WEEK 5

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Task 1: In you own words (which means in your own words) write a summary of the topics about radiative heat transfer we went through including the definitions of emissivity, absorptivity and reflectivity, the view factor, the heat exchange betweeen two black surfaces,the heat exchange between the two gray surface and finally the definition of radiative resistances.

Radiative Heat Transfer

Emissivity: The emissivity of an object can be measured from a value between 0 and 1. An object's emissivity is the power of its surface to emit heat by radiation. It is a ratio of the radiant energy emitted by a surface to that emitter by a blackbody at the same temperature since a blackbody is an illustration of absolute emission and radiation.

Absorptivity: absorptivity can be described as the degree to which something is capable of absorbing another substance such as a liquid, or even energy. Such as a sponge absorbing water at a fast rate, or another person absorbing someone else's negative/positive energy.

Reflectivity: The view factor is the fraction of radiation leaving one surface which is intercepted by a second surface. The intensity of the emitted radiation depends on the view factor of the surface relative to the sky. It is the degree to which heat carried by radiation can be passed between two surfaces.

View Factor: The view factor, is a geometrical quantity corresponding to the fraction of the radiation leaving surface i that is intercepted by the surface j. It does not depend on the surface properties. It is also called shape factor, configuration factor, and angle factor.

·Heat Exchange (between two Black Surfaces):If we have two black bodies, each body will emit its own radiation which will be absorb by the other. So black body 1 will emit radiations toward black object 2, which will be absorbed by Object 2. And the same happens to object 2. To find the net heat exchange between two black surfaces S1 and S2, we calculate the difference between the radiations leaving S1 and captured by S2 and the radiations leaving S2 and captured by S1.

·Heat Exchange (between the two Gray Surface): The two grey surfaces will absorb and reflect a certain fraction of radiation. The reflect part will also constantly absorb by the other side for a certain fraction and reflect the other radiation, and the same thing happens in the other surface. The radiation will generally lose its power during the process.

Radiative Resistances: The radiative resistance is a value used to measure the loss resistance energy, and the loss energy is converted into heat radiation; the energy lost by the radiative resistance is converted into radio waves.

If ϵ1=ϵ2=0.1;

K, T2=308 k

σ=5.67 × 10 – 8 $w/(m\text{^}2.k\text{^}4\ )$

$\dot{Q}_{1\to2}$ = $\frac{A_1\sigma(T_1^4-T_2^4)}{\frac{1}{\epsilon_1}+\frac{1}{\epsilon_2}-1}$ = $\frac{1.5\times5.67\times10^{-8}\times(308^4-298^4)}{\frac{1}{0.1}+\frac{1}{0.1}-1}$ = 4.98 w

$F_{12}=\ \frac{1}{\frac{1}{\epsilon_1}+\frac{1}{\epsilon_2}-1}$ = $\frac{1}{\frac{1}{0.1}+\frac{1}{0.1}-1}$ = 0.0526

Example:

$F_{12}=0.01$

$\dot{Q}_{1\to2}=\ A_1\ \times\ F_{12}\ \times\ \sigma\ (T_1^4-T_2^4)$ = $1.5\times0.01\ \times5.67\ \times10-8\ \times(2984-3084)=\ -0.9466\ w$

$\dot{Q}_{2\to1}=\ -\dot{Q}_{1\to2}=0.09466\ w$