1- Summary about the convective heat transfer:

Heat convection is a mode of heat transfer by the mass motion of a fluid such as air. Heat convection occurs to the surface of an object where the surrounding fluid of object is heated and moved energy away from the source of heat. Convective heat transfer occurs when the surface temperature differs from that of surrounding fluid . he rate of convective heat transfer is a function of the fluid and surface temperatures, the surface area, and the speed of the flow across the surface.

There are two typs of heat transfer, either natural convection or forced convection processes

Natural convection is due to density differences caused by temperature variations in the fluid. At heating the density change in the boundary layer will cause the fluid to rise and be replaced by cooler fluid that also will heat and rise. This continues phenomena is called free or natural convection.

Forced convection occurs when a fluid flow is induced by an external force, such as a pump, fan or a mixer.

Why does increasing in the thickness of a single pane glass does not increase the total resistance?

This is because the resistance of glass is very small compared to the resistance of convection between the air and glass, so when the thickness of glass increases, its resistance increases but it doesn't significantly affect the total thermal resistance.

2-The mistakes made in class questions:

Just calculated the numbers of the thermal resistance between the outer surface and air wrong which resulted in a wrong answer for the whole question but other than that, I answered them all right.

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°CC) separated by a 13-mm-wide stagnant air space(k=0.026 W/m°CC). 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 $WW\ mm2°CC$ and h2 = 40 $WW\ mm2°CC$, which includes the effects of radiation.)

Answer

$$R_{total} = R_{conv,1} + R_{glass1} + R_{air} + R_{glass2} + R_{conv,2}$$

$$\approx 0.0833\frac{°C}{W} + 0.0064\frac{°C}{W} + 0.4167\frac{°C}{W} + 0.0064\frac{°C}{W} + 0.0208\frac{°C}{W}$$

$$=0.5333\frac{°C}{W}$$

And the steady rate of heat transfer through this double − pane window is:

$$\dot{Q} = \frac{T_{\infty 1} - T_{\infty 2}}{R_{total}} \approx \frac{20°C - (-10°C)}{0.5333\frac{°C}{W}} \approx 56.2535W$$

$$\because \dot{Q} = \frac{T_{\infty 1} - T_1}{R_{conv,1}}$$

∴ The temperature of the inner surface of the window is:

$$T_1 = T_{\infty 1} - \dot{Q} * R_{conv,1} \approx 20°C - 56.2535W * 0.0833\frac{°C}{W} \approx 15.3°C$$