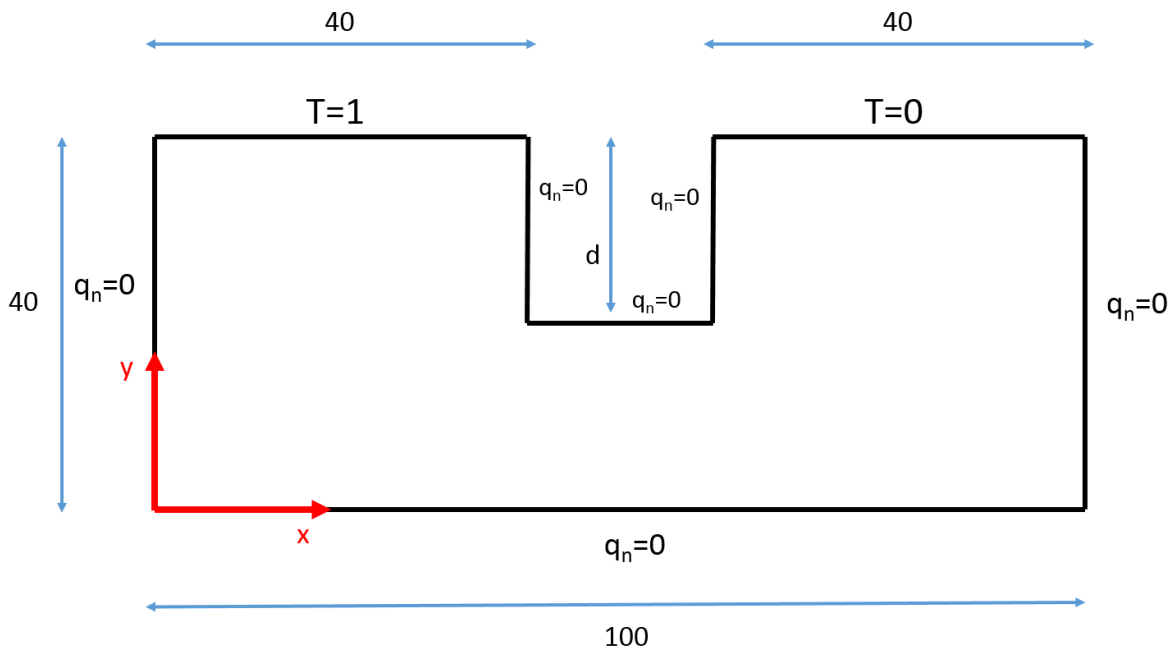


## CE 526 Homework 06

Due Date: 15/05/2020

Difficulty Level = 1.6 (Each homework will be assigned a difficulty level which will be used in the final grading of the homeworks at the end of the semester)

Our objective is to solve a scalar unknown  $T$  for the two dimensional geometry shown below:



The governing equation for  $T$  is

$$\frac{\partial}{\partial x} \left( K_1 \frac{\partial T}{\partial x} \right) + \frac{\partial}{\partial y} \left( K_2 \frac{\partial T}{\partial y} \right) + f(x, y) = 0$$

Take  $K_1=1$  and  $K_2=5$ .

- Derive the weak form and obtain the element equations.
- Use 4-noded rectangular elements. Solve the problem for  $d=10$  and  $30$ . Set  $dx=dy$  and use  $dx=10$  and  $5$  (finer meshes are welcome). Obtain  $T(x,y)$  within the computational domain and also, evaluate  $q_n$  along the essential boundaries at the top. Graphically present and comment on your results.
- Set  $d=0$ , and solve the same problem with  $f(x,y)=\text{Constant}$  (uniform source/sink).  $f(x,y)$  can take positive or negative values. Vary the constant and observe how  $T(x,y)$  changes. Comment on your results.
- Take  $d=0$  and  $f(x,y)=0$ , and solve the problem using triangular elements.