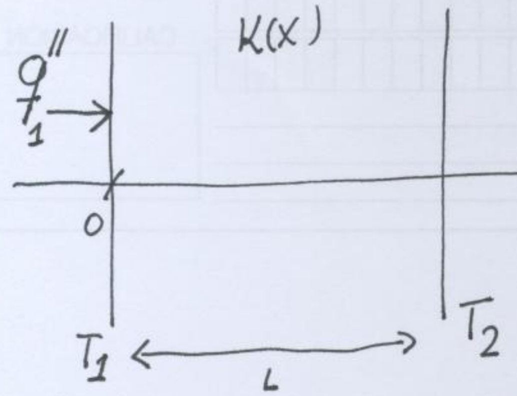
CONDUCCION EN GEOMETRIA PLANA CON CONDICIONES DE CONTORNO MIXTAS



$$\frac{d}{dx}\left(k\frac{dT}{dx}\right)=0$$

$$\begin{cases} q_1''(x=0)=\phi_1/S \equiv \phi_{1S} \\ T(x=L)=T_2 \end{cases}$$

SOLUCION:

$k\dfrac{dT}{dx} = C = -\phi_{1S}$ ya que $q_1'' = -k\left.\dfrac{dT}{dx}\right|_{x=0} = +\phi_{1S} = -C$

$$dT = -\phi_{1S}\cdot\frac{dx}{k} \Rightarrow \int_{T_1}^{T(x)} dT = -\phi_{1S}\int_0^x \frac{dx}{k(x)}$$

o bien $\displaystyle\int_{T(x)}^{T_2} dT = -\phi_{1S}\int_x^L \frac{dx}{k(x)}$

$$T(x) = T_1 - \phi_{1S}\int_0^x \frac{dx}{k} \quad \text{con} \quad T_2 = T_1 - \phi_{1S}\int_0^L \frac{dx}{k} \Rightarrow T_1 = T_2 + \phi_{1S}\int_0^L \frac{dx}{k}$$

por tanto la ec. del campo de temperaturas con las C.C. dadas es

$$\boxed{T(x) = T_2 + \phi_{1S}\left(\int_0^L \frac{dx}{k} - \int_0^x \frac{dx}{k}\right) = T_2 + \phi_{1S}\int_x^L \frac{dx}{k}}$$

APENDICE: CONDUCTIVIDAD DEPENDIENTE DE T : K(T)

$$k\,dT = -\phi_{1S}\,dx \Rightarrow \int_{T_1}^{T(x)} k\,dT = -\phi_{1S}\,x \quad \text{o bien}$$

$$\int_{T(x)}^{T_2} k\,dT = -\phi_{1S}(L-x) \Rightarrow \boxed{x = \frac{1}{\phi_{1S}}\int_{T(x)}^{T_2} k\,dT + L} \rightarrow T(x) = f(x)$$