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 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 !

First part of the question 1:

➢ As I understood , Convection heat transfer is that when air get warm (because of a resource) it get lighter than the cold air so it goes upper or travels from the warm surface and the cold weather which is heavier than warm/hot air will be replaced and this circulation will be continues which we call it CONVECTIVE HEAT TRANSFER .

➢ We have two kinds of convection:

A – Natural (warmer air is lighter, so it goes up and cold weather comes down)

B – Forced (like wind)

➢ Rate of convection heat transfer depends on:
1. Temperature difference
2. Velocity of liquid or gas
3. Kind of liquid or gas

Second part of question 1:

➢ When we increase the thickness of the glass, we actually do nothing, because the glass's heat transfer is high so making it thick will be useless but we should consider the safety and don't get it too thin to prevent the damage (breaking etc.)

Question 2 :

As always Lack of consideration and focusing (my biggest problem since I was a child !) there is no other reason .

Question 3:

Solving the same example done in the class with different numbers :

A = $0.8mm * 1.5mm = 1.2mm^2$

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

$$R_{conv_2} = \frac{1}{h_1 \times A} = (\frac{1}{40 * 1.2}) = 0.0208 \ °C/W$$

$$R_{glass} = \frac{L_g}{(K_g \times A)} = \frac{0.006}{0.78 * 1.2} = 0.0064 \ °\frac{C}{W}$$

$$R_{air} = \frac{L_{air}}{(K_{air} \times A)} = \frac{0.013}{0.026 * 1.2} = 0.4167 \ °\frac{C}{W}$$

$$R_{total} = 0.5333 \ °\frac{C}{W}$$

$$\dot{Q}_{conv} = \frac{30}{0.5333} = 56.25 \ W$$

°C

$$\dot{Q} = \frac{T_{inff_1} - T_{s_1}}{R_{conv_1}} =\rightarrow 56.25 = \frac{20 - T_{s_1}}{0.0833} \rightarrow T_{S_1} = 15.3 \ °C$$

SO :

Increasing the gap between two side of a double pane window won't increase the efficiency of it because the more the gap is the more air will be between two sides so that air can easily move between them and The convection will happen inside the air gap between two sides of a double pane window .