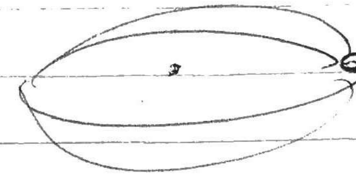
Office Hours : April 25, 2018

Review Session?

- Saturday / Sunday

PROBLEM ONE

$Y = \frac{C(r,t) - C_\infty}{C_i - C_\infty}$



$n = \frac{r}{R}$ $m = \frac{1}{B_i} = 0$

$C(r,t) = 0.17 \frac{kg}{m^3}$

$C_i = 0.02 \frac{kg}{m^3}$

$Y =$ ________

▫ TABLES WORK TOO!
- formula sheet

$F_o = \frac{D_{AB} t}{R^2}$ → $n = 0$

(2) New $C(r,t) = 0.16 \frac{kg}{m^3}$

$Y = \frac{\downarrow - C_\infty}{C_i - C_\infty}$ → ________ $n = 0$, $m = 0$

↓

$F_o = \frac{D_{AB} t}{R^2}$

PROBLEM TWO

$$E_{b,\lambda} = \frac{2\pi c^2 h \lambda^{-5}}{\exp\left(\frac{ch}{k\lambda T} - 1\right)} \qquad \varepsilon = 1 \quad \varepsilon \neq 1$$

$c = 3e^{8}\ \frac{m}{s}$

$h = 6.625e^{-34}\ J \cdot s$ (Planck's const)

$K = 1.38e^{-23}\ \frac{J}{K}$ (Boltzmann const)

T = temp

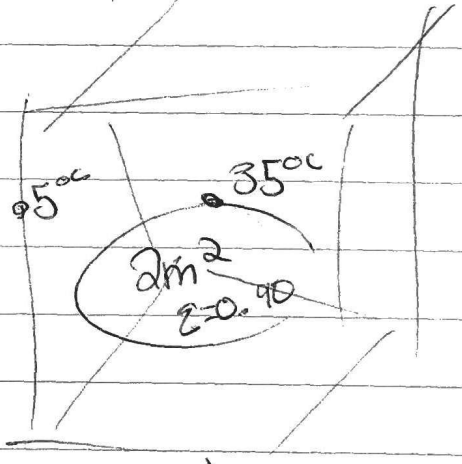
λ = wavelength in meters

$$E_{EARTH} = \left[\frac{E_1 + E_2}{2}\right]\Delta\lambda \leftarrow (10^5 - 10^4)\,\mu m$$

$E_1 = 10^5\,\mu m$ $\quad E_2 = 10^4\,\mu m$

PROBLEM THREE

$\sigma = 5.67 \times 10^{-8}\ \frac{W}{m^2 K^4}$



$$q_{pig\text{-}barn} = \frac{\sigma\,(T_{pig}^4 - T_{barn}^4)}{\frac{1-\varepsilon_{pig}}{\varepsilon_{pig} A_{pig}} + \frac{1}{A_{pig} F_{pig\text{-}barn}} + \frac{1-\varepsilon_{barn}}{\varepsilon_{barn} A_{barn}}}$$

$F_{pig\text{-}barn} = 1$

$\frac{A_{pig}}{A_{barn}} \approx 0$

$$\frac{1}{\varepsilon_{pig} A_{pig}}\left(\quad\right)$$

$$q_{pig\text{-}barn} = \varepsilon_{pig} A_{pig} \sigma\,(T_{pig}^4 - T_{barn}^4)$$

watts

$$\frac{1}{1} \cdot m^2 \cdot \frac{W}{m^2 K} \cdot K^4$$

b) $q_{pig} = \varepsilon_{pig} A_{pig} \sigma T_{pig}^4 = \frac{watts}{m^2 K^4}$

$= watts$

PROB FOUR

$$q'' = 90 \frac{watts}{m^2} \qquad h = 12 \frac{W}{m^2 K}$$

Energy Balance

$\dot{E}_{gen} = \dot{E}_{CONV} + \dot{E}_{RAD}$

$q''_{gen} \cdot A_{person} = h A_{person} (T_{surface\ person} - T_{air}) + q_{person\text{-}wall}$

$q_{person\text{-}wall} = A_{person} \varepsilon \sigma [T_s^4 - T_{wall}^4]$

$[T_s^4 - T_w^4] \rightarrow (T_s^2 - T_w^2)(T_s^2 + T_w^2)$

$[T_s^4 - T_w^4] = (T_s - T_w)(T_s + T_w)(T_s^2 + T_w^2)$

$T_s \approx T_w$ $\qquad 2T_s \qquad 2T_s^2$

$[T_s^4 - T_w^4] = 4 T_s^3 (T_s - T_w)$

~~$T_w = f(C$~~

$T_{air} = f(T_{wall})$

$q''_{gen} A_{person} = h A_{person} (T_s - T_{air}) + A_{person} \varepsilon \sigma 4 T_s^3 (T_s - T_w)$