Mechanical Vibration: Analysis, Uncertainties, and Control H. Benaroya & M. Nagurka, 2010 ERRATA

p.x: Web site for Matlab primer is incorrect. It should be: http://www.crcpress.com/product/isbn/9781420080568

p.15: Figure 1.7c. The words "Suspension system" belong with the upper spring/damper. In their place, they should be replaced with the words "Tire stiffness & damping".

p.64: In Figure 2.6, *l* should be replaced by *L*.

p.99: After "Therefore, the period of oscillation is" should be $T = 2(t_1 + t_2) = 2(0.175+0.0658) = 2(0.241) = 0.482$ s

p.101: In Equation 2.31 there is a missing subscript. It should be $x_p(t)$ in the numerator on the left.

p.134: In Problem 8 the following could be added for clarification: "Assume the materials of the two parts of the shaft are (*i*) not the same and (*ii*) the same. Express your answers in terms of known quantities."

p.147: In the equation for natural frequency (the second equation), there should be a square root on the right-hand side and it should be K (not k).

p.149: In Problem 35 each shaft is rigidly mounted to its support and to the disk. The second sentence should start "From solid mechanics, for each shaft the relation between the moment on the disk M and ..."

p.153: In Problem 44 the last sentence should be "Compare the results."

p.155: In Figure 2.65 the direction of the force should be reversed.

p.175: In Figure 3.12 the units of x(t) are missing. It should be "x(t) (cm)".

p.186: Fig 3.16: The spiral continues to the origin for $\zeta = 0.1$

p.186: In the equation for the signum function it should be if \dot{x} (xdot, not x) is <, =, and > 0.

p.187: Right after Equation 3.15, it should be $F_{\mu} = \mu_k g \pmod{F_{\mu}} = \mu_k g \operatorname{sgn}(\dot{x})$.)

p.188: The sentence "The initial conditions can be found using" should be changed to "The constants *A* and *B* can be found using".

p.201: In Example 3.7, before the sentence "Derive the equation of motion," the following sentence should be added "When y = 0 the beam is horizontal and in static equilibrium."

p.202: In the equation above Section 3.5.2, the right-hand side is missing the factor *ka*. (The right-hand side should be $\frac{kaA}{l}\sin \omega t$.)

p.203: The definition of the frequency response function in Equation 3.32 should be $H(i\omega) = \frac{X(i\omega)}{A/k}.$ This means Equation 3.32 should be: $H(i\omega) \equiv \frac{X(i\omega)}{A/k} = \frac{k}{m(-\omega^2 + 2i\omega\zeta\omega_n + \omega_n^2)}$ $= \frac{\omega_n^2}{(-\omega^2 + 2i\omega\zeta\omega_n + \omega_n^2)} = \frac{1}{(1 - (\omega/\omega_n)^2 + 2i\zeta\omega/\omega_n)}$

The equations at the bottom of the page should be:

$$X(i\omega) = (A/k)H(i\omega)$$
$$= (A/k)|H(i\omega)|e^{-i\phi}$$

p.204: In Equation 3.33 it should be A/k not A. In Equation 3.34 the numerator should be 1 not 1/k. (This makes Equation 3.34 exactly β .)

p.226: The equations for $x_s(t)$ should be

$$x_{s}(t) = \frac{a_{0}}{2} + \sum_{p=1}^{\infty} x_{p}(t)$$
$$= \frac{a_{0}}{2} + \sum_{p=1}^{\infty} A_{p} \Big[a_{p} \cos(p\omega_{T}t - \theta_{p}) + b_{p} \sin(p\omega_{T}t - \theta_{p}) \Big]$$

p.232: In Problem 5 the first word should be "A" not "An".

p.237: In each part of Problem 15 "F(t)" should be "F(t)/m". In Problem 16, replace the last sentence with "Show the cases on a plot of the magnification factor vs. frequency ratio."

p.238: In Problem 20 the numerator should be "1" not "1/k".

p.240: In Problem 26 the last sentence should end: "with $\pm 1\%$ accuracy error." In Problem 28 part (b) the amplitude should be *A* (not *D*) to match Equation 3.42 (p.213).

p.251: In the definition of the unit step function (at the bottom of page), delete "s". It should be " $t \ge t_0$ ".

p.261: The second word of the first paragraph should be "name" not "named".

p.271: In Example 4.4 the problem statement is accidentally repeated in the Solution with a new equation number and footnote.

p.276: In Example 4.7 (in the fourth line) at the equilibrium position the disk has velocity v_0 . (not with dot).

p.294: In the line after Equation 4.34, the equation " $\tau = 1/(\zeta \omega)$ " should be replaced with " $\tau = 1/(\delta f)$ where δ is the log decrement and *f* is the frequency in Hertz."

p.296: In the second paragraph, the phrase "we can substitute the expression for x(t)" should be replaced by "we can substitute the second derivative of x(t)".

p.309: In Problem 2, it should be "Example 4.1" (not Example Problem 4.1). In Problem 3, the units for the torque T should "kN-m" (not kN/m).

p.310: In Problems 7 and 8, "F(t)" should be "F(t)/m" and "forces" should be "forces per mass".

p.311: In Problem 10 assume zero initial conditions and an underdamped response. In Figure 4.28, *M* should be shown in the positive θ direction.

p.375: In Equation 5.39 and the equation above it $X(i\omega)$ is the Fourier transform of x(t). In the equation $x_s(t) = X(i\omega) e^{i\omega\tau}$ it is the amplitude of $x_s(t)$ – not the Fourier transform of x(t). This is confusing and in this section $X(i\omega)$ is intended as the Fourier transform. (The $x_s(t)$ equation can be deleted.)

p.459: The second equation should not have dots before the unit vectors.

p.479: In Example 7.6, there are missing commas in the first two equations. It should be $q_1 = l - r$, $q_2 = r$ and then below it $\dot{q}_1 = -\dot{r}$, $\dot{q}_2 = \dot{r}$

p.481: In the last sentence the phrase "power two and higher" should be "power three and higher".

p.493: In Problem 2 the equation of motion shown is not correct. It should be: $m(a^2 + 4l^2\cos^2\theta)\ddot{\theta} - 2ml^2\dot{\theta}^2\sin 2\theta + mg(5a + 4b)\cos\theta + \frac{1}{2}ka^2\sin 2\theta = 0.$

p.494: In Problem 3 the equation of motion shown is not correct. It should be:

$$\left(m\left(l+r\right)^2 + \frac{2}{5}mr^2\right)\ddot{\theta} + ka^2\sin\theta\cos\theta - mg\left(l+r\right)\cos\theta = 0$$

where l is the length of the rod. This length is not drawn correctly in the figure. (It should be drawn to the left edge of the sphere, not to its center.)

p.495: In Figure 7.15 the grounding symbol should not be used since it is not an inertial ground. The top line should be shown without any grounding symbol. In Problem 11 it should be "Formulate the equations of motion" rather than "equation of motion".

p.496: In Figure 7.16 the grounding symbol should not be used since it is not an inertial ground. The top line should be shown without any grounding symbol.

p.510: In the solution to Example 8.2, $P_2 = -k_2x_1$ in the first set of equations.

p.535: An equal sign is missing in last equation. It should be $m_3 = \frac{W_{car} + W_{cable}}{g} = \frac{1250 \text{ lb}}{g}$ **p.539**: Near the bottom of the page there are missing units with *f*. It should be $f_1 = 1 \text{ N}, f_2 = 0 \text{ N}$

p.541: In the second line delete the word "dimensionless". (The squares of the natural frequencies have units.)

p.550: In Footnote 28 the equation should be $\theta(t)=A\cos(\omega t-\phi)$.

p.558: In the last sentence of the paragraph before Equation 8.60 it should state: "Similarly we can rewrite the last two terms in Equation 8.59 by following a similar procedure for the complex conjugate pairs. For $x_1(t)$, the ratios r_{11} and ..."

p.581: All equations should have = signs, i.e., in two places replace \approx by =.

p.596: In Figure 8.41 the grounding symbol should not be used since it is not an inertial ground. The earth should be shown shaded without the grounding symbol.

p.597: In Problem 12, it should refer to the system of Figure 8.12.

p.599: In Problem 18 the second equation of motion has two errors: (1) the term $(I_0 + \frac{L}{2})\ddot{\theta}$

should be
$$\left(I_0 + \frac{mL^2}{4}\right)\ddot{\theta}$$
 and (2) the term $mg\frac{L}{2}\sin\theta$ should just be $mg\frac{L}{2}\theta$.

p.604: In Prob. 37, in the two forces, replace ω_1 by Ω_1 and ω_2 by Ω_2 in order to distinguish between forcing frequencies and natural frequencies.

p.668: In the caption for Figure 9.23 it should be $B=0.74(g/V)^4$.

p.669: In Problem 2 the rotation in the system is unrestrained. The figure is not clear at the boundaries.

p.705: The normalized modes $(\hat{U}_j(x))$ should be used (in place of $U_j(x)$) in several places, including in Equations 10.43 and 10.44, right before the unnumbered equation $(m\hat{U}_k(x))$, in the unnumbered equation (three places: $\hat{U}_k(x)$ to the left, $\hat{U}_j(x)\hat{U}_k(x)$ to the right), and in the sentence right after the unnumbered equation $(\hat{U}_j(x))$. No change is needed in the sentence beginning with: "We normalize Equation 10.42 for $U_j(x)$ via ..."

In Equation 10.46 there is no j subscript in the derivative.

p.758: In the last sentence of Problem 3, it should ask for the value of the tension, not the value of ω_1 . Also, m = 5 kg/m (not ρ).

p.759: In Problem 6, the beam is fixed-fixed, not cantilever.

p.768: In Problem 42 the length is not provided. It should be L = 1000 in. In Problem 45, it should be Equation 10.124.

p.929: In Equation A.14, in the Taylor expansion, sin a should be replaced by sin θ_0 .

p.930: The reference to "Table 1.1" in the second to last paragraph should be "Table A.1".

p.945: In Table A.2 the function of time entry "Au(t) step" should just be "u(t) step". Also, the Laplace Transform entry "f(s-a)" for exp(-at)f(t) should be "F(s-a)".

Last updated: Nov 28, 2010