Guidelines for this week's submission:

1 - write a summary (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.

Convection is a heat energy transferred between a surface and a moving fluid with different temperatures. The mode of heat transfer by the mass motion of a fluid such as air in a circulation current motion. The process occurs to the surface of an object where the surrounding material of the object is heated and moved energy away from the source of heat, resulting in surface temperature differs from that of surrounding fluid. The governing equation of heat convection behaviours is the Newton's law. Heat convection is moved via the movement of air. It can be classified according to its nature as natural convection and forced convection. Both forced and natural types of convection may exist together. Natural convection occurs everywhere in nature, whereas forced convection is typically driven by wind pressure and heating ventilating and air-conditioning (HVAC) equipment. In fact, the application of studying natural convection is in the thermal design of buildings, solar collector design, nuclear reactor design and many others. There is a wealth of studies related to natural convection in enclosures available in the different literature. Natural convection in different shapes of enclosures is available in nature and is a topic of considerable interest for engineers. Convective Heat Transfer Coefficients h_c - depends on type of media, if its gas or liquid, and flow properties such as velocity, viscosity and other flow and temperature dependent properties.

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!

$$A = \ 0.8 * 1.5 = 1.2$$

$$R_{g_1} = R_{g_2} = \frac{L_g}{(K_g \times A)} = \frac{0.006}{0.78 * 1.2} = 0.0064\,^{\circ}\frac{C}{W}$$

$$R_{airGap} = \frac{L_{airGap}}{(K_{airGap} \times A)} = \frac{0.013}{0.026 * 1.2} = 0.0416\ ^{\circ}C/W$$

$$R_{conv_1} = \frac{1}{h_1 \times A} = (\frac{1}{10 * 1.2)} = 0.0833\,^{\circ}C/W$$

$$R_{conv_2} = \frac{1}{h_2 \times A} = (\frac{1}{40 * 1.2)} = 0.0208\,^{\circ}\frac{C}{W}$$

$$R_{tot} = R_{conv_1} + R_{conv_2} + 2 \times R_g + R_{airGap}$$

$$= 0.0833 + 0.0208 + 2 * 0.0064 + 0.0416 = 0.1585\, ^\circ \frac{C}{W}$$

$$\dot{Q} = \frac{\Delta T}{R_{Tot}} = \frac{30}{0.4332} = 189.27\, W$$

$$\dot{Q} = \frac{T_{inff_1} - T_{s_1}}{R_{conv_1}} = \rightarrow 189.27 = \frac{20 - T_{s_1}}{0.0833} \rightarrow T_{S_1 = -4.233\,^\circ C}$$

The air gap should provide an additional barrier, preventing heat from passing through. However, in this case the air gap did not act as a barrier. In fact, compering the amount of heat passing and the resistance of the total system are much higher than when the airgap was only 10mm