chapter 4, #1, 3, 4

Chapter 4

(1) 100m $\quad c_p \frac{dT}{dt} = Q$

$\hat{C}_o = 4.2 \times 10^3 \, JK^{-1}m^{-2} \cdot \frac{5°C}{86400 \cdot 90} = 2700 \, Wm^{-2}$

$\bar{C}_A = 1 \times 10^7 \, JK^{-1}m^{-2} \frac{20°C}{86400 \cdot 90} = 257 \, Wm^{-2}$

(3) $4\sigma\bar{T}_o^3 = 5.4 \, Wm^{-2}K^{-1}$

$\rho_p C_D U = 1004 \cdot 1.2 \cdot 2 \times 10^{-3} \cdot 5 = 12. \, Wm^{-2}K^{-1}$

(4) 1.) $\bar{T}_s - \bar{T}_a = \dfrac{600 Wm^{-2}(1-0.1) + 0.85(300 Wm^{-2} - \sigma 300^4)}{12. \, Wm^{-2}K^{-1} + 0.85 \, 4\sigma 300^3}$ (459)

$= \dfrac{540 + 135.4}{12 + 5.2} = \dfrac{}{17.2} = \dfrac{}{23.5}$

$T_s = T_a + 23.5°C = 323.5°K$

$= 50.5 \, °C$

$600 \times .7 = 420 - 135.4 = 16.5$

$T_s = 43.5 \, °C \Rightarrow 316.5 \, °K$

Chapter 4, #5

5.): $$T_s - T_a = \frac{S^{\downarrow}(0)(1-\alpha_s) + \varepsilon\left(F^{\downarrow}(0) - \sigma T_a^4\right)}{4\rho C_D U\left(1 + B_e^{-1}\right) + \varepsilon 4\sigma T_a^4}$$

$$B_e \underset{300K}{\sim} 0.25 \Rightarrow B_e^{-1} \sim 4$$

$$T_s - T_a = \frac{540 - 135.4}{60 + 5.2} = 6.2\,^{\circ}C$$

$\alpha = 0.1 \Rightarrow T_s = 6.2 + 27 = \underline{33\,^{\circ}C} = 306K$

$\alpha = 0.3$ $= \frac{420 - 135.4}{65.2} = 4.36\,^{\circ}C = \underline{31.4\,^{\circ}C}$

$= 304.4K$