CD61002- High Performance Scientific Computing- Assignment 1. Due date 29.08.25 5 PM.

Consider the following equation and boundary conditions:

$$\nabla^2 u = 0 \quad 0 \leq x, y \leq 1$$
$$u(0, y) = u(x, 0) = u(x, 1) = 0$$
$$u(1, y) = \sin \pi y$$

Formulate finite element matrix using mesh of nearly 40, 80 and 160 points

Find the spectral radius for the respective iteration matrix and general convergence rates for the above matrices using Jacobi and GS. Find out number of iterations for converged solution in each of these methods and present in a table format.

Find out the number of iterations for SOR (with at least three different values of ω) method. What are the associated general convergence rates?

Points 10

* You may use Matlab or any other package/tool for eigenvalue calculation