Basic equations of heat transfer

Thermal Conductivity

is the property of solid material that is defined as the amount of heat transferred for unit distance due to temperature difference of one unit Kelvin. [W/m.K]

Convection heat transfer coefficient

is the property of fluid material which is defined as the amount of heat transferred in one unit area due to the temperature difference of one unit Kelvin. [W/m² K]

Steady state heat transfer

the change of temperature with respect to time is zero. That is, the temperature of the body is maintained at constant value throughout the working period.

Governing differential equation for steady state heat transfer

$$\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} + \frac{\partial^2 T}{\partial z^2} = 0$$

for three dimensional object

One dimensional heat transfer

The governing differential equation for the steady state one-dimensional conduction heat transfer with convective heat loss from lateral surfaces is given by.

$$k\frac{d^2T}{dx^2} + q = \left(\frac{P}{A_c}\right)h\,(T - T_\infty)$$

k - Coefficien of thermal Conductivity of material

T - temperature

q - internal heat source per unit volume

p - perimeter

A_c - the Gross section area

h - convective heat transfer coefficient

T_∞ - ambient temperature.