NAME: JUI HALVADIA 29-10-2019

EXAMPLE AND SUMMARY

Example 1

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:

No.	Types of Material	Plywood	Urethane
1	Outside Air	0.03	0.03
2	Wood Bevel Lapped Siding	0.14	0.14
3	Plywood (13 mm)	0.11	0.11
4	Urethane (90 mm)	-	(0.98x90/25) = 3.528
5	Wood Studs	0.63	-
6	Gypsum Board	0.079	0.079
7	Inside Surface	0.12	0.12

$R'_{wood} = 0.03 + 0.14 + 0.11 + 0.63 + 0.079 + 0.12 = 1.109 \frac{℃}{W}$

$R'_{ins} = 0.03 + 0.14 + 0.11 + 3.528 + 0.079 + 0.12 = 4.007\ m^2 \frac{℃}{W}$

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

$U_{ins} = \frac{1}{R'_{ins}} = \frac{1}{4.007} = 0.2495 \frac{\mathrm{W}}{\mathrm{m^2 °C}}$

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

$U_{tot} = U_{wood} \text{ x } \frac{A_{wood}}{A_{tot}} + U_{ins} \text{ x } \frac{A_{ins}}{A_{tot}}$

$U_{tot} = U_{wood} \text{ x } 0.25 + U_{ins} \text{ x } 0.75 = 0.9017 \text{ x } 0.25 + 0.2495 \text{ x } 0.75 = 0.4125 \frac{\mathrm{W}}{\mathrm{m^2 °C}}$

$\Delta T = 22 - (-2) = 24\ ℃$

$Q_{tot} = U_{tot} \text{ x } A_{tot} \text{ x } \Delta T = 0.4125 \text{ x } 100 \text{ x } 24 = 990 \text{ W}$

Write a summary of what you have learnt in the class about radiative and radiation heat transfer:

Radiation is a method of heat transfer that does not rely upon any contact between the heat source and the heat source and heated object. Heat can be transmitted through empty space by thermal radiation. Radiation transfer does not require the presence of a material medium to take place (unlike conduction and convection) and it can occur in solids, liquids or gases. Thermal radiation is a type of electromagnetic radiation or light which refers to the waves of the electromagnetic fields propagating through space carrying electromagnetic radiant energy as a result of the changes in the electronic configurations of the atoms or molecules.

Thermal radiation ranges in wavelength from the longest infrared rays through the visible light spectrum to the shortest ultraviolet rays. The intensity and distribution of the radiant energy from within this range is governed by the temperature of the mitting surface.

According to Maxwell theory, energy transfer takes place via electromagnetic waves in radiation. Electromagnetic waves transport energy like other waves and travel at the speed of light. Electromagnetic waves are characterized by their frequency and wavelength, where: $\lambda = \frac{C}{V}$

where c is the speed if light in that medium; in a vacuum c0=2.99 x 108 m/s

Radiation heat transfer is very important in buildings, application on that:

- Heat exchange between the lighting fixture and interior surfaces
- Solar heat absorption on exterior surfaces
- Solar heat absorption and reflection by interior building surface
- Heat emission by the exterior surfaces to the sky
- Heat exchange among interior surfaces
- Heat exchange between interior surfaces and occupants

Light

Light is simply the visible portion of the electromagnetic spectrum, lies between 0.40 and 0.76 micro meter. A light source is when a body, emits some radiation in the visible range.

A body that emits visible radiation is called light source.

Ultra-violate radiation has a shorter wavelength than visible light.

Infrared radiation has a longer wavelength than visible light.

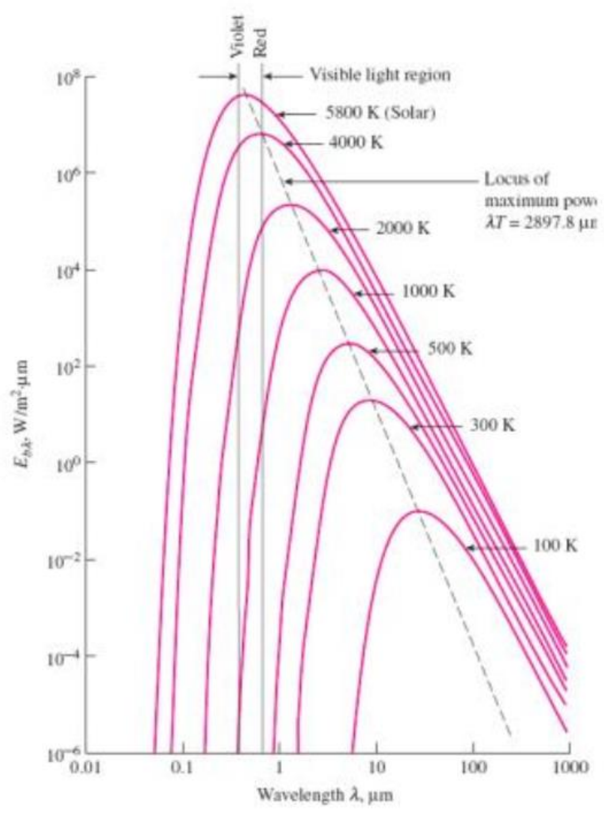
Black Body

A black body is defined as a perfect emitter and absorber of radiation. At a specified temperature and wavelength, no surface can emit more energy than blackbody. A black body is a diffuse emitter which means it emits radiation uniformly in all direction. Also, a black body absorbs all incident radiation regardless of wavelength and direction.

The radiation energy emitted by a blackbody per unit time and per unit surface area can be determined from the Stefan-Boltzmann Law: σ = 5.67 x 10^{-8} W/m^2. k^4

Spectral blackbody emissive power is the amount of radiation energy emitted by a blackbody at an absolute temperature T per unit time, per unit surface area, and per unit wavelength.

The below graph, shows the variation of the blackbody emissive power with wavelength for several temperatures.



THE VARIATION OF THE BLACK BODY EMISSIVE POWER WITH WAVELENGHT FOR SEVERAL TEMPERATURES