MATLAB EXERCISE 1.41 **MoM-based MATLAB program for a charged cube.** Write a computer program in MATLAB for the method-of-moments analysis of a charged metallic cube, Fig.1.22 (from the book), with edge length $a = 1$ m, and compute the total charge of the cube for $V_0 = 1$ V and ten, or as many as possible (given available computational resources), subdivisions per cube edge ($N = 600$ if ten subdivisions per edge are adopted). *(ME1_41.m on IR)*

SOLUTION:

The calculated total charge of the cube adopting $N = 600$ (ten subdivisions per cube edge) equals $Q = 73.27$ pC. Figure S1.22 shows a plot of the computed surface charge density over one side of the cube (the obtained charge distributions on all other sides of the cube are the same).

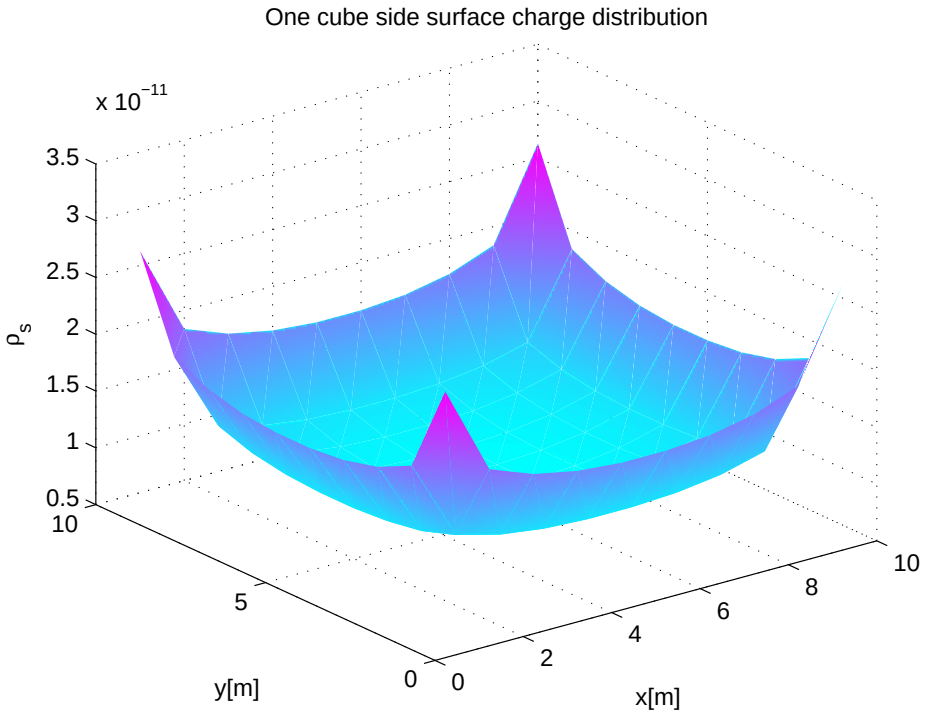

Figure S1.22 MATLAB display of the MoM-computed surface charge density over one side of a charged metallic cube; for MATLAB Exercise 1.41.

```
%
%   Book: MATLAB-Based Electromagnetics (Pearson Prentice Hall)
%   Author: Branislav M. Notaros
%   Instructor Resources
%   (c) 2011
%
%   This MATLAB code or any part of it may be used only for
%   educational purposes associated with the book
%
%
%


%   MoM-based MATLAB program for a charged cube


clear all;
close all;
N = 600;
Nside = N/6;
a = 1;
V0 = 1;
EPS0 = 8.8542*10^(-12);
n = sqrt(Nside);

[p,q,dS] = localCoordinates(n,n,a,a);
temp0 = zeros(1,Nside);
temp1 = a*ones (1,Nside);


x = [p,p,p,p,temp0,temp1];
y = [q,q,temp0,temp1,p,p];
z = [temp0,temp1,q,q,q,q];
S = [dS,dS,dS,dS,dS,dS];


%matrix A
A = matrixA(EPS0,S,x,y,z);

%matrix B

B = V0 * ones(N,1);

rhos = A\B;  %solving the equation


rhos1side = rhos(1:Nside);


%making 2D matrix rhos

for i = 1:n
```

```
rhos2D(i,:) = rhos1side((i-1)*n +1:i*n);
end;


figure(1);
surf(rhos2D);

colormap('cool');
shading interp;
title('One cube side surface charge distribution');
xlabel('x[m]');
ylabel('y[m]');
zlabel('\rho_s');


figure(2);

imagesc(rhos2D);
colormap('cool');
axis equal;
shading interp;
title('One cube side surface charge distribution');
xlabel('x');
ylabel('y');

%Qtot;

Qtot = totalCharge(S,rhos);
fprintf('\nTotal charge of the cube is %2.3d pC', Qtot*10^12);
```