Tosun, Modelling in Transport Phenomena: A Conceptual Approach

Errata for First Printing

p. 63 - Problem 3.5

The answer should be $320\,\mathrm{W/m^2}$ and not $320\,\mathrm{W}$.

p. 89 - After Eq. (4.4-7)

The exponent n must be defined as

$$n = \begin{cases} 0.37 & \text{if} \quad \mathrm{Pr} \leq 10 \\ 0.36 & \text{if} \quad \mathrm{Pr} > 10 \end{cases}$$

p. 90 - Eq. (4.4-8)

$28,200$ should be $282,000$

p. 92 - Churchill-Bernstein correlation

This section should be replaced by:

The use of Eq. (4.4-8) gives

$$\mathrm{Nu} = 0.3 + \frac{0.62\,\mathrm{Re}_D^{1/2}\,\mathrm{Pr}^{1/3}}{\left[1 + (0.4/\mathrm{Pr})^{2/3}\right]^{1/4}} \left[1 + \left(\frac{\mathrm{Re}_D}{282,000}\right)^{5/8}\right]^{4/5}$$

$$= 0.3 + \frac{0.62\,(8.46 \times 10^4)^{1/2}(0.714)^{1/3}}{[1 + (0.4/0.714)^{2/3}]^{1/4}} \left[1 + \left(\frac{8.46 \times 10^4}{282,000}\right)^{5/8}\right]^{4/5} = 193$$

The average heat transfer coefficient and the rate of heat loss from the body are

$$\langle h \rangle = \mathrm{Nu}\left(\frac{k}{D}\right) = (193)\left(\frac{24.86 \times 10^{-3}}{0.3}\right) = 16\,\mathrm{W/m^2.K}$$

$$\dot{Q} = (\pi \times 0.3 \times 1.8)\,(16)\,[30 - (-10)] = 1086\,\mathrm{W}$$

Comment: *The* rate of *heat loss predicted by the Zhukauskas correlation is* 9% *greater than the one calculated using the Churchill-Bernstein correlation. It is important to note that no two correlations will exactly give the same result.*

p. 99 - Eq. (4.5-24)

Equation should be written as

$$D = \frac{0.575}{N}\left(\left\{\log\left[\varepsilon N + 5.875\left(\frac{\mu}{\rho \mathcal{Q} N}\right)\right] - 0.171\right\}^2\right)^{-1/5}$$

p. 100 - Example 4.14

Part of the "**Analysis**" section of the example should be replaced by

Hence, Eq. (4.5-24) gives the pipe diameter as

$$D = \frac{0.575}{N}\left(\left\{\log\left[\varepsilon N + 5.875\left(\frac{\mu}{\rho Q N}\right)\right] - 0.171\right\}^2\right)^{-1/5}$$
$$= \frac{0.575}{1.69}\left(\left\{\log\left[(4.6\times10^{-5})(1.69) + \frac{(5.875)\,(1001\times10^{-6})}{(999)(0.03)(1.69)}\right] - 0.171\right\}^2\right)^{-1/5} = 0.2\,\mathrm{m}$$

p. 101 - Eq. (4.5-26)
$\mathrm{Re}_P^{4/5}$ should be replaced by $\mathrm{Re}^{4/5}$

p. 101 - Eq. (4.5-27)
$\mathrm{Re}_P^{4/5}$ should be replaced by $\mathrm{Re}^{4/5}$

p. 102 - Eq. (4.5-28)
$\mathrm{Re}_P^{0.83}$ should be replaced by $\mathrm{Re}^{0.83}$

p. 131 - Problem 4.19
The answer should be 41 min and not 33 min

p. 139 - Example 5.1
Equations (1) and (2) should be written as

$$\alpha_1\,\beta_{11} + \alpha_2\,\beta_{12} + \alpha_3\,\beta_{13} = 0 \qquad \text{for} \quad j = 1$$
$$\alpha_1\,\beta_{21} + \alpha_2\,\beta_{22} + \alpha_3\,\beta_{23} = 0 \qquad \text{for} \quad j = 2$$

p. 222 - Problem 7.4
The answer to part (b) should be $0.1\,\mathrm{m}^{5/2}/\,\mathrm{min}$ and not $0.17\,\mathrm{m}^{5/2}/\,\mathrm{min}$.

p. 268 - Example 8.8
In the problem statement the units of k should be $\mathrm{W/\,m.K}$ and not $\mathrm{W/\,m^2.K}$

p. 272 - Eq. (8.2-53)
The equation should be written as

$$\dot{Q} = \frac{T_1 - T_2}{\dfrac{R_2 - R_1}{4\pi k R_1 R_2}}$$

p. 313 - Eq. (8.5-39)
The equation should be written as

$$N_{A_z} = -\,\mathcal{D}_{AB}\,\frac{dc_A}{dz} + c_A v_z^{\blacksquare}$$

p. 380 - Eq. (9.4-20)
The equation should be written as

$$\dot{n}_A = \frac{\pi R^2\, \mathcal{D}_{AB}\, c_{A_o} \Lambda \tanh \Lambda}{L}$$

p. 383 - Eq. (9.4-43)
The equation should be written as

$$u = K_1 \sinh(\Lambda\xi) + K_2 \cosh(\Lambda\xi)$$

p. 384 - Eq. (9.4-48)
The equation should be written as

$$\dot{n}_A = -\, 4\pi\, R\mathcal{D}_{AB}\, c_{A_R}(1 - \Lambda \coth \Lambda)$$

p. 420 - Problem 9.12
Equation (2) in part (a) should be written as

$$\frac{d}{dx}\left(\mu\, \frac{dv_z}{dx}\right) = 0$$

Also, the statement of part (b) should read, "Integrate Eq. (2) and ...."

p. 424 - Problem 9.17
In the problem statement, Section 9.5.4.2 should be replaced by Section 9.5.2.1.

p. 450 - Equation (10.2-92)
The equation should be written as

$$\rho\, \hat{C}_P\, \frac{\partial T}{\partial t} = \frac{k}{r^2}\, \frac{\partial}{\partial r}\left(r^2\, \frac{\partial T}{\partial r}\right)$$

p. 466 - Equation (10.3-44)
The equation should be written as

$$\xi = \frac{r}{R}$$

p. 555 - Equation (B.3-11)
The equation should be written as

$$p(x) = \exp\left(\int^x \frac{a_1(u)}{a_o(u)}\, du\right)$$

p. 555 - Equation (B.3-12)

The equation should be written as

$$p(x)\,\frac{d^2y}{dx^2} + \frac{a_1(x)}{a_o(x)}\,p(x)\,\frac{dy}{dx} + \frac{a_2(x)}{a_o(x)}\,p(x)\,y = 0$$

p. 555 - Example B.12
Equation (2) should be written as

$$p(x) = \exp\left(-\int^x \frac{du}{u}\right) = \frac{1}{x}$$

p. 560 - Equation (B.3-28)
The equation should be written as

$$\frac{\partial T}{\partial t} = \alpha\,\frac{\partial^2 T}{\partial x^2}$$

p. 560 - Equation (B.3-33)
The equation should be written as

$$\xi = \frac{x}{L}$$