

## WEEK ASSIGNMENT 2

### Question:

1. Write a summary about the convective heat transfer and explain why increasing the thickness of a single pane glass does not increase the total resistance
2. Write an explanation about what mistakes you made in the class that resulted in wrong answers!
3. Solve the same problem as that of double pane window with the air-gap thickness of 13 mm and glass thickness of 6 mm, comment on your results and explain why we have an optimal range for the air-gap's distance!

1. Convective heat transfer is a convection which transfer heat from one place to another by the movement of fluids. The hot air moves up and the cold air comes down and they have circulation and the cold air moves from one side to another. Increasing the thickness of a single pane glass does not increase the total resistance because the glass resistance is low and air could go through it easily.

2. I choose the wrong formula

3.

$$0.8 * 1.5 = 1.2$$

$$R_{g1} = R_{g2} = \frac{L_g}{(K_g * A)} = \frac{0.006}{0.78 * 1.2} = 0.0064 \frac{C}{W}$$

$$R_{airGap} = \frac{L_{airGap}}{(K_{airGap} * A)} = \frac{0.013}{0.026 * 1.2} = 0.4166 \frac{C}{W}$$

$$R_{CONV1} = \frac{1}{h_1 * A} = \frac{1}{10 * 1.2} = 0.0833 \frac{C}{W}$$

$$R_{CONV2} = \frac{1}{h_2 * A} = \frac{1}{40 * 1.2} = 0.0208 \frac{C}{W}$$

$$\begin{aligned} R_{total} &= R_{conv1} + R_{conv2} + 2 * R_g + R_{airGap} \\ &= 0.0833 + 0.0208 + 2 * 0.0064 + 0.4166 \\ &= 0.5335 \text{ C/W} \end{aligned}$$

$$\dot{Q} = \frac{\Delta T}{R_{total}} = \frac{30}{0.5335} = 56.2324 W$$

$$\dot{Q} = \frac{\Delta T}{R_{con1}} = 56.2324 = \frac{20 - T_{s1}}{0.0833}$$

$$T_{s1} = 15.3159 \text{ } ^\circ\text{C}$$

We can see that the resistance of airgap is higher than others so it is an effective resistance but the thickness of airgap could not be a lot because in that case it will have circulation in itself and it can lose its function and don't act as an effective resistance.