Chapter 1: Introduction to Transport Phenomena in Materials Processing

Chapter 2: Steady State Conduction Heat Transfer

p. 109: Problem 2.1(c):

- q'' =10 W/m^{2}K, not 100 W/m^{2}K
- The Ar is effectively not moving, even though it is a fluid, because the thickness of the gap between the two panes is so small.
- In part (c), where it says "thickness of the air gap", it should read "thickness of the Ar gap".

p. 110: Problem 2.3: The last line in the problem description should read "and the outer and inner heat transfer coefficients are, respectively, h_o = 75 and h_i = 225 W/m^{2}K."

p. 112: Problem 2.11: Use T_{sink}=40°C.

p. 113: Problem 2.13: The height and width of the aluminum are H and W, while the thickness of the trough wall is t.

p. 115: Problem 2.15: Use **(c)** graphite (k = 1.9 W/mK) and **(e)** magnesia (k = 0.085 W/mK).

Chapter 3: Transient Conduction Heat Transfer

p. 139: The equation at the bottom of the page should read

$$\lim_{x\to\infty}\theta(\varepsilon=1,\tau)=\exp(-\infty)\left[1^2-2(1)\right]+1=1$$

p. 139: Eqtn. (3.42) should read

$$\theta = \exp(-3\tau)\left[\varepsilon^2-2\varepsilon\right]+1$$

p. 172: Eqtn. (3.129) should read

$$C_o=\left[\frac{2(k\rho c)_m(T_M-T_i)}{3k_s\rho_s L_f}\right]^{1/2}$$

p. 177, Problem 3.8: Part (b) should end with "($t < t_{crit}$)", not "(t =0)."

p. 178, problem 3.10: The phrase "…on the Figure 3.28." should be removed.

p. 179, problem 3.13: The first sentence should read: "The temperature of an effectively semi-infinite slab of steel, initially at uniform temperature (T_i = 25 °C) is raised instantaneously to 50 °C at the wall."

p. 181, problem 3.23: Assume T_i = 35 °C.

p. 181, problem 3.24: α_m = 2.7x10^{-7} m^2/s.

p. 182, problem 3.25: Use M_f = 0.1 m and T_o = 70°C.

p. 182, problem 3.26: Use L_f = 2.98 x 10^5 J/kg.

p. 183, problem 3.28(c): The latent heat release rate should be $\left[\rho_L L_f A \frac{dM}{dt}\right]_{r=M}$.

Chapter 4: Mass Diffusion in the Solid State

p. 205: The right hand side of eqtn (4.45) should read

$$= \left(\frac{C_{Ai}^{2} - C_{A}^{2*}}{C_{A}^{1*} - C_{A}^{2*}}\right)\sqrt{\frac{D_A^2}{3t}}$$

p. 205: The quadratic equation between (4.46) and (4.47) should read

$$\phi^2 - \frac{1}{\sqrt{3}}\left[\frac{C_{Ai}^{2} - C_{A}^{2*}}{C_{A}^{1*} - C_{A}^{2*}}\right]\phi + \frac{1}{2}\frac{D_A^1}{D_A^2}\left[\frac{C_{A}^{1*} - C_{Ao}^{1}}{C_{A}^{1*} - C_{A}^{2*}}\right] = 0$$

p. 205: Equation (4.47) should read

$$\phi = \frac{1}{2\sqrt{3}}\left[\frac{C_{Ai}^{2} - C_{A}^{2*}}{C_{A}^{2*} - C_{A}^{1*}}\right]\left[1 + \sqrt{1 - 6\left(\frac{D_A^1}{D_A^2}\right)\left(\frac{C_{A}^{1*} - C_{A}^{2*}}{C_{Ai}^{2} - C_{A}^{2*}}\right)\left(\frac{C_{A}^{1*} - C_{Ao}^{1}}{C_{Ai}^{2} - C_{A}^{2*}}\right)}\right]$$

p. 228, problem 4.5: The diffusion coefficient for austenite should read

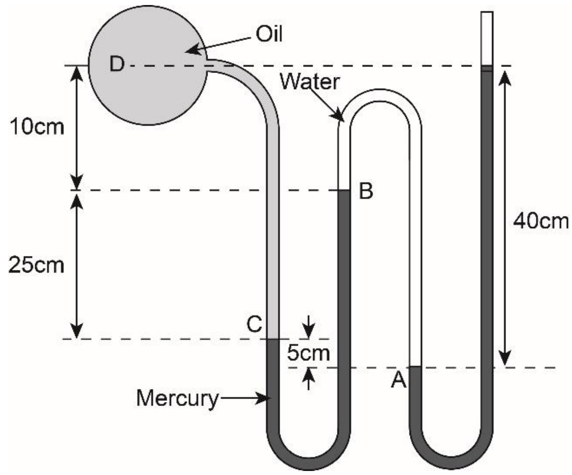
$$D_C^{\gamma} = 7\times10^{-6}\left(\mathrm{m^2/s}\right)\exp\left[-\left(133{,}900\,\mathrm{J/gmol}\right)/RT\right]$$

p. 228, problem 4.6: Part (c) should read: "**(c)** Write the expression for solute flux continuity at the interface. Scale this relationship using these reference values, $\Delta C^A = C_o^A - C_{Int}$ and $\Delta C^B = C_{Int} - C_o^B$, and the result from part (b). Find an estimate for the interface composition, C_{Int}, in terms of properties and the initial compositions."

p. 231, problem 4.10: Part (c) should read $D_{Al}^{\alpha} \approx 3.9\times10^{-5}\left(\frac{\mathrm{m^2}}{\mathrm{s}}\right)\exp\left(-\frac{155{,}000\,\mathrm{J/mole}}{RT}\right)$

Chapter 5: Hydrostatics

p. 249, problem 5.10: The figure 5.15 should read:



Chapter 6: Mechanical Energy Balance in Fluid Flow

p. 278, problem 6.2: Assume a smooth pipe (no roughness).

p. 279, problem 6.4: The mass flow rate should be $\dot{m} = 7500\,\mathrm{kg/s}$.

p. 281, problem 6.8: The maximum allowable depth of the moving Al layer is *h* = 0.1 m and the relative roughness is 0.0001.

p. 281, problem 6.10: The frictional loss should be 120 J/kg, not 120 J/km. Use ρ = 870 kg/m^3 and μ =0.8 kg/ms

Chapter 7: Equations of Fluid Motion

p. 287: The second part of the equation between Eq. (7.7) and Eq. (7.8) should read

$$\dot{m}_{y+dy} = \rho v_{y+dy} A_{y+dy}$$

p. 303, problem 7.2: Use δ = 0.01 m.

p. 304, problem 7.3: The second sentence should read "Motion in the fluid is started by a sudden change in fluid velocity from zero to a characteristic value, U_o, uniform in the *x* direction."

Chapter 8: Internal Flow

p. 320, Figure 8.8: label of gravitational force in figure should read

$$\bar{g} = g_z \hat{z} = -g\hat{z}$$

p. 354, problem 8.1: "*r* = 1000 rpm" should be "*ω* = 1000 rpm".

p. 355, problem 8.8: The last section should read "Solve the system for the velocity field and sketch *w*(*r*)." A sketch of *u*(*r*) would be a horizontal line at *u* = 0!

p. 355, problem 8.9: This problem should refer to Figure 8.23, not Figure 8.24.

Chapter 9: External Flows

p. 401, problem 9.12: $u_{ref} << \Omega R = v_{ref}$ should be added to the list of assumptions in problem statement. Also, The density of the photoresist is 1200 kg/m^3.

Chapter 10: Convection Heat Transfer

p. 441, Equation 10.77: Should be $\overline{Nu} = C\,\mathrm{Re}_D^m\,\mathrm{Pr}^{1/3}$

p. 458: Re range on Eq. (10.124) should be 2500 < Re_D < 10^7.

p.464: The term $\left(\frac{\alpha x}{\delta_T^2}\right)$ in Eq. (10.142) should be $\left(\frac{\alpha x}{\delta_T^2}\right)^2$.

p.465: The term $\left(\frac{x}{\delta}\right)$ in Eq. (10.144) should be $\left(\frac{x}{\delta}\right)^2$.

p. 466, Equation (10.148): Should be $\overline{Nu}_H = 0.68 + \left[\frac{0.67}{\left(\mathrm{Pr}^{9/16} + 0.671\right)^{4/9}}\right]\left(Ra_H\,\mathrm{Pr}\right)^{1/4}$

p. 472, Eq. 10.160: Should have $\left(C_{sf}\right)^{-3}$, not $\left(C_{sf}\right)^3$.

p. 475, problem 10.2: Use D = 0.01 m.

p. 478-479, problem 10.13: Use $q = 0.004\,\mathrm{W} = 4\,\mathrm{mW}$

p.479, problem 10.16: Use 0.05 m/s < V_a < 5 m/s

p. 480, problem 10.19: All the temperatures should be in Kelvin.

p. 480, problems 10.20 and 10.21: Use $h_{fg} = 2.3\times10^6\,\frac{\mathrm{J}}{\mathrm{kg}}$ and $\sigma = 0.060\,\mathrm{N/m}$.

Chapter 11: Mass Transfer in Fluids

p. 521, problem 11.3: Le = 1

Chapter 12: Radiation Heat Transfer

p. 529, The beginning of the first full paragraph should read "Setting $dE_\lambda/d\lambda$ =0..."

p. 569, problem 12.3: Instead of reading that the plate "is insulated on the backside," the problem statement should read that the plate is "heated on the backside."

p**. 571**, problem 12.15: Use Figure 12.27 for this problem.

p. 572, problem 12.17:

- T_H = 600 K
- "Panel" should be replaced with "plate."
- The variable "w_s" should be replaced with "w_H."

p. 573, problem 12.19: The tabulated view factor, F_{21}, is $F_{21} = \frac{1}{2}\left\{1 - \left[1 + \left(\frac{D}{L}\right)^2\right]^{-1/2}\right\}$

<u>Appendix II: Equations of motion and thermal energy balance</u>

p. 579: The next to last terms in the three Navier-Stokes equations in Cartesian coordinates should be $\frac{\partial}{\partial y}\left(\frac{\partial u}{\partial y}\right)$, $\frac{\partial}{\partial y}\left(\frac{\partial v}{\partial y}\right)$, and $\frac{\partial}{\partial y}\left(\frac{\partial w}{\partial y}\right)$.