Week2_Vshasivari

Monday, October 14, 2019 11:52 PM

1----------

We have two heat transfers :

Convection - Which is the heat transfer between a fluid and a solid

Conduction- Which is the heat transfer inside the solid

Example of convection and conduction is that - Inside a wall we have Conduction and outside we have **Convection**

So when we need to find the temperature of the wall and not the temperature inside we have to combine convection and conduction

We have to types of convection, which are : **Natural and Forced**

The rate of convective heat transfer depends on :

- Variation of the heat
- Speed of air (velocity of liquid or gas)
- Kind (type) of liquid or gas

Newtons Law of Cooling

Qconv. = h x As x (Ts - T∞)

Temp. of the surface Ts and Temp. of the room inside the room T∞

Rconv = $\frac{1}{h\ x\ As}$

According to this formula the higher the air the less resistant (higher the h less resistance we have), because resistance R

Is not proportional to h

Q = $\frac{T\infty 1 - T\infty 2}{R\ total}$

R total = Rcon1 + Rwall + Rcon2 = $\frac{1}{h1A} + \frac{L}{kA} + \frac{a}{h2A}$

Rg = $\frac{L}{k\ x\ A}$

The glass doesn't have a big role in heat transfer (thermal resistance of convection-glass is very small compared to conduction - glass and air), so if we raise the thickness L still the same

temperature goes inside or a very slight difference which is not to be considered.

2----------

The reason I resulted on wrong answer was the problem of calculation (Math part), the other part of the assignment went well .

3----------

Consider a 0.8-m-high and 1.5-m-wide double-pane window consisting of two 6-mm-thick layers of glass (k= 0.78 W/m.°C) separated by a 13-mm-wide stagnant air space (k= 0.026 W/m.°C). Determine the steady rate of heat transfer through this double-pane window and the temperature of its inner surface.

Take the convection heat transfer coefficients on the inner and outer surfaces of the window to be h1= 10 W/m2 · °C and h2=40 W/m2 · °C, which includes the effects of radiation.

A = 0.8m x 1.5m = 1.2 m2

Rcon1 = $\frac{1}{h1xA} = \frac{1}{10x1.2} = 0.0833°C/W$

Rcon2 = $\frac{1}{h2xA} = \frac{1}{40x1.2} = 0.0208° \frac{C}{W}$

Rglass = $\frac{1}{k\ glassxA} = \frac{0.006}{0.78x1.2} = 0.0064° \frac{C}{W}$

R air = $\frac{1}{k\ airxA} = \frac{0.013}{0.026x1.2} = 0.4167° \frac{C}{W}$

Rtot = Rcon1 + Rglass1 + Rair + Rglass2 + Rcon2 = 0.0833+0.0064+0.4167+0.0064+0.0208 = 0.5336 ° $\frac{C}{W}$

Q = $\frac{T\infty1-T\infty2}{Rtot} = \frac{20-(-10)}{0.5336} = \frac{30°C}{0.5336°C/w} = 56.221W$

Q = $\frac{T\infty1-T1}{Rcon1} =$

T1 = t∞1 - Q x Rcon1 = 20°C - 56.221W x 0.0833°C/W ≈ 15.3°C