WEEK 1 _ POJER ILARIA

EXERCISE 1

$L = 0{,}4\, m$ Δt = 25 m k = 0,78 W/m A = 15 m^2

$\dot{Q}$=kA ΔT/L=0.78 ∗15∗25/0.4=731,25 W

Rwall = L/kA= 0.4/(0.78 ∗15)=0.03419 °C/W

SUMMARY of 1^{st} LECTURE (2 october)

Steady State heat conduction in Plane wall

Q = energy [J]

$\dot{Q}$ = *dQ/dt* energy/time [J/s] = [W] it is power, an amount of energy per time

$\dot{Q}$in - $\dot{Q}$out = $\frac{\text{dEwall}}{\text{dt}}$ ($\longrightarrow$ energy balance)

$\dot{Q}$in= rate of heat tranfer into the wall

$\dot{Q}$out= rate of heat tranfer out of the wall

$\frac{\text{dEwall}}{\text{dt}}$ = rate of change of the energy of the wall

$\frac{\text{dEwall}}{\text{dt}}$=0 for steady operation

Fourier's law of heat conduction:

$\dot{Q}$cond,wall = -kA $\frac{\text{dT}}{\text{dx}}$ [W]

$$\frac{\text{d(something)}}{\text{dt}} = \frac{\text{how something changes}}{\text{by time}}$$

(over time, informal way to explain this writing mode)

$$\frac{\Delta T}{dx} = \frac{dT}{dx} \quad \frac{\text{how T changes}}{\text{by space}}$$

(over space)

$$\int_{x=0}^{L} Q^{\cdot}cond, wall \; dx = - \int_{T=T_1}^{T_2} kA \; dT$$

K = is a constant that depend on the material, it tell us how much conductive a material is.

$$\dot{Q}\text{cond,wall} = \text{kA} \frac{T_1 - T_2}{\text{L}} \; [\text{W}] \quad \begin{matrix} \longrightarrow \\ \longrightarrow \end{matrix} \quad \frac{\text{Temperature}}{\text{Thickness of the wall}}$$

The rate of heat conduction through a plane wall is proportional to the average thermal conductivity, the wall area, and the temperature difference.

Thermal Resistance Concept

$$\dot{Q}\text{cond,wall} = \text{kA} \frac{\Delta T}{\text{L}} \; [\text{W}]$$

Heat transfer through a wall is proportional to his area. It is proportional to the difference of temperature and the conductivity.

It is inversely proportional to the tickness: the thicker the wall, the less heat goes through it.

Conductivity = willigness of material to transfer heat

The unit of conductivity is [W/mK]   (K = kelvin degrees)

K = °C+273,15