Consider a steady state heat transfer in an L-shaped solid body whose cross-section is given in the figure below. The thermal conductivity of the body is $= 15\,W/m.K$. The left surface of the body is 5 cm and insulated, and the bottom surface is 10 cm and maintained at a uniform temperature of 100 °C. The top surface is 5 cm on both sides of the step and the entire top surface is subjected to convection to ambient air at $T_\infty = 25$℃ with a convection coefficient of $h_{conv} = 80\,W/m^2.K$. The right surface is 2 cm and is also insulated. Use finite difference formulation to determine the temperature distribution in the body. Use $\Delta x = \Delta y = 1cm$ as the mesh interval. Solve the problem using Matlab/Octave. Show the temperature distribution as isotherms on a Matlab plot. Also calculate and show the heat flux at each node on a Matlab plot. Hand in your report on a CD containing all the relevant files and plots.

The steady state heat transfer equation can be treated as

$$\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} = 0$$