WEEK ASSIGNMENT- 1

A short summary about the conductive heat transfer and solving the same exercise with L= 0.4 m, A= 20 m^2, a ΔT= 25, and k=0.78 W/m K using both simple method and using the resistance concept.

Heat can travel from one place to another in three ways: ***Conduction, Convection and Radiation***

CONDUCTION : Heat transfer takes place in solids because of temperature differences between various parts of the solid.

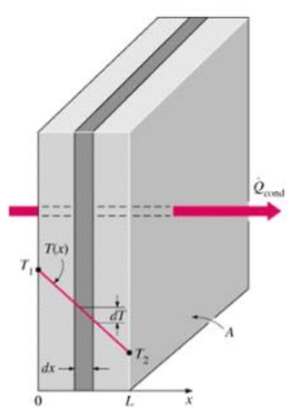
Steady State Heat Conduction in Plane Wall

$\dot{Q}$= Energy (J)

$\dot{Q} = \frac{dQ}{dt} = \frac{Energy(J)}{Time(S)}$ =Watt for steady operation $\frac{dQ}{dt}$ =0

In steady operation, the rate of heat transfer through the wall is constant.

$\frac{dT\ (temp)}{dx\ (dist)}$ = homo assumption = $\frac{\Delta T}{\Delta x}$



$\dot{Q}_{cond,\ wall} = kA\,\frac{T1 - T2}{L}$ (W)

Fourier's Law of heat conduction

$$\boxed{\dot{Q}_{cond,\ wall} = kA\,\frac{\Delta T}{L}}$$

Heat Transfer through a wall

- is proportional to its Area
- is proportional to the difference of temperature and conductivity (k)
- Conductivity : willingness of material to transfer heat.
- IT inversely proportional to the thickness (thicker wall, less heat goes)
- The nit of conductivity = (W/mk)

Temperature units : k= Č + 275.15

Example: L= 0.4 m, A= 20 m2, a ΔT= 25, and k=0.78 W/m K using both simple method and using the resistance concept.

Solve: Simple method

$\dot{Q}_{cond,\ wall} = kA \frac{\Delta T}{L}$ (W)

$= .78 \text{ X } 20 \text{ X } \frac{25}{.4}$

$\dot{Q}_{cond,\ wall} = 975$ W

Resistance Concept

$R_{wall} = \frac{L}{kA}$ ($\mathring{C}$/W)

$= \frac{.4}{.78x20}$

$R_{wall} = .0256$ ($\mathring{C}$/W)

$\dot{Q} = \frac{\Delta T}{\text{Rwall}} = \frac{25}{.0256} = 976.5625$ W