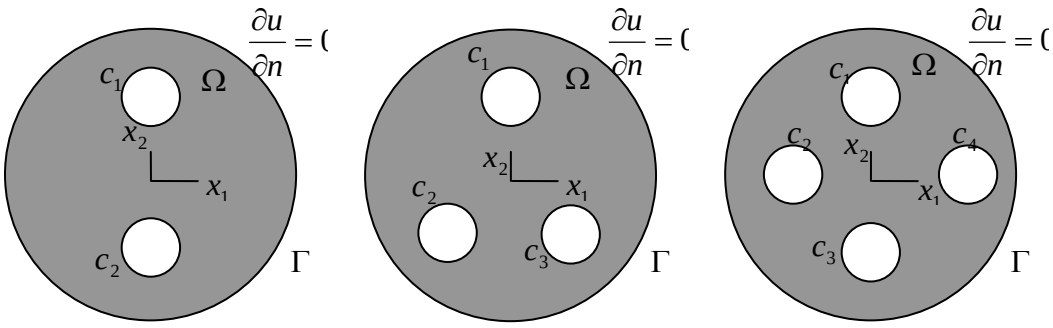
Beprog 103 Torsion problems with circular holes

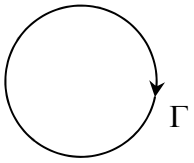


Governing equation：$\nabla^2 u(x) = 0$, $x \in \Omega$

$$\frac{\partial u}{\partial n} = -\frac{1}{2}\frac{d}{ds}(r^2), x \in \Gamma + C_1 + C_2 + \ldots + C_n$$

Where C_j is the circle with center $\left(\xi_1^j, \xi_2^j\right)$.

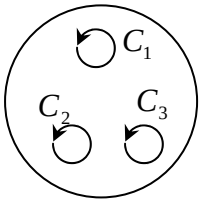
(1)



$$\frac{\partial u}{\partial n} = 0$$

where $r^2 = x_1^2 + x_2^2$.

(2)



$$\frac{\partial u}{\partial n} = \xi_1^j \sin(\theta) - \xi_2^j \sin(\theta) \quad \text{for} \, C_j$$

Where $\left(\xi_1^j, \xi_2^j\right)$ is the center of C_j.

Reference:

D. A. Caulk, “Analysis of Elastic Torsion in a Bar with Circular Holes by a Special Boundary Integral Method,” Journal of Applied Mechanics, Vol. 105, 1983, pp. 101-108.