The following equation describes steady state heat conduction with generation in two dimensions after non-dimensionalization:

$$\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} = q / k$$

where q and k are constants for heat generation and thermal conductivity. The system has the following boundary conditions:

T(x=0,y)=0

T(x=1,y)=1

$\frac{\partial T}{\partial y} = 0$ at y=0

$\frac{\partial T}{\partial y} = 0$ at y=1

Write a program that will calculate the Temperature profile using the finite difference method. Use central finite difference to express the second order derivatives. Try the following iterative solution methods Jacobian, Gauss-Seidal, SOR with different relaxation parameters 0<w<2.Try meshes with 9x9, 17x17, 33x33 grid points for q/k=100. Plot the convergence history for the different iterative methods on the three different grids.