ERRATA

Fluid Mechanics – A Problem Solving Approach by Uddin (CRC Press)

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Pg 8:

$$\beta = \left(\frac{\partial V}{\partial T}\right)_P = \frac{-1}{\rho}\left(\frac{\partial \rho}{\partial T}\right)_P$$

Should be corrected as

$$\beta = V\left(\frac{\partial V}{\partial T}\right)_P = \frac{-1}{\rho}\left(\frac{\partial \rho}{\partial T}\right)_P$$

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Pg 15, Ex 1.3
The final solution is printed as

$$\tau_{rz}\big|_{r=r_o} = \frac{\mu_o U_o^m}{r_o^m}\left(\frac{m+1}{m}\right)^m$$

Should be corrected as

$$\tau := \frac{(-1)^m \mu o\ Uo^m \left(\frac{m+1}{m}\right)^m}{ro^m}$$

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Pg 52: In Example 2.8

The length of the inclined surface is 0.5 m and the width is 0.6 m.

Should be corrected as

The length of the inclined surface is 0.6 m and the width is 0.5 m.

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Pg 53: In Example 2.8

$$z_R = z_{cen} + \frac{I_{xxc}}{A} = 1.43\ m$$

Should be corrected as

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$$x_R = x_{cen} + \frac{I_{xz,cen}}{z_{cen} \cdot A}$$
Pg 65 Ex 3.2 $$\vec{V} = \sqrt{16y^2 + x^2 - 14x + 49 + 9z^2}$$ At origin ($x = y = z = 0$), we have $\vec{V} = 7$. At y-axis ($x = z = 0$), we have: $$\vec{V} = \sqrt{16y^2 + 80y + 149}$$ **Correct is** $\sqrt{4.x^2 + 16.y^2 + 9.z^2 - 28.x + 80.y + 149.}$ **V=** 12.20655562
Pg 72 **Example** A velocity field in fluid is given by: $$\vec{V} = 3xy^3\hat{i} + 3xy\hat{j} + (3zy + 4t)\hat{k}$$ Find (i) magnitude and direction of u, v, and w velocity components (ii) vorticity vector Add in question statement At x=3.6666,y=1,z=1.
Pg 75

The equation $$y = y_p \exp\left[\left(\sqrt{\ln\left(\frac{x}{x_p}\right)} + 1\right) - 1\right]^2$$

Has derivational error

Correction:

$$\frac{dx}{x} = 3(t+1)dt$$

Integrating both sides:

$$\int \frac{dx}{x} = 3\int (t+1)dt$$

$$\ln x = \frac{3}{2}t^2 + 3t + C_1$$

$$x(t) = C_1 \exp\left(\frac{3}{2}t^2 + 3t\right)$$

Similarly, for $y(t)$:

$$v = \frac{dy}{dt} = 3y(t-1) \quad \Rightarrow \quad \frac{dy}{dt} = 3y(t-1)$$

Separating the variables:

$$\frac{dy}{y} = 3(t-1)dt$$

Integrating both sides:

$$\int \frac{dy}{y} = 3\int (t-1)dt$$

$$\ln y = \frac{3}{2}t^2 - 3t + C_2$$

$$y(t) = C_2 \exp\left(\frac{3}{2}t^2 - 3t\right)$$

Applying the initial condition (x_p, y_p) at $t = 0$:

$$x(0) = x_p = C_1 \exp\left(\frac{3}{2} \times 0^2 + 3 \times 0\right) \Rightarrow C_1 = x_p$$

$$y(0) = y_p = C_2 \exp\left(\frac{3}{2} \times 0^2 - 3 \times 0\right) \Rightarrow C_2 = y_p$$

Therefore, the trajectory equations are:

$$x(t) = x_p \exp\left(\frac{3}{2}t^2 + 3t\right)$$

$$y(t) = y_p \exp\left(\frac{3}{2}t^2 - 3t\right)$$

Pg 91

If we consider incompressible flow then density will be removed from this equation, and the equation will reduced to form:

$$\nabla(\vec{V}) = 0$$

Should be corrected as

$\nabla \cdot \vec{V}$ =0
Pg 195: $$u(y) = \frac{-1}{2}\left(\frac{1}{\mu}\frac{\partial P}{\partial x}\right)\left[y^2 - h^2\right]$$ The substitution β is introduced to make the analysis simple: Should be corrected as $$u = \frac{\beta}{2}\left(h^2 - y^2\right)$$
Pg 201: $$u = \frac{dP}{dz}\frac{r^2}{4\mu} - \frac{dP}{dx}\frac{r_w^2}{4\mu} \quad (8.5)$$ This equation should be read as $$u = \frac{dP}{dz}\frac{r^2}{4\mu} - \frac{dP}{dz}\frac{r_w^2}{4\mu}$$
Pg 278

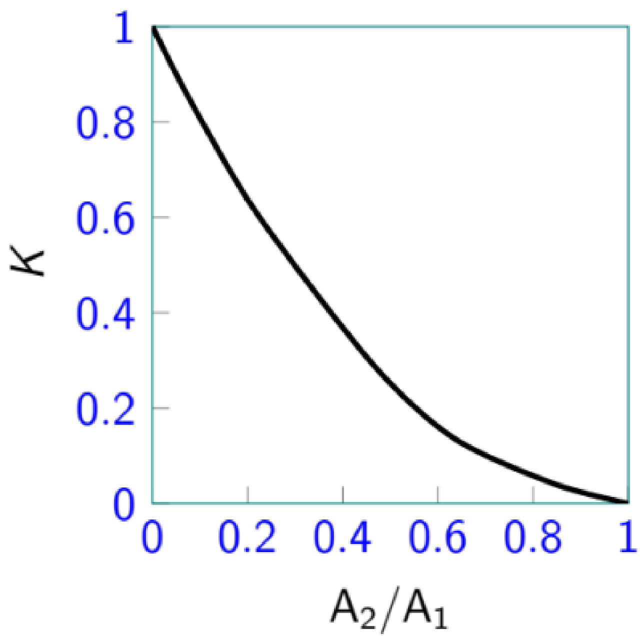

Figure 30: K factor for sudden Enlargement for $A_2 > A_1$.

Correction: In plot **abscissa** is A_1/A_2.

Pg 379

$$A = \frac{-ca}{\sinh(mh)\underbrace{\cos(m\pi)}_{1}}$$

The correct is

Since at $x=\pi/2$, $\eta=a$

$$A = \frac{-ca}{\sinh(mh)\underbrace{\sin(m\pi/2)}_{1}}$$

Pg 385

$$w = \frac{\partial \psi}{\partial z}$$ Should be taken as $$w = -\frac{\partial \psi}{\partial x}$$
Pg 385 The stream function we have already defined as: $$\psi(x, \eta) = c\eta + A\sinh(mh + m\eta)\sin(mx)$$ Should be read as $$\psi(x, z) = c \cdot z + A \cdot \sinh(m \cdot h + m \cdot z) \cdot \sin(m \cdot (x - c \cdot t))$$
Pg 417: The speed of sound or the posted speed is the speed at which an infinite chasm of a small pressure wave travels in the matter **Correct**: The speed of sound or the acoustic speed is the speed at which a small pressure wave travels in the matter
Pg 425 **Figure 16.5** The movement of a military aircraft at a speed ~~higher than~~ close to the acoustic speed. u, far greater than the speed at which the sphere is moving in the medium. The β is the cone half angle in a 2D plane. Note that the type of shockwave that is formed is an oblique shockwave. Figure 16.5 shows the movement of a military aircraft at a speed ~~higher than~~ approaching the acoustic speed.