Task 1: In your 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 between two black surfaces, the heat exchange between the two gray surface and finally the definition of radiative resistances.

Emissivity:

Emissivity of an object is capability of emitting radiation compare to capability of black body for emission which is (e = 1). The amount of it depends on the object's surface and the temperature, wavelength and the direction of the emitted radiation can be ranged from 0 to 1.

Spectral emissivity: when heat emitted in a specific wave length from the surface of the object, spectral emissivity occurred (ε_λ). The amount of ε_λ in gray surface is constant. (Independent from wavelength)

Directional emissivity: The amount of emission in a determined angle between surface and radiation (ε_θ). ε_θ is constant in diffused surface (independent of direction)

But in the real surface, these emissivity factors are not constant.

Absorptivity:

Absorption happens when incoming radiation can passes through the object as the wave passes through it and stock in the object.

$\alpha = \frac{\text{absorbed radiation}}{\text{incident radiation}} = \frac{\text{G abs}}{\text{G}} \qquad 0 \leq \alpha \leq 1$

Reflectivity:

Reflectivity is the part of incoming radiation that is not absorbed by object so the object reflect the incoming radiation outwards.

$\rho = \frac{\text{reflected radiation}}{\text{incident radiation}} = \frac{\text{G ref}}{\text{G}} \qquad 0 \leq \rho \leq 1$

Transmissivity:

Transmissivity is the fraction of incoming radiation which transmitted and pass through the surface.

$$\tau = \frac{\text{transmitted radiation}}{\text{incident radiation}} = \frac{G\ tr}{G} \qquad 0 \leq \tau \leq 1$$

$G_{abs} + G_{ref} + G_{tr} = G$ =>> $\alpha + \rho + \tau = 1$

The View Factor:

Radiation heat transfer between surfaces depends on the orientation of the surfaces relative to each other, their radiation properties and temperatures. View factor is a geometrical parameter that consider the effects of orientation on radiation between surfaces. In view factor calculations, we assume uniform radiation in all directions throughout the surface

The view factor or F_{ij} ranges between zero and one. In F_{ij} = 0 indicates that two surfaces do not see each other directly (like a plane surface or convex surface). F_{ij} = 1 indicates that the surface j completely surrounds surface.

Radiative resistance: The factor that prevents radiative heat transfer from one surface to another cause less incoming radiative incoming heat to another surface.

Task 2: Solve the last example you solved in the class (radiative heat exchange between two parallel plates) awhile considering the two emissivity's to be 0.1, what can you conclude from the result?

ε_1=0.1 and ε_2=0.1:

R'_{total} = $\frac{1}{0.1} + \frac{1}{0.1} - 1 = 19$

Q_{12l}= A_σ $(T_1^4 - T_2^4)$ / $\frac{1}{\epsilon\prime 1} + \frac{1}{\epsilon\prime 1} - 1$ = A × 5.67 × 10−8 × $800^4 - 500^4$ / $\frac{1}{0.1} + \frac{1}{0.1} - 1$ = 1035.72 W

ε_1=0.2 and ε_2=0.7:

R'_{total} = $\frac{1}{0.2} + \frac{1}{0.7} - 1 = 5.43$

Q_{12}= $A_\sigma(T_1^4 - T_2^4)$ / $\frac{1}{\epsilon 1} + \frac{1}{\epsilon 1} - 1$ = A × 5.67 × 10−8 × $800^4 - 500^4$ / $\frac{1}{0.2} + \frac{1}{0.7} - 1$ = 3624.68 W

By comparing the results can be inferred that the amount of radiative heat transition is much more dependent to the emissivity value of surfaces.