Assigment Week 2.

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Guidelines for this week's submission:

1 write a summary (in your own words!, (in your own words !!!) about the convective heat transfer (half a page) 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)
Convection.
Newton's law of cooling.

Convection is the transfer of heat from one point to another. Its mathematical expression is:

$$R_{conv} = \frac{1}{H_1 \cdot A}$$

This means that the higher the area (A) of the wall, the less resistant it would be.

The total resistant of a glass panel is the result of the convection on the exterior, the conduction of the glass panel and the convection of the interior. To calculate de convection through the glass we need to use the formula: **L /K . A**. If in that formula if we use a 2mm glass thickness or an 8 mm thickness, it would not make a big difference. For that reason it is said that glasses panel do not have an effect on heat transfers and as a consequence, increasing the thickness of a single panel glass does not increase the total resistance. As a conclusion, the thickness of glass panels should be chosen taking in account security purposes.

3) $R_{conv_1} = \frac{1}{H_1 \cdot A} = \frac{1}{10W/m2.°C \cdot 1{,}20m^2} = 0{,}0833\ °C/W$

$R_{glass_{1\ y\ 2}} = \frac{L}{K \cdot A} = \frac{0{,}006m}{0{,}78W/\ m^2.°C \cdot 1{,}20m^2} = 0{,}00641\ °C/W$

$R_{air} = \frac{L}{K \cdot A} = \frac{0{,}013m}{0{,}026W/\ m^2.°C \cdot 1{,}20m^2} = 0{,}41\ °C/W$

$R_{conv_2} = \frac{1}{H2 \cdot A} = \frac{1}{40W/m2.°C \cdot 1{,}20m^2} = 0{,}0208\ °C/W$

$R_{total} = R_{conv_1} + R_{glass_1} + R_{air} + R_{glass_2} + R_{conv_1} =$
0,0833 °C/W + 0,00641 °C/W + 0,41 °C/W + 0,00641 °C/W + 0,0208 °C/W=
0,5269 °C/W

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$Q = \frac{\Delta T}{R_{total}} = \frac{20°C - (-10°C)}{0{,}5269\ °C/W} = \frac{30°C}{0{,}5269\ °C/W} = 56{,}93W$

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$Q = \frac{T - T1}{1/H \cdot A} =$

$56{,}93W = \frac{20°C - T1}{0{,}0833\ °C/W} =$

$56{,}93W \cdot 0{,}0833\ °C/W = 20°C - T1$

$4{,}74°C = 20°C - T1$

$4{,}74°C - 20°C = -T1$

$-15{,}26°C = -T1$

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$Q = \frac{T - T2}{1/H \cdot A} =$

$56{,}93W = \frac{15{,}26°C - T2}{0{,}00641\ °C/W} =$

$56{,}93W \cdot 0{,}00641\ °C/W = 15{,}26°C - T2$

$0{,}36°C = 15{,}26°C - T2$

$0{,}36°C - 15{,}26°C = -T2$

$-14{,}90\ °C = -T2$

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$Q = \frac{T - T3}{1/H \cdot A} =$

$56{,}93W = \frac{14{,}90°C - T3}{0{,}41\ °C/W} =$

$56{,}93W \cdot 0{,}41\ °C/W = 14{,}90°C - T3$

$23{,}34°C = 14{,}90°C - T3$

$23{,}34°C - 14{,}90°C = -T3$

$-8{,}44\ °C = T3$

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$Q = \frac{T - T4}{1/H \cdot A} =$

$56{,}93W = \frac{-8{,}44°C - T4}{0{,}00641\ °C/W} =$

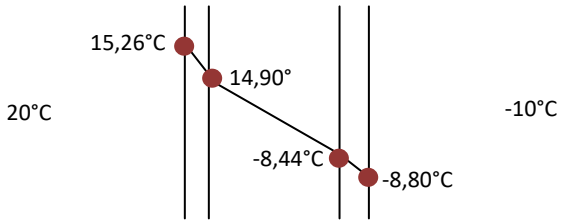
$56{,}93W \cdot 0{,}00641\ °C/W = -8{,}44C - T4$

$0{,}36°C = -8{,}44°C - T4$

$0{,}36°C + 8{,}44°C = -T4$

$-8{,}80°C = T4$

Final answer:
T1= 15,26°C
T2= 14,90 °C
T3= -8,44 °C
T4= -8,80°C



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15/10/2019