

Assignment_2

November 16, 2024

#Assignment 2 Due EOD Monday Sept 23

#Question 1

Consider the spring system with spring constants and forces on blocks 1 and 4 noted.

0.1 a) Write out the equilibrium equations for the positions of the blocks, and form a linear system.

{answer}

##b) Use Gauss-Seidel iterations to solve this system. Use an absolute tolerance on the residual's Frobenius norm of $1e-4$ to determine convergence. Report the solution and the number of iterations required. {method, implementation, answer}

1 Question 2

You have a new nuclear fuel type which is an infinite square bar, 1m in edge length. Its thermal conductivity is $k = 2W/m^2$. During irradiation, it generate fission heat $Q = 1kW/m^3$ and is cooled with heat pipes which keep the surface temperature exactly $100\ ^0C$.

Reminder: The steady-state heat transport equation is: $-\nabla \cdot [-k\nabla T] = -Q$

1.1 a) Discretize the problem with a 100x100 mesh and find the maximum temperature in steady state.

{method, implementation, answer}

1.2 b) Ideally, your solution will be independant of your mesh size. Conduct a *mesh sensativity analysis* (which means to halve the mesh size and rerun) to check if your solution depend on your discretization. Use an iterative method and comment on the effectiveness of an ILU preconditioner.

{method, implementation, answer}