Q1.
Write summary about the convective heat transfer

ANS:

It is the transfer of heat from one place to another by the movement of fluids such as air or water. Usually the heat is transferred from the hotter object to the cooler object
And it is mainly of 2 types, natural and forced.

Convection resistance of the surface is the thermal resistance of the surface against heat the convection.

$Q_{conv} = h\ A_S\ (T_S - T_\infty)$
$Q_{conv} = (T_S - T_\infty)/\ R_{conv}$
$R_{conv} = 1/hA_s$

When the convection heat transfer coefficient is large-the convection resistance becomes zero.

Q2.
Explain about the mistakes done while doing the sum

ANS:

Forgot to consider the k value given for the air gap, instead used the same k value
And also conversion of h value (which is in m) into mm.

Q3.
Why increasing the thickness of a single plane glass doesn't increase the total resistance?

ANS:

As compared to the thermal resistance of convection between glass and air with the thermal resistance of glass, the value of glass is very less. Increasing the thickness of a single glass can increase the thermal resistance of the glass, but it doesn’t make any changes to the total thermal resistance, so increasing the thickness of a single plane glass doesn't increase the total resistance.

Q4.
Consider a 0.8m high and 1.5m wide double-pane window consisting of two 6mm thick layers of glass (k=0.78 W/m°C) separated by a 13mm wide stagnant air space (k=0.026 W/m°C).
Determine the steady rate of heat transfer through this double-pane window and the temperature of its inner surface.

ANS:

h1 = 10 W/m^2℃ , h2 = 40 W/m^2℃ , k_1=0.78 W/m° , k_2=0.026 W/m°C

A = 0.8mm ∗ 1.5mm = 1.2mm^2

R_{conv1} = 1/10*1.2=0.0833 ℃/w

R_{conv2} = 1/40*1.2=0.0208℃/w

Rg_1 = 0.6/.78*1.2=.0064℃/w

Rg_2 = 0.013/.026*1.2=0.0416℃/w

Total thermal resistance of the window,

R_{total} =0.0833+0.0208+0.0064+0.0416 = 0.533 ℃/w

Q = 20- (-10) /0.533 =56.26W

Temp of inner surface of the window,

= 20-56.26 * 0.0833=15.3℃