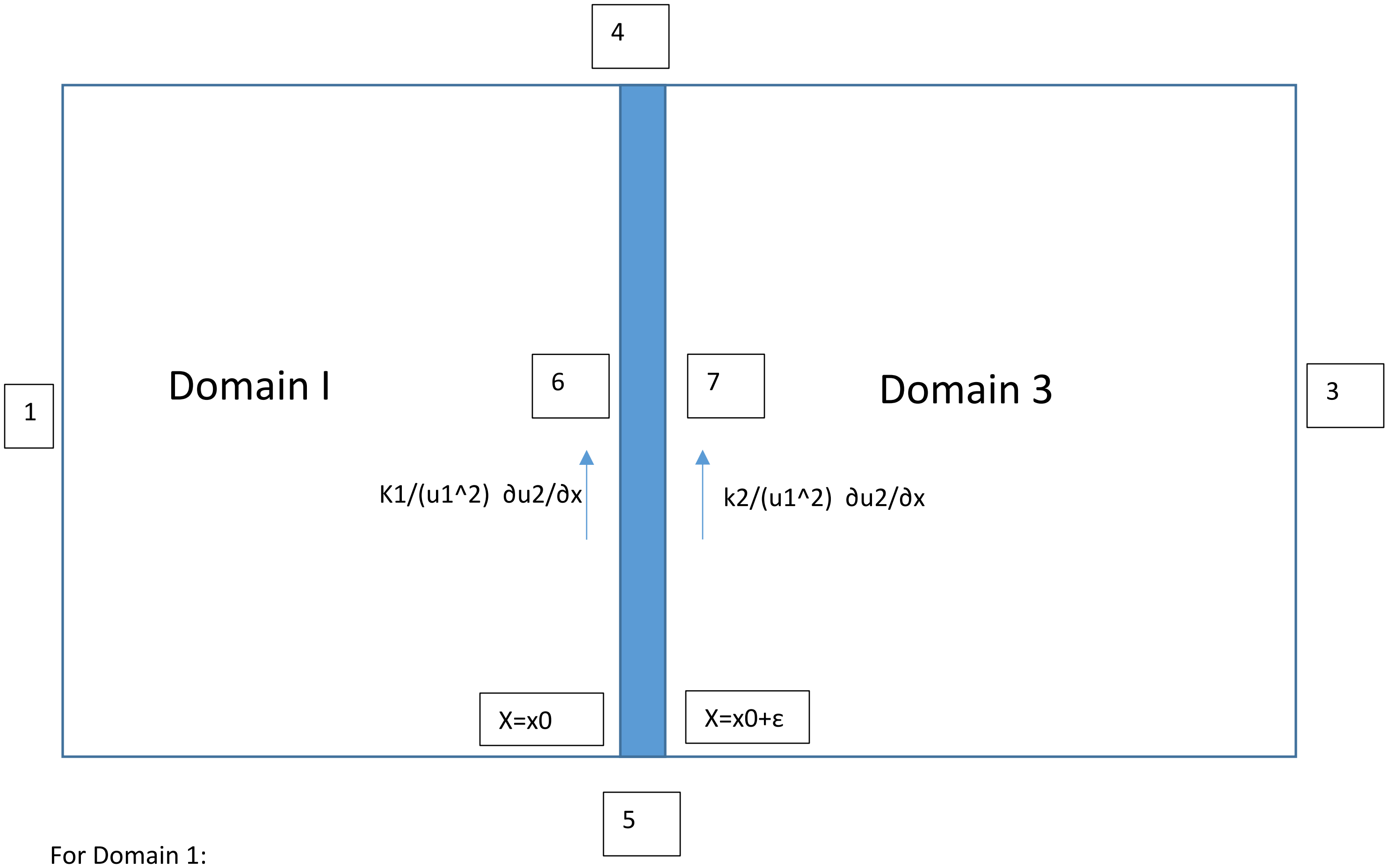

For Domain 1:

$$\frac{\partial u1}{\partial t} - \nabla^2 u1 + u1\left(\frac{k2^\wedge 2}{u1^\wedge 4}(u2x^\wedge 2 + u2y^\wedge 2) + u2^\wedge 2 - 1\right) = 0$$

$$-\nabla.\left(\frac{k2\nabla u2}{u1^2}\right) + \frac{u2}{k2} = 0$$

For Domain 2:

$$\frac{\partial u1}{\partial t} - \left(\frac{\varepsilon 1^\wedge 2}{\varepsilon 2^\wedge 2}\right)\nabla^2 u1 + u1\left(\frac{\varepsilon 1^\wedge 2 k1^\wedge 2}{u1^\wedge 4}(u2x^\wedge 2 + u2y^\wedge 2) + u2^\wedge 2 - 1\right) = 0$$

$$-\nabla.\left(\frac{k1\nabla u2}{u1^2}\right) + \frac{u2}{k1} = 0$$

Where k1,k2 , ε1, ε2 are constant. Boundary condition at 6 and 7

$$\frac{k2}{u1^\wedge 2}\frac{\partial u2}{\partial x} = \frac{k1}{u1^\wedge 2}\frac{\partial u2}{\partial x}$$

With

$\frac{\partial u2}{\partial y} = \frac{\partial u2}{\partial y} = 0$ and u2=u2 and

$$\left.\frac{\partial u1}{\partial x}\right| domain1 = \left.\frac{\partial u1}{\partial x}\right| domain2 = 0$$