WEEK 4 _ TGEORGE

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

	Wood	Insulation
Outside air	0,03	0,03
Wood bevel 13mm	0,14	0,14
Plywood 13 mm	0,11	0,11
Urethane rigid foam insulation 90		3,52
Wood studs 90mm	0,63	
Gypsum 13 mm	0,07	0,07
Inside surface	0,12	0,12

Rwood = 0,03+0,14+0,11+0,63+0,07+0,12

= 1,10 $m^2°C/W$ Rins=0,03+0,14+0,11+3,52+0,07+0,12 = 3,99

$m^2°C/W$

Uwood = 1/Rwood

= 1/1,10 =0,90 $m^2°C/W$

Uins = 1/Rins = 1/3,99

= 0,25 $m^2°C/W$

Utotal = 25% Uwood + 75% Uins

= 0,9*0,25 + 0,25*0,75

=0,225+0,1875= 0,4125 $W/m^2°C$ Q = Utotal * As* deltaT =

0,4125*125*0,8*24

= **990,24 W**

Radiation and Radiative Heat Transfer

Depending on the temperature of the material, it transmits radiation ranging from ultraviolet to far-field infrared. The entire body acts as an emission source of continuous thermal radiation, and also as a continuous receiver of radiation originating even from far-field bodies.

Thermal radiation is one of three mechanisms which enables bodies with varying temperatures to exchange energy. Thermal radiation is characterized by the emission of electromagnetic waves from the material (variation of its internal energy).

All bodies radiate energy in the form of photons moving in a random direction, with random phase and frequency. When radiated photons reach another surface, they may either be absorbed, reflected or transmitted. However, thermal radiation is linked to the molecular structure of the transmitter, receiver, and the crossed medium.

The behavior of a surface with radiation incident upon it can be described by the following quantities:

- α = absorptance - fraction of incident radiation absorbed
- ρ = reflectance - fraction of incident radiation reflected
- τ = transmittance - fraction of incident radiation transmitted.

Blackbody radiation" or "cavity radiation" refers to an object or system which absorbs all radiation incident upon it and re-radiates energy which is characteristic of this radiating system only, not dependent upon the type of radiation which is incident upon it. The radiated energy can be considered to be produced by standing wave or resonant modes of the cavity which is radiating. The amount of radiation emitted in a given frequency range should be proportional to the number of modes in that range. The best of classical physics suggested that all modes had an equal chance of being produced, and that the number of modes went up proportional to the square of the frequency.