – Juni 2016 (tray/hari/shift)											
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Menthol	23	25	20	18	24	31	18	24	23	22	20	30
Dual Shape	21	23	16	22	24	23	12	19	18	22	29	18
ROA	27	26	21	24	20	24	17	26	29	17	21	19
Cavitek	1	1	1	1	0	1	1	1	11	14	23	22
CPA/CPS	20	17	16	21	7	12	7	10	12	10	23	5
NWA	16	19	23	26	22	25	23	17	21	22	25	14

Lampiran 2 Koding *Simulated Annealing* pada MATLAB

1. Program Utama

```
clear all
close all
clc

%% INPUT

% TMI=xlsread('data SA.xlsx',1);
% Konstanta=xlsread('data SA.xlsx',2);
% Presedence=xlsread('data SA.xlsx',3);

TMIload=load('TMI.mat');
TMIread=TMIload.TMI;
TMIProduct=TMIread;
Konstantaload=load('Konstanta.mat');
Konstanta=Konstantaload.Konstanta;
PresedenceSWAPload=load('PresedenceSWAP.mat');
PresedenceSWAP=PresedenceSWAPload.Presedence;
PresedenceTRANSFERload=load('PresedenceTRANSFER.mat');
PresedenceTRANSFER=PresedenceTRANSFERload.Presedence;
Constrainload=load('Constrain.mat');
Constrain=Constrainload.Constrain;
JMLPRODUK=6;


%input manual
SP=1;
Tabulis=[1,2,3,39];

% dari excel
C=Konstanta(1);
Cr=Konstanta(2);
qm1=Konstanta(3);
qm2=Konstanta(4);
qm3=Konstanta(5);
qm4=Konstanta(6);
qm5=Konstanta(7);
qm6=Konstanta(8);
qm=[qm1,qm2,qm3,qm4,qm5,qm6];
%T=Konstanta(9);
Tin=100;
MAXP=Konstanta(10);

[Mtmi,Ntmi]=size(TMIread);
TMI=struct('Kelompok',[],'Data',[],'Mean',[],'Meantotal',[]);
TMI(1).Kelompok=TMIread(1:5,1);
TMI(2).Kelompok=TMIread(6:8,1);
```

```
TMI(3).Kelompok=TMIread(9:10,1);
TMI(4).Kelompok=TMIread(11:12,1);
TMI(5).Kelompok=TMIread(13:15,1);
TMI(6).Kelompok=TMIread(16:19,1);
TMI(7).Kelompok=TMIread(20:26,1);
TMI(8).Kelompok=TMIread(27:36,1);
TMI(9).Kelompok=TMIread(37:39,1);

TMI(1).Data=TMIread(1:5,2:Ntmi-1);
TMI(2).Data=TMIread(6:8,2:Ntmi-1);
TMI(3).Data=TMIread(9:10,2:Ntmi-1);
TMI(4).Data=TMIread(11:12,2:Ntmi-1);
TMI(5).Data=TMIread(13:15,2:Ntmi-1);
TMI(6).Data=TMIread(16:19,2:Ntmi-1);
TMI(7).Data=TMIread(20:26,2:Ntmi-1);
TMI(8).Data=TMIread(27:36,2:Ntmi-1);
TMI(9).Data=TMIread(37:39,2:Ntmi-1);

TMI(1).Mean=TMIread(1:5,Ntmi);
TMI(2).Mean=TMIread(6:8,Ntmi);
TMI(3).Mean=TMIread(9:10,Ntmi);
TMI(4).Mean=TMIread(11:12,Ntmi);
TMI(5).Mean=TMIread(13:15,Ntmi);
TMI(6).Mean=TMIread(16:19,Ntmi);
TMI(7).Mean=TMIread(20:26,Ntmi);
TMI(8).Mean=TMIread(27:36,Ntmi);
TMI(9).Mean=TMIread(37:39,Ntmi);


TMI(1).Meantotal=sum(TMIread(1:5,Ntmi));
TMI(2).Meantotal=sum(TMIread(6:8,Ntmi));
TMI(3).Meantotal=sum(TMIread(9:10,Ntmi));
TMI(4).Meantotal=sum(TMIread(11:12,Ntmi));
TMI(5).Meantotal=sum(TMIread(13:15,Ntmi));
TMI(6).Meantotal=sum(TMIread(16:19,Ntmi));
TMI(7).Meantotal=sum(TMIread(20:26,Ntmi));
TMI(8).Meantotal=sum(TMIread(27:36,Ntmi));
TMI(9).Meantotal=sum(TMIread(37:39,Ntmi));

%%
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% STAGE 1 STAGE 1 STAGE 1 STAGE 1 STAGE 1 STAGE 1 STAGE 1
STAGE 1 STAGE 1
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=================================================================
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```

```
%
==========================================================
==========

disp('=== SA STAGE 1 == SA STAGE 1 == SA STAGE 1 == SA STAGE
1 ===')

%% BDT
[~,M]=size(TMI(1).Data);
K=length(TMI);

for m=1:M
    for ws=1:K
        BDT(ws,m)=(qm(m)*(SP*C-sum(TMI(ws).Data(:,m))));
        IDT(ws,m)=(C-sum(TMI(ws).Data(:,m))).*qm(m);
    end
end
%BDT=sum(BDTcount,2);
%BDT(1)=sum(BDTcount2);


%% Simulated Annealing STAGE 1

TMIiter=struct('tmi',TMI);
T=Tin;
k=2;
while T>10
    for s=1:39
        r=randsp(T);
        TMIsebelum=TMIiter(k-1).tmi;

[TMIbaru,K,keterangan,WS,PRODUK]=swaptransferfcn(r,TMIsebelum
,IDT,K,M,Tabulis,PresedenceTRANSFER,PresedenceSWAP,C,Constrai
n);
        TMIsiklus=struct('TS',[]);
        TMIsiklus(s).TS=TMIbaru;
        disp(keterangan)
        % HITUNG WAKTU STASIUN KERJA BARU
        for i=1:K
            MEANTOTALGET(i,1)=TMIbaru(i).Meantotal;
        end
        MEANTOTALBARU=sum(MEANTOTALGET);
        [~,M]=size(TMIbaru(1).Data);

        for m=1:M
            for ws=1:K
                BDTbaru(ws,m)=(qm(m)*(SP*C-
sum(TMIbaru(ws).Data(:,m))));
                IDT(ws,m)=(C-
sum(TMIbaru(ws).Data(:,m))).*qm(m);
            end
```

```
        end

        if BDTbaru(WS,PRODUK)<BDT(WS,PRODUK)
            BDT=BDTbaru;
            TMIiter(k).tmi=TMIbaru;
            %disp('TMIiter terupdate')
        else
            diff=((BDTbaru(WS,PRODUK)-
BDT(WS,PRODUK))/BDTbaru(WS,PRODUK))*100;
            R=rand(1);
            if R<exp(-diff/T);
                BDT=BDTbaru;
                TMIiter(k).tmi=TMIbaru;
                %disp('TMIiter terupdate')
            else
                TMIiter(k).tmi=TMIsebelum;
                %disp('TMIiter tidak terupdate')
            end
        end
        k=k+1;
    end
    T=T*Cr;
end


%%
==================================================================
=========
%
==================================================================
==========
% STAGE 2 STAGE 2 STAGE 2 STAGE 2 STAGE 2 STAGE 2 STAGE 2
STAGE 2 STAGE 2
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==================================================================
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%
==================================================================
==========
%%
disp('=== SA STAGE 2 == SA STAGE 2 == SA STAGE 2 == SA STAGE
2 ===')
TMI=TMIiter(end).tmi;

for m=1:M
    for ws=1:K
        IDT(ws,m)=(C-sum(TMI(ws).Data(:,m))).*qm(m);
        Skcount(ws,m)=IDT(ws,m)*qm(m);
    end
end
Sk=sum(Skcount(:));
```

```
Sim=sum(IDT(:));
IDTperSimminseperK=(IDT/Sim - 1/K).^2;
sumIDTperSimminseperK_times_qm=sum(IDTperSimminseperK,1)*qm';
BWS=sumIDTperSimminseperK_times_qm*(K/(K-1));

for m=1:M
    for ws=1:K
        qmSkmperSk(ws,m)=((qm(m)*IDT(ws,m)/Sk) - (1/M))^2;
    end
end
BS=(M/(K*(M-1)))*sum(qmSkmperSk(:));

BSawal=BS;
BWSawal=BWS;

%% Simulated Annealing STAGE 2

TMIiter2=struct('tmi',TMI);
T=Tin;
k=2;

BSiter(1)=BS;
BWSiter(1)=BWS;
while T>10
    for s=1:39
        r=randsp2(T);
        TMIsebelum=TMIiter2(k-1).tmi;

[TMIbaru,K,keterangan,WS,PRODUK]=swaptransferfcn(r,TMIsebelum
,IDT,K,M,Tabulis,PresedenceTRANSFER,PresedenceSWAP,C,Constrai
n);
        TMIsiklus=struct('TS',[]);
        TMIsiklus(s).TS=TMIbaru;
        disp(keterangan)
        % HITUNG WAKTU STASIUN KERJA BARU
        for i=1:K
            MEANTOTALGET(i,1)=TMIbaru(i).Meantotal;
        end
        MEANTOTALBARU=sum(MEANTOTALGET);
        [~,M]=size(TMIbaru(1).Data);
        BSsebelum=BS;
        BWSsebelum=BWS;
%-------------------------------------------------------------
---------
        for m=1:M
            for ws=1:K
                IDT(ws,m)=(C-
sum(TMIbaru(ws).Data(:,m))).*qm(m);
                Skcount(ws,m)=IDT(ws,m)*qm(m);
            end
        end
```

```
        Sk=sum(Skcount(:));
        Sim=sum(IDT(:));
        IDTperSimminseperK=(IDT/Sim - 1/K).^2;

sumIDTperSimminseperK_times_qm=sum(IDTperSimminseperK,1)*qm';
        BWSbaru=sumIDTperSimminseperK_times_qm*(K/(K-1));

        for m=1:M
            for ws=1:K
                qmSkmperSk(ws,m)=((qm(m)*IDT(ws,m)/Sk) -
(1/M))^2;
            end
        end
        BSbaru=(M/(K*(M-1)))*sum(qmSkmperSk(:));


%-----------------------------------------------------------------
---------

        if BSbaru<BS && BWSbaru<BWS
            BS=BSbaru;
            BWS=BWSbaru;
            BSiter(k)=BSbaru;
            BWSiter(k)=BWSbaru;
            TMIiter2(k).tmi=TMIbaru;
            %disp('TMIiter terupdate')
        else
            diff=(((BSbaru-BS)+(BWSbaru-
BWS))/(BSbaru+BWSbaru))*100;
            R=rand(1);
            if R<exp(-diff/T);
                BS=BSbaru;
                BWS=BWSbaru;
                BSiter(k)=BSbaru;
                BWSiter(k)=BWSbaru;
                TMIiter2(k).tmi=TMIbaru;
                %disp('TMIiter terupdate')
            else
                TMIiter2(k).tmi=TMIsebelum;
                BS=BSsebelum;
                BWS=BWSsebelum;
                BSiter(k)=BSsebelum;
                BWSiter(k)=BWSsebelum;
                %disp('TMIiter tidak terupdate')
            end
%-----------------------------------------------------------------
---------
        end
        k=k+1;
    end
    T=T*Cr;
```

```
end

TMIFinal=TMIiter2(end).tmi

format long

disp('=====Sebelum SA======')
disp(BSawal);
disp(BWSawal);


disp('=====Sesudah SA======')
disp(BSbaru);
disp(BWSbaru);

format short

subplot(2,1,1)
plot(BSiter)
xlabel('iterasi');
ylabel('BS');

subplot(2,1,2)
plot(BWSiter)
xlabel('iterasi');
ylabel('BWS');
```

2. Fungsi Tukar dan Pindah Aktivitas

```
function
[TMIbaru,K,keterangan,WS,PRODUK]=swaptransferfcn(r,TMI,IDT,K,
M,Tabulis,PresedenceTRANSFER,PresedenceSWAP,C,Constrain)
TMIbaru=[];
%keterangan='no process';
if r<0.25
    %=====================================================
    %== SWAP SWAP SWAP SWAP SWAP SWAP SWAP SWAP SWAP =====
    %=====================================================
    [devIDT,IDTmeank]=idtfcn(IDT,M,K);
    ws1=randi(K,1);

[ws1,SP,kelompokws1,TMIws1sp,Meanws1,kelompokws1del,TMIws1spd
el,TMIws1del,Meanws1del]=evaluasiwaktuproduk1(ws1,devIDT,TMI,
Tabulis,K);
    Szx=IDT(ws1,SP);
    SZpM=IDTmeank(ws1);
    WS=ws1;
    PRODUK=SP;
    %assignin('base','Szx',Szx)
    %assignin('base','SZpM',SZpM)

%==============================================================
=========================================================
    if Szx> SZpM
        saws1=(find(TMIws1spdel==min(TMIws1spdel)));
%selected activity dari ws1
        aktivitas1=kelompokws1del(saws1);
        ws2=randi(K,1);
        while ws2==ws1
            ws2=randi(K,1);
        end

[ws2,TMIws2sp,kelompokws2,Meanws2,kelompokws2del,TMIws2spdel,
TMIwsdel,Meanwsdel]=evaluasiwaktuproduk2(ws2,ws1,SP,devIDT,TM
I,Tabulis,K);
        saws2=(find(TMIws2spdel==max(TMIws2spdel)));
        aktivitas2=kelompokws2del(saws2);

        %assignin('base','aktivitas1',aktivitas1);
        %assignin('base','aktivitas2',aktivitas2);
        %assignin('base','saws2',saws2)
        %assignin('base','TMIws2spdel',TMIws2spdel);

%==============================================================
==============================================================
===
    else
```

```
%==============================================================
==============================================================
===
        saws1=(find(TMIws1spdel==max(TMIws1spdel)));
%selected activity dari ws1
        aktivitas1=kelompokws1del(saws1);
        ws2=randi(K,1);
        while ws2==ws1
            ws2=randi(K,1);
        end

[ws2,TMIws2sp,kelompokws2,Meanws2,kelompokws2del,TMIws2spdel,
TMIwsdel,Meanwsdel]=evaluasiwaktuproduk2(ws2,ws1,SP,devIDT,TM
I,Tabulis,K);
        saws2buf=(find(TMIws2spdel>0));
        TMIws2spdel=TMIws2spdel(saws2buf);
        saws2=(find(TMIws2spdel==min(TMIws2spdel)));
        aktivitas2=kelompokws2del(saws2);
    end


    Pre=PresedenceSWAP(aktivitas1,aktivitas2);
    if Pre==1
        keterangan='Presedence - no swap';
        TMIbaru=TMI;
    elseif Pre==0
        keterangan='Precedence for Swap OK';
        TMI1mean=TMI(ws1).Mean;
        TMI2mean=TMI(ws2).Mean;

        Swapadd1=find(kelompokws1==kelompokws1del(saws1));
        Swapadd2=find(kelompokws2==kelompokws2del(saws2));
        %assignin('base','ws1',ws1);
        %assignin('base','ws2',ws2);

        assignin('base','kelompokws2',kelompokws2)
        assignin('base','kelompokws2del',kelompokws2del)
        TMI1meannew=TMI1mean;
        TMI1meannew(Swapadd1)=TMI2mean(Swapadd2); %matriks
Mean baru yg sudah diswap

        TMI2meannew=TMI2mean;
        TMI2meannew(Swapadd2)=TMI1mean(Swapadd1); %matriks
Mean baru yg sudah diswap
        assignin('base','TMI1meannew',TMI1meannew)
        assignin('base','TMI2meannew',TMI2meannew)
        sumTMI1meannew=sum(TMI1meannew); %mean total dari TMI
pada ws1 dijumlah
        sumTMI2meannew=sum(TMI2meannew); %mean total dari TMI
pada ws1 dijumlah
```

```
        if sumTMI1meannew>C || sumTMI2meannew>C %kapasitas
tidak memenuhi
            keterangan='Capacity - no swap';
            TMIbaru=TMI;
        else
            keterangan='Capacity for Swap OK';
            TMI1kelompok=TMI(ws1).Kelompok;
            TMI2kelompok=TMI(ws2).Kelompok;

            TMI1kelompoknew=TMI1kelompok;
            TMI1kelompoknew(Swapadd1)=TMI2kelompok(Swapadd2);

            TMI2kelompoknew=TMI2kelompok;
            TMI2kelompoknew(Swapadd2)=TMI1kelompok(Swapadd1);


            %Constrain
            for i=1:length(TMI1kelompoknew)
                for j=1:length(TMI1kelompoknew)

ZCws1cek(i,j)=Constrain(TMI1kelompoknew(i),TMI1kelompoknew(j)
);
                end
            end

            for i=1:length(TMI2kelompoknew)
                for j=1:length(TMI2kelompoknew)

ZCws2cek(i,j)=Constrain(TMI2kelompoknew(i),TMI2kelompoknew(j)
);
                end
            end

            ZCws1cekfinal=sum(ZCws1cek(:));
            ZCws2cekfinal=sum(ZCws2cek(:));
            if ZCws1cekfinal~=0 || ZCws2cekfinal~=0
                keterangan='Zoning Constrain - no swap';
                TMIbaru=TMI;
            else
                assignin('base','Swapadd1',Swapadd1)
                assignin('base','Swapadd2',Swapadd2)

                assignin('base','ws1',ws1)
                assignin('base','ws2',ws2)
                BUF1_Kelompok=TMI(ws1).Kelompok(Swapadd1);
                BUF1_Data=TMI(ws1).Data(Swapadd1,:);
                BUF1_Mean=TMI(ws1).Mean(Swapadd1);

                BUF2_Kelompok=TMI(ws2).Kelompok(Swapadd2);
                BUF2_Data=TMI(ws2).Data(Swapadd2,:);
```

```
                BUF2_Mean=TMI(ws2).Mean(Swapadd2);

                % SWAP
                TMI(ws1).Kelompok(Swapadd1)=BUF2_Kelompok;
                TMI(ws1).Data(Swapadd1,:)=BUF2_Data;
                TMI(ws1).Mean(Swapadd1)=BUF2_Mean;
                TMI(ws1).Meantotal=sum(TMI(ws1).Mean);

                TMI(ws2).Kelompok(Swapadd2)=BUF1_Kelompok;
                TMI(ws2).Data(Swapadd2,:)=BUF1_Data;
                TMI(ws2).Mean(Swapadd2)=BUF1_Mean;
                TMI(ws2).Meantotal=sum(TMI(ws2).Mean);
                assignin('base','TMIterswap',TMI)
                TMIterswap=TMI;
                TMIbaru=TMIterswap;
                keterangan=strcat('SWAP at[',...
                    num2str(ws1),'] to [',num2str(ws2),'] --
activity [', ...
                    num2str(TMI(ws1).Kelompok(Swapadd1)),']
to [',num2str(TMI(ws2).Kelompok(Swapadd2)),']') ;
            end
        end
    end
else
  %=====================================================
  %== TRANSFER TRANSFER TRANSFER TRANSFER TRANSFER =====
  %=====================================================
  [devIDT,IDTmeank]=idtfcn(IDT,M,K);
  % Workstation ke-k
  ws1=randi(K,1);
  %disp(strcat('ws1=',num2str(ws1)))

[ws1,SP,kelompokws1,TMIws1sp,Meanws1,kelompokws1del,TMIws1spd
el,TMIws1del,Meanws1del]=evaluasiwaktuproduk1(ws1,devIDT,TMI,
Tabulis,K);
  %disp(strcat('ws1 updated =',num2str(ws1)))
  if isempty(TMI(ws1).Kelompok)==1
      TMI(ws1)=[];
      K=K-1;
      ws1=randi(K,1);

[ws1,SP,kelompokws1,TMIws1sp,Meanws1,kelompokws1del,TMIws1spd
el,TMIws1del,Meanws1del]=evaluasiwaktuproduk1(ws1,devIDT,TMI,
Tabulis,K);
  end


  Szx=IDT(ws1,SP);
  SZpM=IDTmeank(ws1);
```

```
%==============================================================
==========================================================
   if Szx> SZpM
      WS=ws1;
      PRODUK=SP;
      Cekws=1:K;
      Cekws(ws1)=[];
      TRFfindall=[];
      for i=1:length(Cekws)
          cekmax=[];
          cekmaxempty=[];
          TMIcekdata=TMI(Cekws(i)).Data;
          kelompokcek=TMI(Cekws(i)).Kelompok;
          TMIcek=TMIcekdata(:,SP);
          for j=1:length(TMIcek)
              cekmax(j,1)=(TMIcek(j)==max(TMIcekdata(j,:)));
          end
          cekmaxempty=find(cekmax==1);
          if isempty(cekmaxempty)==0
              TRFfind=kelompokcek(cekmaxempty);
              TRFfindall=[TRFfindall;TRFfind];
          end
      end

      %TRFfindall=tabulisignorTRF(Tabulis,TRFfindall);

[TRFfindall,TMIcekdel]=tabulisignorTRF(Tabulis,TRFfindall,TMI
cek);
      aktivitasTRF=max(TRFfindall);

      cariws=[];
      for i=1:K;
          assignin('base','TMI_i_Kelompok',TMI(i).Kelompok);
          assignin('base','aktivitasTRF',aktivitasTRF)
          cariws=find(TMI(i).Kelompok==aktivitasTRF);
          if isempty(cariws)~=1
              WSORIGIN=i;
              break;
          end
      end


%TMI=struct('Kelompok',[],'Data',[],'Mean',[],'Meantotal',[])
;
      TMIwsKELOMPOKnew=TMI(ws1).Kelompok;
      TMIwsDATAnew=TMI(ws1).Data;
      TMIwsMEANnew=TMI(ws1).Mean;

      Aadd=find(TMI(WSORIGIN).Kelompok==aktivitasTRF);
```

```
      TMIwsKELOMPOKnew=[TMIwsKELOMPOKnew;aktivitasTRF];
      TMIwsDATAnew=[TMIwsDATAnew;TMI(WSORIGIN).Data(Aadd,:)];
      TMIwsMEANnew=[TMIwsMEANnew;TMI(WSORIGIN).Mean(Aadd,:)];
      TMIwsMEANTOTALnew=sum(TMIwsMEANnew);


      for c=1:length(TMI(ws1).Kelompok)

cekPre(c,1)=PresedenceTRANSFER(aktivitasTRF,TMI(ws1).Kelompok
(c));
      end
      PreTRF=sum(cekPre==0); %banyaknya precedence bernilai 0
dalam ws1

      if PreTRF==0
          keterangan='Presedence - no transfer';
          TMIbaru=TMI;
      elseif PreTRF~=0
          if TMIwsMEANTOTALnew>C %kapasitas tidak memenuhi
              keterangan='Capacity - no transfer';
              TMIbaru=TMI;
          else
              for i=1:length(TMI(ws1).Kelompok)

ZCcek(i,1)=Constrain(aktivitasTRF,TMI(ws1).Kelompok(i));
              end
              ZCcekfinal=sum(ZCcek(:));
              if ZCcekfinal~=0
                  keterangan='Zoning Constrain - no
transfer';
                  TMIbaru=TMI;
              else
                  keterangan=strcat('TRANSFER at[',...
                    num2str(WSORIGIN),'] to [',num2str(ws1))
;
                  TMI(ws1).Kelompok=TMIwsKELOMPOKnew;
                  TMI(ws1).Data=TMIwsDATAnew;
                  TMI(ws1).Mean=TMIwsMEANnew;
                  TMI(ws1).Meantotal=TMIwsMEANTOTALnew;

                  TMI(WSORIGIN).Kelompok(Aadd,:)=[];
                  TMI(WSORIGIN).Data(Aadd,:)=[];
                  TMI(WSORIGIN).Mean(Aadd,:)=[];

TMI(WSORIGIN).Meantotal=sum(TMI(WSORIGIN).Mean);
                  TMIbaru=TMI;
              end
          end
      end
```

```
%==============================================================
==============================================================
===
   else
%==============================================================
==============================================================
===
    % ws1 = WS ORIGIN
   TMIcekdata=TMI(ws1).Data;
   TMIcek=TMIcekdata(:,SP);
   kelompokcek=TMI(ws1).Kelompok;

[kelompokcek,TMIcekdel]=tabulisignorTRF(Tabulis,kelompokcek,T
MIcek);
   aktivitasTRF=kelompokcek(find(TMIcekdel==max(TMIcekdel)));

   devIDTcek=devIDT(:,SP);
   devIDTcek(ws1,:)=[];
   IDTmeankcek=IDTmeank;
   IDTmeankcek(ws1,:)=[];
   WScek=1:K;
   WScek(ws1)=[];
   ceklowfind=[];
   for i=1:K-1
       ceklow(i,1)=(devIDTcek(i)<IDTmeankcek(i));
   end
   ceklowfind=find(ceklow==1);

   if isempty(ceklowfind)==0

WSDESTINATION=WScek(ceklowfind(randi(length(ceklowfind),1)));
   end

   TMIwsKELOMPOKnew=TMI(WSDESTINATION).Kelompok;
   TMIwsDATAnew=TMI(WSDESTINATION).Data;
   TMIwsMEANnew=TMI(WSDESTINATION).Mean;
   WS=WSDESTINATION;
   PRODUK=SP;
   Aadd=find(TMI(ws1).Kelompok==aktivitasTRF);

   TMIwsKELOMPOKnew=[TMIwsKELOMPOKnew;aktivitasTRF];
   TMIwsDATAnew=[TMIwsDATAnew;TMI(ws1).Data(Aadd,:)];
   TMIwsMEANnew=[TMIwsMEANnew;TMI(ws1).Mean(Aadd,:)];
   TMIwsMEANTOTALnew=sum(TMIwsMEANnew);


   % ========= PECEDENCE - CAPACITY - ZONING CONSTRAIN
===========
   % paling tidak harus ada sepasang aktivitas dalam
WSDESTINATION yang
   % Presedence-nya sama dengan 0
```

```
   for c=1:length(TMI(WSDESTINATION).Kelompok)
       assignin('base','c',c)

cekPre(c,1)=PresedenceTRANSFER(aktivitasTRF,TMI(WSDESTINATION
).Kelompok(c));
   end
   PreTRF=sum(cekPre==0); %banyaknya precedence bernilai 0
dalam WSDESTINATION

   if PreTRF==0 %tidak ada sepasang aktivitas bernilai 0
       keterangan='Presednece - no transfer';
       TMIbaru=TMI;
   elseif PreTRF~=0
       if TMIwsMEANTOTALnew>C %kapasitas tidak memenuhi
           keterangan='Capacity - no transfer';
           TMIbaru=TMI;
       else
           for i=1:length(TMI(WSDESTINATION).Kelompok)

ZCcek(i,1)=Constrain(aktivitasTRF,TMI(WSDESTINATION).Kelompok
(i));
           end
           ZCcekfinal=sum(ZCcek(:));
           if ZCcekfinal~=0
               keterangan='Zoning Constrain - no transfer';
               TMIbaru=TMI;
           else
               TMI(WSDESTINATION).Kelompok=TMIwsKELOMPOKnew;
               TMI(WSDESTINATION).Data=TMIwsDATAnew;
               TMI(WSDESTINATION).Mean=TMIwsMEANnew;

TMI(WSDESTINATION).Meantotal=TMIwsMEANTOTALnew;
               TMI(ws1).Kelompok(Aadd,:)=[];
               TMI(ws1).Data(Aadd,:)=[];
               TMI(ws1).Mean(Aadd,:)=[];
               TMI(ws1).Meantotal=sum(TMI(ws1).Mean);
               TMIbaru=TMI;
               keterangan=strcat('TRANSFER at[',...
                    num2str(ws1),'] to
[',num2str(WSDESTINATION)) ;
           end
       end
   end
   end
end
```

3. Fungsi Mencari Nilai Waktu *Idle*

```
function [devIDT,IDTmeank]=idtfcn(IDT,M,K)


IDTmeank=mean(IDT,2);
for m=1:M
    for k=1:K
        devIDT(k,m)=abs(IDT(k,m)-IDTmeank(k));
    end
end
```

4. Fungsi Nilai Random Spesial Tahap 1

```
function [r]=randsp(T)

%if T>19 R>=0.25
if T>19
r = 0.25 + (1-0.25).*rand(1);

else
%if T<=19 R<0.25
r = 0.001 + (0.249-0.001).*rand(1);
end
```

5. Fungsi Nilai Random Spesial Tahap 2

```
function [r]=randsp2(T)

%if T>19 R>=0.25
if T>19

r = 0.001 + (0.249-0.001).*rand(1);
else
%if T<=19 R<0.25

r = 0.25 + (1-0.25).*rand(1);
end
```

6. Fungsi Menghitung Waktu Aktivitas Terpilih Pertama

```
function
[ws,SP,kelompokws,TMIwssp,Meanws,kelompokwsdel,TMIwsspdel,TMI
wsdel,Meanwsdel]=evaluasiwaktuproduk1(ws,devIDT,TMI,Tabulis,K
)

[~,SP]=find(devIDT==max(devIDT(ws,:))); %SP = selected
product

TMIwssp=TMI(ws).Data(:,SP); %time
TMIws=TMI(ws).Data;
kelompokws=TMI(ws).Kelompok; %aktivitas
Meanws=TMI(ws).Mean;

% abaikan yang tabulis
%[TMIwsspdel,kelompokdel]=tabulisignor(Tabulis,kelompokws,TMI
wssp,TMIws,Meanws);
[kelompokwsdel,TMIwsspdel,TMIwsdel,Meanwsdel]=tabulisignor(Ta
bulis,kelompokws,TMIwssp,TMIws,Meanws);

s0find=[];
s0find=(find(TMIwsspdel~=0));
while isempty(s0find)==1
    %reselect ws ws2
    ws=randi(K,1);

    [~,SP]=find(devIDT==max(devIDT(ws,:)));

    TMIwssp=TMI(ws).Data(:,SP); %time
    TMIws=TMI(ws).Data;
    kelompokws=TMI(ws).Kelompok; %aktivitas
    Meanws=TMI(ws).Mean;

    % abaikan yang tabulis

[kelompokwsdel,TMIwsspdel,TMIwsdel,Meanwsdel]=tabulisignor(Ta
bulis,kelompokws,TMIwssp,TMIws,Meanws);

    s0find=[];
    s0find=(find(TMIwsspdel~=0));
end
```

7. Fungsi Menghitung Waktu Aktivitas Terpilih 2

```
function
[ws2,TMIwssp,kelompokws,Meanws,kelompokwsdel,TMIwsspdel,TMIws
del,Meanwsdel]=evaluasiwaktuproduk2(ws2,ws1,SP,devIDT,TMI,Tab
ulis,K)

TMIwssp=TMI(ws2).Data(:,SP); %time
TMIws=TMI(ws2).Data;
kelompokws=TMI(ws2).Kelompok; %aktivitas
Meanws=TMI(ws2).Mean;
% abaikan yang tabulis
%[TMIwsspdel,kelompokwsdel]=tabulisignor(Tabulis,kelompokws,T
MIwssp);
[kelompokwsdel,TMIwsspdel,TMIwsdel,Meanwsdel]=tabulisignor(Ta
bulis,kelompokws,TMIwssp,TMIws,Meanws);
assignin('base','TMIwsspdel',TMIwsspdel)
assignin('base','WS2',ws2)
assignin('base','SP',SP)
s0find=[];
s0find=(find(TMIwsspdel~=0));
while isempty(s0find)==1
    %reselect ws ws2
    Knew=1:K;
    Knew(find(Knew==ws2))=[];
    ws2=Knew(randi(1));
    while ws2==ws1
        ws2=randi(K,1);
    end

    [~,SP]=find(devIDT==max(devIDT(ws2,:)));

    TMIwssp=TMI(ws2).Data(:,SP); %time
    TMIws=TMI(ws2).Data;
    kelompokws=TMI(ws2).Kelompok; %aktivitas
    Meanws=TMI(ws2).Mean;

    % abaikan yang tabulis

[kelompokwsdel,TMIwsspdel,TMIwsdel,Meanwsdel]=tabulisignor(Ta
bulis,kelompokws,TMIwssp,TMIws,Meanws);

    s0find=[];
    s0find=(find(TMIwsspdel~=0));
end
```

8. Fungsi Eliminasi Aktivitas yang ada dalam *taboo list* untuk Penukaran Aktivitas

```
function
[kelompokdel,TMIwsspdel,TMIwsdel,Meanwsdel]=tabulisignor(Tabu
lis,kelompokws,TMIwssp,TMIws,Meanws) %wssp= workstation
selected product
E=[];
% abaikan yang tabulis
cek=1;
for i=1:length(kelompokws)
    for j=1:length(Tabulis)
        if kelompokws(i)==Tabulis(j)
            E(cek)=i;
            cek=cek+1;
        end
    end
end

if isempty(E)==0
    kelompokdel=kelompokws;
    kelompokdel(E)=[];

    TMIwsspdel=TMIwssp;
    TMIwsspdel(E)=[];

    TMIwsdel=TMIws;
    TMIwsdel(E,:)=[];

    Meanwsdel=Meanws;
    Meanwsdel(E)=[];
elseif isempty(E)~=0
    kelompokdel=kelompokws;
    TMIwsspdel=TMIwssp;
    TMIwsdel=TMIws;
    Meanwsdel=Meanws;
end
```

9. Fungsi Eliminasi Aktivitas yang ada dalam *taboo list* untuk Memindah Aktivitas

```
function
[kelompokdel,TMIcekdel]=tabulisignorTRF(Tabulis,kelompokws,TM
Icek) %wssp= workstation selected product
E=[];
% abaikan yang tabulis
cek=1;
for i=1:length(kelompokws)
    for j=1:length(Tabulis)
        if kelompokws(i)==Tabulis(j)
            E(cek)=i;
            cek=cek+1;
        end
    end
end

if isempty(E)==0
    kelompokdel=kelompokws;
    kelompokdel(E)=[];
    TMIcekdel=TMIcek;
    TMIcekdel(E)=[];
elseif isempty(E)~=0
    kelompokdel=kelompokws;
    TMIcekdel=TMIcek;
end
```

Lampiran 3. Hasil Simulated Annealing pada Matlab

1. Hasil Simulated Annealing pada Solusi Pertama

=== SA STAGE 1 ==
Capacity - no transfer
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SWAP at[5] to [1] --
activity [5] to [11]
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SWAP at[1] to [3] --
activity [9] to [5]
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SWAP at[5] to [1] --
activity [5] to [11]
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SWAP at[5] to [1] --
activity [5] to [11]
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Presedence - no swap
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SWAP at[5] to [1] --
activity [5] to [11]

Presedence - no swap
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SWAP at[1] to [5] --
activity [12] to [5]
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SWAP at[1] to [3] --
activity [9] to [5]
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SWAP at[1] to [5] --
activity [12] to [5]
Presedence - no swap
SWAP at[1] to [5] --
activity [12] to [5]
Capacity - no swap
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SWAP at[5] to [1] --
activity [5] to [11]
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SWAP at[1] to [5] --
activity [12] to [5]
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SWAP at[5] to [1] --
activity [5] to [11]
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SWAP at[5] to [1] --
activity [5] to [11]
Presedence - no swap
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SWAP at[1] to [3] --
activity [9] to [5]
Capacity - no swap
Presedence - no swap
SWAP at[5] to [1] --
activity [5] to [11]
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SWAP at[1] to [3] --
activity [9] to [5]
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SWAP at[5] to [1] --
activity [5] to [11]
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SWAP at[5] to [1] --
activity [5] to [11]
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SWAP at[5] to [1] --
activity [4] to [12]
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SWAP at[5] to [1] --
activity [12] to [4]
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SWAP at[5] to [1] --
activity [4] to [12]
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SWAP at[5] to [1] --
activity [12] to [4]
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SWAP at[5] to [1] --
activity [4] to [12]
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SWAP at[5] to [1] --
activity [12] to [4]
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SWAP at[5] to [1] --
activity [4] to [12]
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SWAP at[5] to [1] --
activity [12] to [4]
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SWAP at[5] to [1] --
activity [4] to [12]
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SWAP at[5] to [1] --
activity [12] to [4]
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SWAP at[5] to [1] --
activity [4] to [12]
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SWAP at[5] to [1] --
activity [12] to [4]
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SWAP at[5] to [1] --
activity [4] to [12]
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SWAP at[5] to [1] --
activity [12] to [4]
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SWAP at[5] to [1] --
activity [4] to [12]
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SWAP at[5] to [1] --
activity [12] to [4]
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SWAP at[5] to [1] --
activity [4] to [12]
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SWAP at[5] to [1] --
activity [12] to [4]
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Presedence - no swap	Presedence - no transfer	Presedence - no transfer
Presedence - no swap	Presedence - no transfer	Capacity - no transfer
Presedence - no swap	Capacity - no transfer	Capacity - no transfer
Capacity - no swap	Presedence - no transfer	Capacity - no transfer
Presedence - no swap	Capacity - no transfer	Presedence - no transfer
SWAP at[5] to [1] --	Presedence - no transfer	Capacity - no transfer
activity [4] to [12]	Presedence - no transfer	Presedence - no transfer
Presedence - no swap	Presedence - no transfer	Presedence - no transfer
Presedence - no swap	Presedence - no transfer	Capacity - no transfer
Presedence - no swap	Presedence - no transfer	Capacity - no transfer
Presedence - no swap	Presedence - no transfer	Presedence - no transfer
Capacity - no swap	Presedence - no transfer	Presedence - no transfer
Presedence - no swap	Presedence - no transfer	Capacity - no transfer
Presedence - no swap	Capacity - no transfer	Capacity - no transfer
Capacity - no swap	Capacity - no transfer	Presedence - no transfer
Presedence - no swap	Presedence - no transfer	Capacity - no transfer
Capacity - no swap	Presedence - no transfer	Capacity - no transfer
SWAP at[5] to [1] --	Capacity - no transfer	Presedence - no transfer
activity [12] to [4]	Presedence - no transfer	Presedence - no transfer
Presedence - no swap	Capacity - no transfer	Presedence - no transfer
Capacity - no swap	Presedence - no transfer	Presedence - no transfer
Capacity - no swap	Presedence - no transfer	Presedence - no transfer
Presedence - no swap	Presedence - no transfer	Presedence - no transfer
Presedence - no swap	Presedence - no transfer	Presedence - no transfer
Presedence - no swap	Presedence - no transfer	Presedence - no transfer
Presedence - no swap	Presedence - no transfer	Capacity - no transfer
Presedence - no swap	Presedence - no transfer	Presedence - no transfer
Presedence - no swap	Capacity - no transfer	Capacity - no transfer
Presedence - no swap	Presedence - no transfer	Presedence - no transfer
Presedence - no swap	Presedence - no transfer	Capacity - no transfer
Presedence - no swap	Presedence - no transfer	Presedence - no transfer
Presedence - no swap	Capacity - no transfer	Capacity - no transfer
SWAP at[5] to [1] --	Capacity - no transfer	Presedence - no transfer
activity [4] to [12]	Capacity - no transfer	Presedence - no transfer
Presedence - no swap	Presedence - no transfer	Presedence - no transfer
Presedence - no swap	Capacity - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Capacity - no transfer	Capacity - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
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Capacity - no transfer	Capacity - no transfer	Capacity - no transfer

Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
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Presedence - no transfer	Presedence - no transfer	Capacity - no transfer
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Capacity - no transfer	Capacity - no transfer	Presedence - no transfer
Capacity - no transfer	Capacity - no transfer	Capacity - no transfer
Capacity - no transfer	Presedence - no transfer	
Presedence - no transfer		
Presedence - no transfer	Presedence - no transfer	
Presedence - no transfer	Presedence - no transfer	
Presedence - no transfer		
Capacity - no transfer		
Presedence - no transfer	===Sebelum SA===	===Sesudah SA====
Presedence - no transfer	0.195395046958617	0.195266675864631
Presedence - no transfer	0.147611747999734	0.147397688917121

2. Hasil Simulated Annealing pada Solusi Kedua

=== SA STAGE 1 ==	Capacity - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Capacity - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Capacity - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Capacity - no transfer
Presedence - no transfer	Presedence - no transfer	Capacity - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Capacity - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Capacity - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Capacity - no transfer	Capacity - no transfer	Presedence - no transfer
Capacity - no transfer	Capacity - no transfer	Presedence - no transfer
Capacity - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Capacity - no transfer
Presedence - no transfer	Presedence - no transfer	Capacity - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
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Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Capacity - no transfer
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Presedence - no transfer	Presedence - no transfer	Capacity - no transfer
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Capacity - no transfer
Presedence - no swap
Capacity - no swap
Presedence - no swap
Capacity - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
Capacity - no swap
SWAP at[5] to [1] -- activity [5] to [11]
Presedence - no swap
Capacity - no swap
Presedence - no swap
Presedence - no swap
SWAP at[5] to [1] -- activity [5] to [11]
Presedence - no swap
SWAP at[5] to [1] -- activity [5] to [11]
Presedence - no swap
Presedence - no swap

Presedence - no swap
Presedence - no swap
Presedence - no swap
SWAP at[5] to [1] -- activity [5] to [11]
Capacity - no swap
Presedence - no swap
Presedence - no swap
Capacity - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
SWAP at[1] to [5] -- activity [12] to [5]
Presedence - no swap
Presedence - no swap
Capacity - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
SWAP at[5] to [1] -- activity [5] to [11]
Presedence - no swap
Presedence - no swap
Capacity - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
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Capacity - no swap
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Presedence - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
SWAP at[5] to [1] -- activity [5] to [11]
Presedence - no swap
Presedence - no swap

Capacity - no swap
Presedence - no swap
SWAP at[5] to [1] -- activity [5] to [11]
Presedence - no swap
Presedence - no swap
SWAP at[1] to [3] -- activity [9] to [5]
Capacity - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
SWAP at[1] to [5] -- activity [12] to [5]
Presedence - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
SWAP at[1] to [3] -- activity [9] to [5]
Capacity - no swap
Capacity - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
Capacity - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
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Capacity - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
SWAP at[1] to [3] -- activity [9] to [5]
Capacity - no swap
Capacity - no swap
Presedence - no swap

Presedence - no swap
Presedence - no swap
Presedence - no swap
Capacity - no swap
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Presedence - no swap
Capacity - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
Capacity - no swap
SWAP at[5] to [1] -- activity [5] to [11]
Capacity - no swap
Capacity - no swap
Capacity - no swap
Capacity - no swap
Presedence - no swap
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Presedence - no swap
Presedence - no swap
SWAP at[1] to [3] -- activity [9] to [5]
Presedence - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap

SWAP at[5] to [1] -- activity [5] to [11]
Presedence - no swap
Presedence - no swap
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SWAP at[1] to [3] -- activity [9] to [5]
Capacity - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
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Presedence - no swap
Capacity - no swap
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Presedence - no swap
Capacity - no swap
Presedence - no swap
SWAP at[1] to [5] -- activity [12] to [5]
Presedence - no swap
Capacity - no swap
Capacity - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
Capacity - no swap
Capacity - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap

Presedence - no swap
SWAP at[1] to [5] -- activity [12] to [5]
Presedence - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
Capacity - no swap
Presedence - no swap
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Presedence - no swap
Presedence - no swap
Capacity - no swap
Presedence - no swap
SWAP at[5] to [1] -- activity [5] to [11]
Presedence - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
SWAP at[1] to [3] -- activity [9] to [5]
Presedence - no swap
=== SA STAGE 2 ===
Presedence - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
Capacity - no swap
Presedence - no swap
Capacity - no swap
Presedence - no swap
Presedence - no swap
SWAP at[1] to [5] -- activity [12] to [5]
Presedence - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap

Presedence - no swap
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Presedence - no swap
Capacity - no swap
Presedence - no swap
SWAP at[5] to [1] -- activity [4] to [11]
Presedence - no swap
Presedence - no swap
Capacity - no swap
Presedence - no swap
Capacity - no swap
Capacity - no swap
Presedence - no swap
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Capacity - no swap
Presedence - no swap
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Presedence - no swap
Presedence - no swap
SWAP at[5] to [1] -- activity [12] to [4]
Presedence - no swap
Presedence - no swap

Presedence - no swap
SWAP at[5] to [1] -- activity [4] to [12]
Capacity - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
Presedence - no swap
Capacity - no swap
Presedence - no swap
Presedence - no swap
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Capacity - no swap
Presedence - no swap
Capacity - no swap
SWAP at[5] to [1] -- activity [12] to [4]
SWAP at[5] to [1] -- activity [4] to [12]
Capacity - no swap
Presedence - no swap
Capacity - no swap
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SWAP at[5] to [1] -- activity [12] to [4]
Presedence - no swap
Presedence - no swap
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SWAP at[5] to [1] -- activity [4] to [12]
Capacity - no swap
Presedence - no swap
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SWAP at[5] to [1] -- activity [12] to [4]

Presedence - no swap
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SWAP at[5] to [1] -- activity [4] to [12]
Capacity - no swap
Capacity - no swap
Presedence - no swap
Capacity - no swap
Presedence - no swap
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Capacity - no swap
Presedence - no swap
SWAP at[5] to [1] -- activity [12] to [4]
Presedence - no swap
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Capacity - no swap
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SWAP at[5] to [1] -- activity [4] to [12]
Presedence - no swap
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SWAP at[5] to [1] -- activity [12] to [4]
Capacity - no swap
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SWAP at[5] to [1] -- activity [4] to [12]
Presedence - no swap
Presedence - no swap
Capacity - no swap
Presedence - no swap
SWAP at[5] to [1] -- activity [12] to [4]
Presedence - no swap
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SWAP at[5] to [1] -- activity [4] to [12]
Presedence - no swap
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Presedence - no swap
SWAP at[5] to [1] -- activity [12] to [4]
Capacity - no swap
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SWAP at[5] to [1] -- activity [4] to [12]
Presedence - no swap
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Presedence - no swap
SWAP at[5] to [1] -- activity [12] to [4]
Presedence - no swap
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Capacity - no swap
Presedence - no swap
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SWAP at[5] to [1] -- activity [4] to [12]
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SWAP at[5] to [1] -- activity [12] to [4]
Capacity - no swap
Presedence - no swap
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SWAP at[5] to [1] -- activity [4] to [12]
Presedence - no swap
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SWAP at[5] to [1] -- activity [12] to [4]
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Capacity - no swap
SWAP at[5] to [1] -- activity [4] to [12]
Capacity - no swap
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Capacity - no swap
SWAP at[5] to [1] -- activity [4] to [12]
Presedence - no swap
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Presedence - no swap	Capacity - no transfer	Presedence - no transfer
Presedence - no swap	Presedence - no transfer	Presedence - no transfer
Presedence - no swap	Presedence - no transfer	Capacity - no transfer
Capacity - no swap	Capacity - no transfer	Presedence - no transfer
Presedence - no swap	Presedence - no transfer	Capacity - no transfer
Presedence - no swap	Capacity - no transfer	Capacity - no transfer
Presedence - no swap	Presedence - no transfer	Capacity - no transfer
Capacity - no swap	Presedence - no transfer	Presedence - no transfer
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Presedence - no swap	Capacity - no transfer	Capacity - no transfer
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Capacity - no swap	Capacity - no transfer	Capacity - no transfer
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Presedence - no swap	Presedence - no transfer	Presedence - no transfer
Capacity - no swap	Capacity - no transfer	Presedence - no transfer
Capacity - no swap	Capacity - no transfer	Presedence - no transfer
Capacity - no swap	Presedence - no transfer	Presedence - no transfer
Presedence - no swap	Capacity - no transfer	Presedence - no transfer
Presedence - no swap	Presedence - no transfer	Capacity - no transfer
Presedence - no swap	Presedence - no transfer	Capacity - no transfer
Capacity - no swap	Capacity - no transfer	Presedence - no transfer
Presedence - no swap	Presedence - no transfer	Presedence - no transfer
Presedence - no swap	Presedence - no transfer	Presedence - no transfer
SWAP at[5] to [1] -- activity	Presedence - no transfer	Capacity - no transfer
[12] to [4]	Capacity - no transfer	Capacity - no transfer
Presedence - no swap	Capacity - no transfer	Capacity - no transfer
Presedence - no swap	Capacity - no transfer	Capacity - no transfer
Capacity - no swap	Presedence - no transfer	Capacity - no transfer
Presedence - no swap	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Capacity - no transfer	Capacity - no transfer
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Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Capacity - no transfer	Presedence - no transfer	Presedence - no transfer
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Presedence - no transfer
Capacity - no transfer

===Sebelum SA===
0.195395046958617
0.147611747999734

===Sesudah SA===
0.195279819868954
0.147420997458176

3. Hasil Simulated Annealing pada Solusi 3

=== SA STAGE 1 ==	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Capacity - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Capacity - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Capacity - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Capacity - no transfer	Capacity - no transfer
Presedence - no transfer	Capacity - no transfer	Capacity - no transfer
Presedence - no transfer	Capacity - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Capacity - no transfer
Presedence - no transfer	Presedence - no transfer	Capacity - no transfer
Presedence - no transfer	Presedence - no transfer	Capacity - no transfer
Capacity - no transfer	Capacity - no transfer	Presedence - no transfer
Capacity - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Capacity - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Capacity - no transfer	Capacity - no transfer
Capacity - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Capacity - no transfer
Presedence - no transfer	Capacity - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Capacity - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Capacity - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Capacity - no transfer
Capacity - no transfer	Capacity - no transfer	Presedence - no transfer
Capacity - no transfer	Presedence - no transfer	Presedence - no transfer
Capacity - no transfer	Presedence - no transfer	Capacity - no transfer
Capacity - no transfer	Capacity - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Capacity - no transfer	Presedence - no transfer
Presedence - no transfer	Capacity - no transfer	Presedence - no transfer
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Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Capacity - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Capacity - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Capacity - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer
Presedence - no transfer	Capacity - no transfer	Presedence - no transfer
Presedence - no transfer	Capacity - no transfer	Presedence - no transfer
Presedence - no transfer	Presedence - no transfer	Presedence - no transfer

Capacity - no transfer	Presedence - no transfer	Capacity - no transfer
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SWAP at[5] to [1] --
activity [5] to [11]
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SWAP at[5] to [1] --
activity [5] to [11]
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SWAP at[1] to [5] --
activity [12] to [5]
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SWAP at[1] to [3] --
activity [9] to [5]
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SWAP at[5] to [1] --
activity [5] to [11]
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activity [5] to [11]
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activity [5] to [11]
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SWAP at[1] to [3] --
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SWAP at[5] to [1] --
activity [5] to [11]
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activity [5] to [11]
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SWAP at[1] to [5] --
activity [12] to [5]
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SWAP at[1] to [3] --
activity [9] to [5]
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activity [9] to [5]
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SWAP at[5] to [1] --
activity [5] to [11]
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activity [5] to [11]
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