Week4_sconde

1)

	Wood	Insulation
Outside Air	0.03	0.03
Wood Bevel(13mm*200mm)	0.14	0.14
Polywood(13mm)	0.11	0.11
Urethane Rigif Foam Ins.(90mm)	No	0.98*90/25=3.528
Wood Studs(90mm)	0.63	No
Gypsum Board(13mm)	0.079	0.079
Inside Surface	0.12	0.12

$$R_{wood} = (0.11 + 0.63 + 0.14 + 0.12 + 0.03) m^2 \frac{\mathrm{W}}{°C} = 1.109\ m^2 \frac{\mathrm{W}}{°C}$$

$$R_{insulation} = (0.11 + 0.079 + 0.14 + 3.528 + 0.12 + 0.03) = 4.007\ m^2 \frac{\mathrm{W}}{°C}$$

$$U_{wood} = \frac{1}{R_{wood}} = \frac{1}{1.109\ m^2 \frac{\mathrm{W}}{°C}} = 0.9017 \frac{W}{m^2\ °C}$$

$$U_{insulation} = \frac{1}{R_{insulation}} = \frac{1}{4.007\ m^2 \frac{\mathrm{W}}{°C}} = 0.2495 \frac{W}{m^2\ °C}$$

$$A_{wall} = 50\ *\ 0.8\ *\ 2.5 = 100\ m^2$$

$$U_{total} = U_{wood} * \frac{A_{wood}}{A_{total}} + U_{insulation} * \frac{A_{insulation}}{A_{total}}$$

$$U_{total} = U_{wood}\ *\ 0.25 + U_{insulation}\ *\ 0.75 = 0.9017 * 0.25 + 0.2495 * 0.75 = 0.4125 \frac{W}{m^2\ °C}$$

$$\Delta T = 24\ °C\ Q$$

$$Q_{total} = U_{total} * A_{total} * \Delta T = 0.4125 * 100 * 24 = 990\ W$$

2) *Radiation Heat Transfer*

- Radiation is the transfer of energy in the of Electromagnetic waves - and in this context, we're talking about any electromagnetic waves which mostly everything: your seatmate, the air, the light from the lightbulbs, Sun's UV rays, etc.

- Lower electromagnetic waves, the lesser it is visible in the eyes, the higher the electric waves, the more it is visible to the eyes. E.g.; Light in light bulb.

- Unlike convection and conduction heat transfer, radiation heat transfer does not require any medium of matter for it to take place. For example, in space, the Ultraviolet rays of the Sun or the Solar radiation does not need gas, liquid or any solid matter of some sort for it to move/transfer. However, the main factor that contributes to the amount of heat transferred thru radiation is its travel distance to the object being radiated. The longer the travel of the radiation, the lesser is the Heat transferred. That's why it's much colder during winter on both North and South Pole than the other parts of the Earth, because the Sun's rays don't reach that location that much. It also occurs in solid, liquid and gas matter.

- In the case of thermal radiation from a solid surface, the medium through which the radiation passes could be vacuum, gas, or liquid.

- Reflective coatings can help reduce the heat transfer from radiation a little since they absorb fewer electro magnetic waves.

- Heat transfer from a body with a high temperature to a body with a lower temperature, when bodies are not in direct physical contact with each other or when they are separated in space, is called heat radiation

- If the medium is a vacuum, since there are no molecules or atoms, the radiation energy is not attenuated and, therefore, fully transmitted. Therefore, radiation heat transfer is more efficient in a vacuum.

- It depends on how much surface area there is for it radiate out away from the surface.

- $\frac{dQ}{dt} \propto A$ The amout of heat taken away from the object does depend and is proportional to the Surface Area of the Object.

- $\frac{dQ}{dt} \propto AT^4$ It depends on the Temperature. Not only does the object has some surface area, it will also keep up some temperature. Therefore, the $\frac{dQ}{dT}$ will depend on the temperature T^4.

Black body

- a surface that absorbs all incident radiation and reflects none is called a black surface or black body.

- For example, if you're wearing a all black through a sunny day, you're more like to feel hot than if you're wearing white or lighter colors because black color does not reflect any UV radiation at all.

- The Stefan–Boltzmann law of thermal radiation for a black body states that the rate of radiation energy from the surface per unit area is proportional to the fourth power of the temperature of the body $q = \sigma A T^4$ with q rate of energy emission from the surface, A surface area of the radiator and σ the Stefan–Boltzmann constant.

- For liquid medium, most of the radiation is absorbed is a thin layer close to the solid surface and nothing is transmitted.