

```

clear; close all; clc;
x=0.04;
y=0.04;
nx=25; % Grid size in x
ny=25; % grid size in y
dx=x/nx; % step size in x
dy=y/ny;% step size in y
dt=0.25; % time step size
h=400; % thermal coefficient of convection
k=61; % thermal conductivity
alpha=0.000016; % thermal diffusivity
To=100; % initial temperature
Tinf=25; % ambient temperature
imax=nx+1;
jmax=ny+1;
T(1:imax,1:jmax)=To;
rx=(alpha*dt)/(dx*dx);
ry=(alpha*dt)/(dy*dy);

```

```

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%% ADI Method %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
for t=dt:dt:60

    a(1,1)=1;
    a(imax,1)=0;
    b(1,1)=0;
    b(imax,1)= -k/dx;
    d(1,1)= -1;
    d(imax,1)=(k/dx)+h;
    c(1,1)=0;
    c(imax,1)=h*Tinf;
    %implicit in x
    for j=2:1:jmax-1
        for i=2:1:imax-1
            a(i,1)=-rx/2;
            b(i,1)=-rx/2;
            d(i,1)=1+rx;
            c(i,1)=T(j,i)+(ry*(T(j+1,i)-2*T(j,i)+T(j-1,i)))/2;
        end
        Tnew(j,:)=(TDMA(b,d,a,c,imax));
    end

    Tnew(1,:)=Tnew(2,:);
    Tnew(jmax,:)=((k*Tnew(jmax-1,:)/dy+h*Tinf)/((k/dy)+h));
    T=Tnew;
    a(1,1)=1;
    a(jmax,1)=0;
    b(1,1)=0;
    b(jmax,1)= -k/dy;

```

```

d(1,1)= -1;
d(jmax,1)=(k/dy)+h;
c(1,1)=0;
c(jmax,1)=h*Tinf;
% implicit in y
for i=2:1:imax-1
    for j=2:1:jmax-1
        a(j,1)=-ry/2;
        b(j,1)=-ry/2;
        d(j,1)=1+ry;
        c(j,1)=T(j,i)+(rx*(T(j,i+1)-2*T(j,i)+T(j,i-1))/2);
    end
    Tnew(:,i)=(TDMA(b,d,a,c,jmax));
end
Tnew(:,1)=Tnew(:,2);
Tnew(:,imax)=(k*Tnew(:,imax-1)/dx+h*Tinf)/((k/dx)+h);
T=Tnew;
end
% Temperature matrix
disp(T)

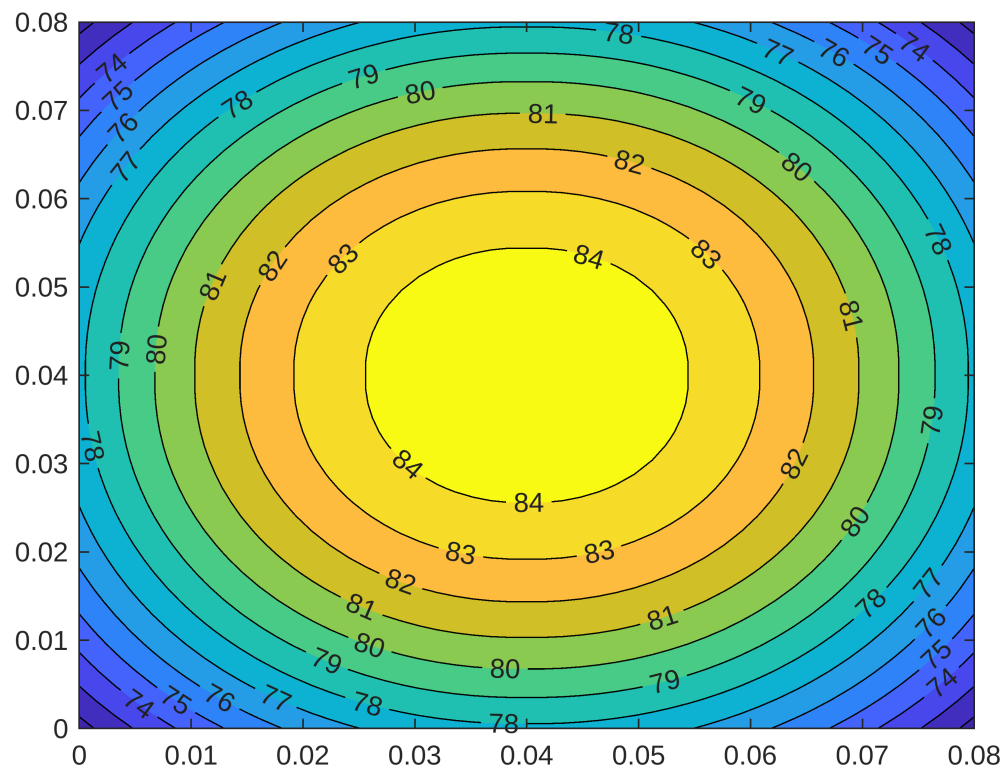
```

84.8595	84.8595	84.8355	84.7877	84.7159	84.6203	84.5008	84.3575	84.1905	83.9998	83.8595
84.8595	84.8595	84.8355	84.7877	84.7159	84.6203	84.5008	84.3575	84.1905	83.9998	83.8595
84.8355	84.8355	84.8116	84.7638	84.6921	84.5965	84.4770	84.3338	84.1668	83.9762	83.8355
84.7877	84.7877	84.7638	84.7160	84.6443	84.5488	84.4295	84.2864	84.1195	83.9290	83.7877
84.7159	84.7159	84.6921	84.6443	84.5727	84.4773	84.3582	84.2152	84.0486	83.8583	83.7159
84.6203	84.6203	84.5965	84.5488	84.4773	84.3821	84.2631	84.1204	83.9540	83.7641	83.6203
84.5008	84.5008	84.4770	84.4295	84.3582	84.2631	84.1443	84.0019	83.8359	83.6463	83.5008
84.3576	84.3576	84.3338	84.2864	84.2152	84.1204	84.0019	83.8598	83.6942	83.5051	83.3576
84.1905	84.1905	84.1669	84.1196	84.0486	83.9540	83.8359	83.6942	83.5291	83.3405	83.1905
83.9998	83.9998	83.9762	83.9291	83.8583	83.7641	83.6463	83.5051	83.3405	83.1525	82.9998
83.7855	83.7855	83.7620	83.7150	83.6445	83.5506	83.4333	83.2926	83.1285	82.9412	82.7855
83.5476	83.5476	83.5242	83.4774	83.4072	83.3137	83.1968	83.0567	82.8933	82.7068	82.5476
83.2862	83.2862	83.2629	83.2164	83.1465	83.0534	82.9370	82.7975	82.6349	82.4492	82.2862
83.0015	83.0015	82.9784	82.9320	82.8625	82.7698	82.6540	82.5152	82.3533	82.1685	81.9998
82.6936	82.6936	82.6705	82.6244	82.5552	82.4631	82.3479	82.2098	82.0488	81.8650	81.6936
82.3625	82.3625	82.3395	82.2937	82.2249	82.1333	82.0188	81.8815	81.7214	81.5387	81.3625
82.0084	82.0084	81.9856	81.9400	81.8717	81.7806	81.6668	81.5303	81.3713	81.1896	80.9998
81.6313	81.6313	81.6087	81.5634	81.4956	81.4051	81.2920	81.1565	80.9985	80.8180	80.6313
81.2316	81.2316	81.2091	81.1642	81.0968	81.0069	80.8947	80.7601	80.6032	80.4240	80.2316
80.8093	80.8093	80.7870	80.7423	80.6754	80.5863	80.4749	80.3413	80.1856	80.0078	79.8093
80.3645	80.3645	80.3424	80.2981	80.2317	80.1433	80.0328	79.9003	79.7458	79.5694	79.3645
79.8975	79.8975	79.8755	79.8317	79.7659	79.6782	79.5686	79.4372	79.2840	79.1091	78.8975
79.4084	79.4084	79.3867	79.3432	79.2780	79.1910	79.0824	78.9522	78.8004	78.6270	78.4084
78.8975	78.8975	78.8759	78.8328	78.7682	78.6821	78.5745	78.4455	78.2951	78.1234	77.8975
78.3648	78.3648	78.3435	78.3009	78.2369	78.1516	78.0451	77.9174	77.7685	77.5984	77.3648
77.8108	77.8108	77.7897	77.7474	77.6841	77.5998	77.4944	77.3679	77.2206	77.0523	76.8108

```

%%% heat contour %%%%%%%%%
[X,Y]=meshgrid(0:dx:(x*2),0:dy:(2*y));
Tplot=[flip(flip(Tnew,2)), flip(Tnew,1); flip(Tnew,2), Tnew];
Tplot(ny+1,:)=[]; Tplot(:,nx+1)=[];
contourf(X,Y,Tplot,Tinf:To,'ShowText','on');

```



```
function sol = TDMA(b,d,a,c,n)
    g(1)=d(1); N(1)=c(1);
    for M=2:n
        g(M)=d(M)-b(M)*a(M-1)/g(M-1);
        N(M)=c(M)-b(M)*N(M-1)/g(M-1);
    end
    sol(n)=N(n)/g(n);
    for M=n-1:-1:1
        sol(M)=(N(M)-a(M)*sol(M+1))/g(M);
    end
end
```