LAMPIRAN I

Program utama untuk mengerjakan program Monte Carlo (*flip* spin) tersimpan dengan nama file Antisegi3.m adalah:

```
N=6;
Nx=Ny=N;
spin=zeros(Ny,Nx);
Td=50;
mcs=200;
d=0.1;
J=input('input J = ');
T=0;
l=Td/d;
ET=zeros(1,l);
MT=zeros(1,l);
c=zeros(1,l);
terima=0;

for f=1:l
    T=T+d;
```

```
    c(f)=T;
    terima=0;
    Ekum=0;
    Mkum=0;

    for i=1:2:Ny
        for j=1:2:Nx
        spin(i,j)=1;
        spin(i,j+1)=-1;
        spin(i+1,j)=1;
        spin(i+1,j+1)=-1;
        end
    end
[M0,E0]=EM(spin,Ny,Nx,J);
E=E0;
M=M0;

%monte carlo random posisi
    for a=1:mcs
        for k=1:Ny
        i=k;
            for l=1:Nx
                x=1+round((Nx-1)*rand(1));
                j=x;
                spin(i,j)=-spin(i,j);
```

```
                    [Mt,Et]=EM(spin,Ny,Nx,J);
                    dE=Et-E;
                    w=e.^(-dE/T);
                    if dE<=0 ||rand<=w
                        E=Et;
                        M=Mt;
                        terima=terima+1;
                        else
                        E=E;
                        M=M;
                        spin(i,j)=-spin(i,j);
                    end
            end
        end
            Ekum=Ekum+E;
            Mkum=Mkum+M;
        end
ET(f)=Ekum/(mcs*Ny*Nx);
MT(f)=Mkum/(mcs*Ny*Nx);
end
plot(c,MT)
```

Program subroutine untuk menghitung energi dan magnetisasi berdasarkan Persamaan (29) dan (30), dan tersimpan dengan nama file EM.m, adalah:

```
function [M,E]=EM(spin,Ny,Nx,J)
E=0;
M=0;

for i=1:Ny
    for j=1:Nx
    %interaksi nn
            if j==1
            kiri=spin(i,Nx);
            else
            kiri=spin(i,j-1);
            end

            if j==Nx
            kanan=spin(i,1);
            else
            kanan=spin(i,j+1);
            end

%interaksi nnn
         if i==1
             if j==1
             kaa=spin(Ny,1);
             kab=spin(1,1);
             kia=spin(2,Nx);
```

```
                kib=spin(Ny,Nx);
                else

                    if j==Nx
                    kaa=spin(Ny,Nx);
                    kab=spin(2,Nx);
                    kia=spin(2,Nx-1);
                    kib=spin(Ny,j-1);
                    else
                        kaa=spin(Ny,j+1);
                        kab=spin(2,j+1);
kia=spin(2,j-1);
kib=spin(Ny,j-1);
                    end
                end
            end

            if i==Ny
                if j==1
                kaa=spin(Ny-1,2);
                kab=spin(1,2);
                kia=spin(1,Nx);
                kib=spin(Ny-1,1);
                else
                    if j==Nx
```

```
        kaa=spin(Ny-1,1);
        kab=spin(1,1);
        kia=spin(1,Nx);
        kib=spin(Ny-1,Nx-1);
        else
             kaa=spin(Ny-1,j+1);
             kab=spin(1,j+1);
             kia=spin(1,j+1);
             ki=spin(Ny-1,j-1);
        end
    end
end
if i~=1 && i~=Ny
    if j==1
    kaa=spin(i-1,2);
    kab=spin(i+1,2);
    kia=spin(i+1,1);
    kib=spin(1,1);
    else
         if j==Nx
         kaa=spin(1,1);
         kab=spin(i+1,1);
         kia=spin(i+1,Nx);
         kib=spin(1,Nx);
         else
```

```
                    kaa=spin(i-1,j+1);
                    kab=spin(i+1,j+1);
                    kia=spin(i+1,j-1);
                    kib=spin(i-1,j-1);
                end
            end
        end

E=E+2*(-spin(i,j)*(kanan+kiri)-J*spin(i,j)*(kaa+kab+kia+kib));
    end
end

%menghitung magnetisasi
for i=1:Ny
for j=1:Nx
M=M+spin(i,j);
end
end

end
```