Q2 Boundary Condⁿ: $T = 0$ for all boundaries

$k = 1, Q = 1$, $L \times L = 1 \times 1$

$$\left(\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2}\right) + 1 = 0$$

No. of grid points $= n$

$$dx = dy = \frac{L}{n-1}$$

Discretisation of Domain

Discretisation Scheme for governing eqns:

$$\frac{\partial^2 T}{\partial x^2} = \frac{T_{i+1,j} + T_{i-1,j} - 2T_{i,j}}{(dx)^2}$$

$$\frac{\partial^2 T}{\partial y^2} = \frac{T_{i,j+1} + T_{i,j-1} - 2T_{i,j}}{(dy)^2}$$

Central Difference Method

$$\Rightarrow \frac{T_{i+1,j} + T_{i-1,j} - 2T_{i,j}}{(dx)^2} + \frac{T_{i,j+1} + T_{i,j-1} - 2T_{i,j}}{(dy)^2} + 1 = 0$$

$$\Rightarrow (dy)^2 (T_{i+1,j} + T_{i-1,j}) + (dx)^2 (T_{i,j+1} + T_{i,j-1}) - 2T_{i,j}(dx^2 + dy^2) + dx^2 dy^2 = 0$$

$$\Rightarrow \boxed{T_{i,j} = \frac{(dy)^2 (T_{i+1,j} + T_{i-1,j}) + (dx)^2 (T_{i,j+1} + T_{i,j-1}) + dx^2 dy^2}{2(dx^2 + dy^2)}}$$