

MATLAB EXERCISE 1.40 MoM program for a rectangular charged plate. Repeat the previous MATLAB Exercise but for a rectangular charged plate of side lengths a and b ($a \neq b$), with the respective numbers of subdivisions along sides amounting to n and m . (*ME1-40.m on IR*)

SOLUTION:

Adopting $a = 1$ m, $b = 2$ m, $V_0 = 1$ V, $n = 10$, and $m = 20$ ($N = 200$), a plot of the computed surface charge density over the plate is shown in Fig.S1.21. The total charge of the plate amounts to $Q = 58.16$ pC.

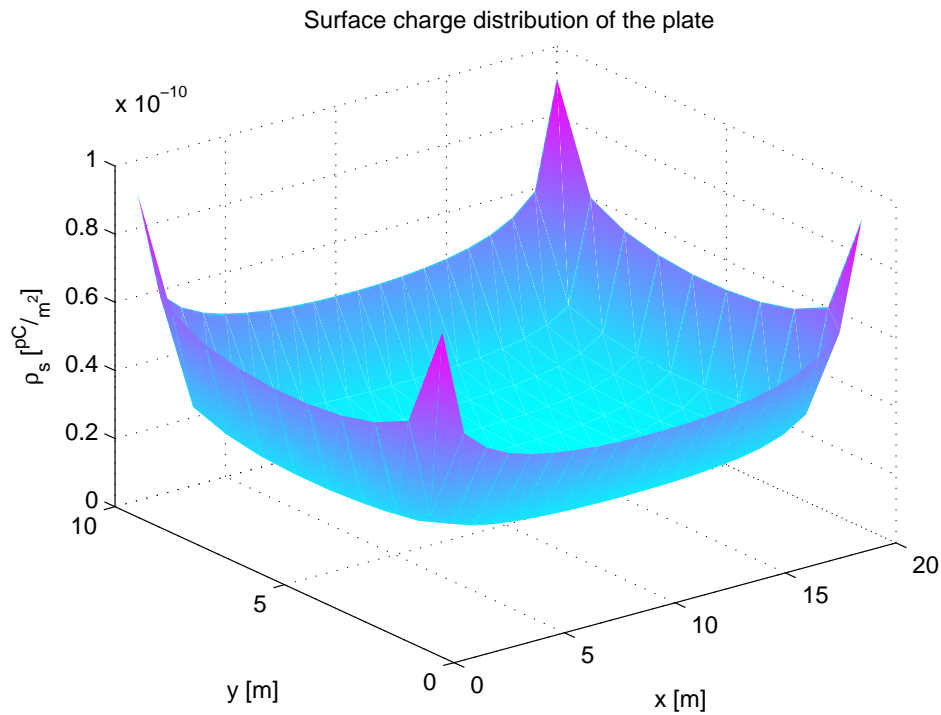


Figure S1.21 MATLAB display – using function `surf` – of the charge distribution of a rectangular plate obtained – in MATLAB – by the method of moments; for MATLAB Exercise 1.40.

```
%  
% 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 program for a rectangular charged plate
```

```
clear all;  
close all;
```

```
a = 1;  
b = 2;  
V0 = 1;  
EPS0 = 8.8542*10^(-12);  
n = 10;  
m = 20;  
N = n*m; %total number of patches
```

```
%coordinates of centers of patches
```

```
[x,y,S] = localCoordinates(n,m,a,b);
```

```
%matrix A
```

```
A = matrixA(EPS0,S,x,y);
```

```
%matrix B
```

```
B = V0*ones(1,N)'; %transpose -- to make it a column matrix
```

```
rhos = A\B; %solving the equation
```

```
% making 2D matrix rhos2D from results rhos in 1D array
```

```
for i = 1:n  
rhos2D(i,:) = rhos((i-1)*m +1:i*m);  
end;
```

```
figure(1);
```

```
surf(rhos2D);  
colormap('cool');  
shading interp;
```

```
title(' Surface charge distribution of the plate');
xlabel('x [m]');
ylabel('y [m]');
zlabel('\rho_s [^{pC}/_{m^2}]');

figure(2);

imagesc(rhos2D);
colormap('cool');
axis equal;
shading interp;
title('Surface charge density in C/m^2');
xlabel('x');
ylabel('y');

Qtot = totalCharge(S,rhos);

fprintf('\nTotal charge of rectangular plate is %2.3d pC', Qtot*10^12);
```