

A two-dimensional flat plate is subjected to the boundary conditions shown in the figure below. It is required to find the steady state temperature distribution inside the flat plate. The flat plate is made of Iron with thermal conductivity of $k = 80 \text{ W/mK}$.

- (a) Prepare a report with the problem set up, solution method and the obtained discretized equations.
- (b) Write a computer program based on **finite difference** method with grid spacing of $\Delta x = \Delta y = 1\text{cm}$, $\Delta x = \Delta y = 0.5\text{cm}$ and $\Delta x = \Delta y = 0.25\text{cm}$, respectively. Find out the temperature distribution and investigate the effect of grid resolution.
- (c) Optional: Increase the grid spacing to more if you like and see the difference.
- (d) You can use a **direct solver** for your current project.
- (e) Use appropriate 1D and 2D graphs for your result presentation.
- (f) Try to interpret your observation.
- (g) Include your code as the appendix.
- (h) Upload one PDF file as your project report.

Tip: Try to write a modular program to make it extendible and modifiable for future projects.

