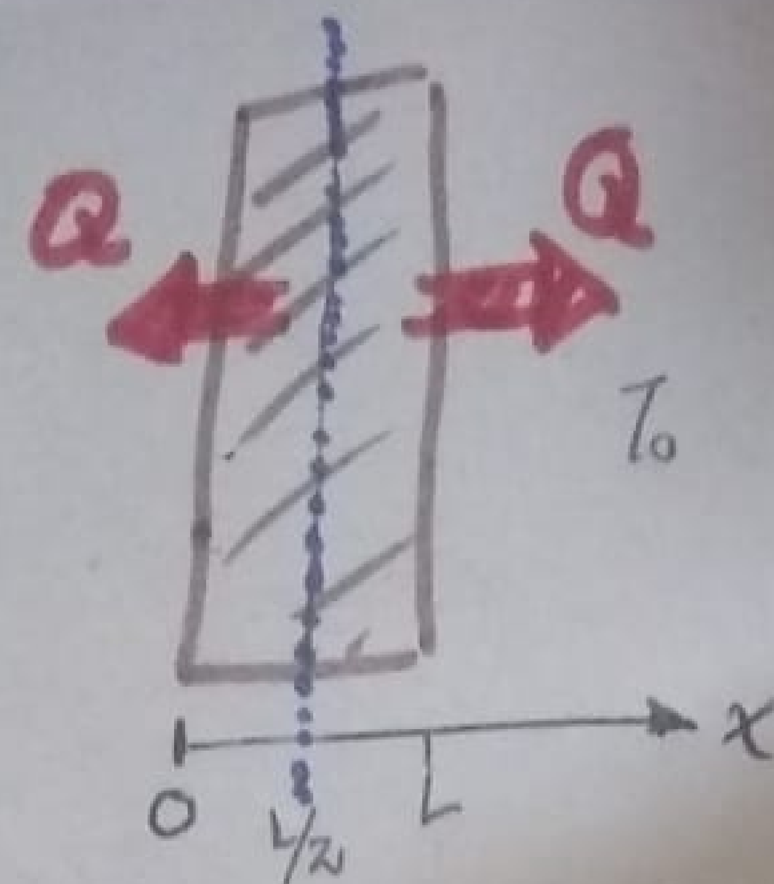
2)



- Producción de calor uniforme ϕ
- Unidireccional
- Coeficientes constantes
Steady State

Ecuación General de Transferencia de Calor

$$\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} + \frac{\partial^2 T}{\partial z^2} + \frac{\dot{e}_{gen}}{K} = \frac{1}{\alpha}\frac{\partial T}{\partial t}$$

$$\frac{\partial^2 T}{\partial x^2} + \frac{\dot{e}_{gen}}{K} = 0 \rightarrow \frac{dT}{dx} = -\frac{\dot{e}_{gen}}{K}x + C_1$$

$$T(x) = \frac{-\dot{e}_{gen}}{2K}x^2 + C_1 x + C_2$$

→ B.C.1

$$h_i(T_i - T_s) = -K\frac{dT}{dx}$$

toca invertir por el sentido del flujo del calor

$$h_i(T_s - T_i) = -K\frac{dT}{dx}$$

$$h_i(T_s - T_i) = -K\left(\frac{-\dot{e}_{gen}\,x}{K} + C_1\right)$$

• B.C 2

$$h_o(T_s - T_o) = -K\frac{dT}{dx}$$

$$h_o(T_s - T_o) = -K\left(-\frac{\dot{e}_{gen}}{K}x + C_1\right)$$

Big Supocition:

→ Note → In the middle of the wall, more exactly in L/2 → what happen there?

T → is maximux

$\frac{dT}{dx} \to 0$ and we can deduce, how the wall is the same material and K → constant, T_s is equal in both sides.

→ Solve for T_s

$$T_s = -\frac{K}{h_i}\left(-\frac{\dot{e}_{gen}}{K}x + C_1\right) + T_i$$

$$h_o\left(-\frac{K}{h_i}\left(-\frac{\dot{e}_{gen}}{K}x + C_1\right) + T_i - T_o\right) = -K\left(-\frac{\dot{e}_{gen}x}{K} + C_1\right)$$

$$\frac{h_o}{h_i}\dot{e}_{gen}x - \frac{h_o K C_1}{h_i} + h_o T_i - h_o T_o = \dot{e}_{gen}x + KC_1$$

$$\dot{e}_{gen}x\left(\frac{h_o}{h_i} - 1\right) + h_o T_i - h_o T_o = C_1 * K\left(1 + \frac{h_o}{h_i}\right)$$

$$\frac{dT}{dx} = -\frac{\dot{e}_{gen}}{k}x + C_1 \qquad \frac{L}{2} = x \Rightarrow \frac{dT}{dx} = 0$$

$$0 = -\frac{\dot{e}_{gen}}{k}x + C_1 \rightarrow$$

$$0 = -\frac{\dot{e}_{gen}x}{k} + \frac{\dot{e}_{gen}x\left(\frac{h_o}{h_i}+1\right)}{\left(1-\frac{h_o}{h_i}\right)} + \frac{h_o T_i}{\left(1-\frac{h_o}{h_i}\right)} - \frac{h_o T_o}{\left(1-\frac{h_o}{h_i}\right)}$$

$$\dot{e}_{gen}\left(\frac{L}{2k} - \frac{\frac{L}{2}\left(\frac{h_o}{h_i}+1\right)}{\left(1-\frac{h_o}{h_i}\right)}\right) = \frac{h_o T_i}{\left(1-\frac{h_o}{h_i}\right)} - \frac{h_o T_o}{\left(1-\frac{h_o}{h_i}\right)}$$

$$\dot{e}_{gen} = \frac{\frac{h_o T_i}{\left(1-\frac{h_o}{h_i}\right)} - \frac{h_o T_o}{\left(1-\frac{h_o}{h_i}\right)}}{\frac{L}{2k} - \frac{\frac{L}{2}\left(\frac{h_o}{h_i}+1\right)}{\left(1-\frac{h_o}{h_i}\right)}} \Rightarrow \boxed{\dot{e}_{gen} = \frac{h_o T_i - h_o T_o}{\frac{L}{2k}\left(1-\frac{h_o}{h_i}\right) - \frac{L}{2}\left(\frac{h_o}{h_i}+1\right)}}$$