Task 1: you should complete the modified example of simplified wall calculations that you went through in the assignment of week 3 and find the total heat transfer through wall

Determine the overall unit thermal resistance (the R-value) and the overall heat transfer coefficient (the U-factor) of a wood frame wall that is built around 38-mm 90-mm wood studs with a center-to-center distance of 400 mm. The 90-mm-wide cavity between the studs is filled with urethane rigid foam insulation. The inside is finished with 13-mm gypsum wallboard and the outside with 13 mm wood plywood and 13-mm 200-mm wood bevel lapped siding. The insulated cavity constitutes 75 percent of the heat transmission area while the studs, plates, and sills constitute 21 percent. The headers constitute 4 percent of the area, and they can be treated as studs.(this means 75% of area is insulation and 25% can be considered wood) Also, determine the rate of heat loss through the walls of a house whose perimeter is 50 m and wall height is 2.5 m in Las Vegas, Nevada, whose winter design temperature is -2 C. Take the indoor design temperature to be 22C and assume 20 percent of the wall area is occupied by glazing.

$R_{UNIT}(\mathrm{m}^2\cdot℃/\mathrm{w})$	wood	Insulation
Outside air	0.03	0.03
Wood bevel	0.14	0.14
urethane rigid foam insulation	NO	0.98*90/25=3.528
Wood studs(90mm)	0.63	NO
gypsum wallboard	0.079	0.079
wood plywood	0.11	0.11
Inside air	0.12	0.12

$A = 50 \times 2.5 \times 80\% = 100m^2$

$\Delta T = T_1 - T_2 = 22 - (-2) = 24℃$

$$R'_{\text{with}WOOD} = 0.03+0.14+0.63+0.079+0.11+0.12 = 1.109\text{m}^2\cdot℃/\text{w}$$

$$R'_{\text{with}INS} = 0.03+0.14+3.528+0.079+0.11+0.12 = 4.007\text{m}^2\cdot℃/\text{w}$$

$$\because \frac{1}{R_{\text{total}}} = \frac{1}{R_{wood}} + \frac{1}{R_{ins}}, R' = R\times A \rightarrow R = \frac{R'}{A}$$

$$\therefore \frac{1}{\frac{R'_{\text{total}}}{A_{tot}}} = \frac{1}{\frac{R'_{wood}}{A_{wood}}} + \frac{1}{\frac{R'_{ins}}{A_{ins}}} \rightarrow \frac{A_{tot}}{R'_{\text{total}}} = \frac{A_{wood}}{R'_{wood}} + \frac{A_{ins}}{R'_{ins}}$$

$$\because U_{tot}\times A_{tot} = U_{wood}\times A_{wood} + U_{ins}\times A_{ins}$$

Both side of the equation divide by A_{tot}

$$U_{tot} = U_{wood}\times\frac{A_{wood}}{A_{tot}} + U_{ins}\times\frac{A_{ins}}{A_{tot}} = 0.25\times U_{wood} + 0.75\times U_{ins}$$

$$\because U_{wood} = \frac{1}{R'_{wood}} = \frac{1}{1.109} = 0.902, U_{ins} = \frac{1}{R'_{ins}} = \frac{1}{4.007} = 0.250$$

$$\therefore U_{tot} = 0.25\times U_{wood} + 0.75\times U_{ins} = 0.25\times 0.902 + 0.75\times 0.250 = 0.413\text{w/m}^2℃$$

$$\text{Q}_{\text{tot}} = U_{tot}\times A_{tot}\times\Delta T = 0.413\times 100\times 24 = 991.2W$$

Task 2 In 2 pages you shoudl write a summary (in your own word!, in your own words !!) of what you have learnt in this session about radiation and radiative heat transfer

Heat transfer (or heat transfer) is a physical phenomenon in physics, which refers to the heat transfer phenomenon caused by temperature difference.Heat transfer the change in internal energy in a body as measured by heat.There are three basic forms of heat transfer: heat conduction, heat radiation and heat convection.As long as there is a temperature difference within or between bodies, heat energy must be transferred from high temperature to low temperature in one or more of the above three ways.Thermal radiation, the phenomenon that an object radiates electromagnetic waves due to its temperature, is called thermal radiation.Any

body whose temperature is above absolute zero produces heat radiation. The higher the temperature, the greater the total energy emitted.The energy emitted (or absorbed) on the surface of a radiation source per unit time and area is related to the nature and temperature of the surface.