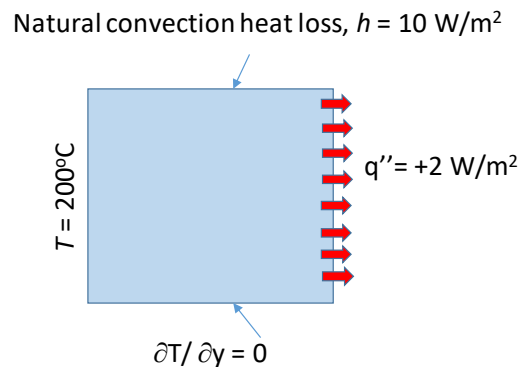


Assignment 6
Two-dimensional Parabolic Solver
Due and Viva: 9 Oct, 2025, during lecture slot

Consider a metal block (1 (length) \times 1 (width) m) is subject to the following boundary conditions:



Consider initial condition of metal block as 0°C everywhere in the block. The block is made of a material that thermal diffusivity, $\alpha = 10^{-4} \text{ m}^2/\text{s}$. Write a program to solve a 2D parabolic equation of the type:

$$\frac{\partial T}{\partial t} = \alpha \left[\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} \right]$$

Solve using FTCS scheme. Consider the number of grid points 40 in both x and y directions. Consider $\Delta t = 0.1 \text{ s}$. Obtain solution for time = 10 s. Plot the temperature history at the following points: (0.2, 0.2); (0.5, 0.5) and (0.75, 0.75).

Take $k = 100 \text{ W m}^{-1} \text{ K}^{-1}$ and $T_\infty = 25^\circ\text{C}$.

Optional: Make a computer animation of time-varying isotherms in the computational domain.