*MATLAB CODE FOR 2D CONVECTION-DIFFUSION*

L = 5; % length of rod

n\_points = 101; % n\_points = nx = ny

h = L/(n\_points-1); % h = dx = dy = L/(n\_points-1)

x = 0:h:L;

y = 0:h:L;

T(1, 1:n\_points) = 0;

T(1:n\_points, 1) = 25;

T\_new(1, 1:n\_points) = 100;

T\_new(1:n\_points, 1) = 0;

rho = 1; %density of material

u = 1; %velocity in x direction

v = 1; %velocity in y direction

gamma = 0.05;

error = 1;

itr = 0;

while error > 1e-7

for i = 2:n\_points-1

for j = 2:n\_points-1

aE = gamma/h - rho\*u\*h/2;

aW = gamma/h + rho\*u\*h/2;

aN = gamma/h - rho\*v\*h/2;

aS = gamma/h + rho\*v\*h/2;

aP = aE + aW + aS + aN + 0;

T\_new(i,j) = (aE\*T(i+1,j) + aW\*T(i-1,j) + aN\*T(i, j-1) + aS\*T(i, j+1))/aP;

end

end

itr = itr + 1;

error = 0;

for i = 2:n\_points-1

for j = 2:n\_points-1

error = error + abs(T(i,j)-T\_new(i,j));

end

end

T = T\_new;

end

x\_L = ((1:n\_points)-1).\*h;

y\_L = 1-((1:n\_points)-1).\*h;

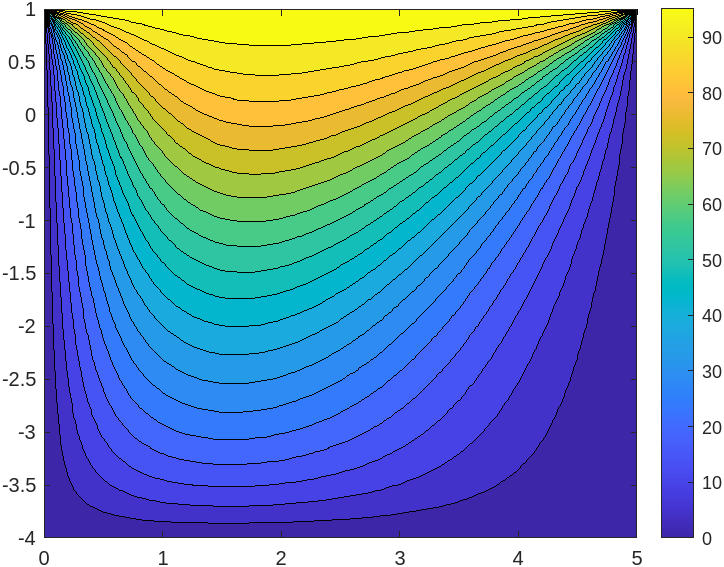
[X,Y] = meshgrid(x\_L, y\_L);

contourf(X,Y,T,20);

colorbar;

figure;

plot(1-y,T(:, (n\_points+1)/2),'--o');



*MATLAB CODE FOR 2D CONVECTION-DIFFUSION WITH POROUS MEDIA*

L = 5; % length of rod

n\_points = 101; % n\_points = nx = ny

h = L/(n\_points-1); % h = dx = dy = L/(n\_points-1)

x = 0:h:L;

y = 0:h:L;

T(1, 1:n\_points) = 0;

T(1:n\_points, 1) = 25;

T\_new(1, 1:n\_points) = 100;

T\_new(1:n\_points, 1) = 0;

rho = 1; %density of material

u = 1; %velocity in x direction

v = 1; %velocity in y direction

mu=1e-2; %porosity of porous media

k=1; %conductance

gamma = 0.05;

error = 1;

itr = 0;

while error > 1e-7

for i = 2:n\_points-1

for j = 2:n\_points-1

aE = gamma/h - rho\*u\*h/2;

aW = gamma/h + rho\*u\*h/2;

aN = gamma/h - rho\*v\*h/2;

aS = gamma/h + rho\*v\*h/2;

aP = aE + aW + aS + aN + 0;

T\_new(i,j) = (aE\*T(i+1,j) + aW\*T(i-1,j) + aN\*T(i, j-1) + aS\*T(i, j+1))/aP+(mu\*u)\*h\*h/k+(mu\*v)\*h\*h/k;

end

end

itr = itr + 1;

error = 0;

for i = 2:n\_points-1

for j = 2:n\_points-1

error = error + abs(T(i,j)-T\_new(i,j));

end

end

T = T\_new;

end

x\_L = ((1:n\_points)-1).\*h;

y\_L = 1-((1:n\_points)-1).\*h;

[X,Y] = meshgrid(x\_L, y\_L);

contourf(X,Y,T,20);

colorbar;

figure;

plot(1-y,T(:, (n\_points+1)/2),'--o');

