MATLAB EXERCISE 2.11 **Computation of matrices for a direct FD method.** As an alternative to the iterative technique based on Eq.(2.16) (from the book), the finite-difference analysis of a square coaxial cable, in Fig.2.4(a) (from the book), can be carried out by directly solving the system of linear algebraic equations with the potentials at interior grid nodes in Fig.2.4(b) as unknowns [applying Eq.(2.15) (from the book) to each interior grid node, we get a set of simultaneous equations the number of which equals the number of unknown potentials]. The system of equations, in which known potentials at nodes on the surface of conductors appear on the right-hand side of equations, is solved by the Gaussian elimination method (or by matrix inversion). In this MATLAB exercise, write a function `mACfd()` that establishes the system of equations, i.e., that computes matrices $[A]$ and $[C]$ of the matrix equation, for the direct FD analysis of the cable. *(mACfd.m on IR)*

SOLUTION:

```
%
%   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
%
%
%


%   Computation of matrices for a direct FD method


function[A,C]= mACfd(Vstart,N2)

C = zeros(N2^2,1);
for i=1:N2
    for j = 1:N2
        k = (i-1)*N2 + j;

        A(k,k)= 1;

        if (Vstart(i,j)==0)
            A(k,k-N2)= -1/4; %up
            A(k,k+N2)= -1/4; %down
            A(k,k+1)=-1/4;   %right
            A(k,k-1)= -1/4;  %left
        else C(k)=Vstart(i,j);
        end;

    end;
end;
```