

Errata File
for
Fundamentals of Electrical Engineering
Third Printing
by
Giorgio Rizzoni
compiled by
Dr. Ralph Tanner
Western Michigan University

This errata file identifies errors that have been noted in the third printing.

p.26: Figure 2.24 (b): The battery symbol is upside down, based upon the polarity shown.

p.214: "... in the form of equation 5.50, with $K_S = 1$, $\omega_n^2 = 1/LC$..." should read "... in the form of equation 5.50, with $\omega_n^2 = 1/LC$..."

p.214: "... by inspection that $K_S = 1$; $\omega_n = 1/\sqrt{LC}$..." should read "... by inspection that $\omega_n = 1/\sqrt{LC}$..."

p.214: "... we have $s_{1,2} = -12.5 \pm j316.2$..." should read "... we have $s_{1,2} = -12.6 \pm j316.0$..." The second line of the equation immediately below this should then be:

$$= \alpha_1 e^{(-12.6+j316.0)t} + \alpha_2 e^{(-12.6-j316.0)t}$$

p. 215: Caption for Figure 5.43: "Natural response of underdamped ..." should read "Natural response of overdamped ..."

p.229: The text neglects to divide the voltage drop across the resistor by the inductance. This causes errors in α_1 and α_2 at the bottom of the page and in the voltage across the spark plug on the following page. The student should trace through these errors to obtain the correct solution (-819.2 V). Note that there is also one additional sign error in the final computation by the text of the initial voltage across the spark plug.

p.249: CHECK YOUR UNDERSTANDING: The answers are incorrect. They should be 800, 800, and 800; phase (degrees) -22.918E-6, -229.18E-6, and -22.919E-3

p.276: Problem 6.45: C should equal 1 mF

p.280: "... with phase angle $\theta_V = \pi/6$ and ..." should read "... with phase angle $\theta_V = 0$ and ..."

p.285: In the **Known Quantities:** section: "load resistance and inductance values" should read "load resistance and capacitance values."

p.290: Under FOCUS ON METHODOLOGY: step 4. should read, "If Q is negative, the load is capacitive; if positive, the load is inductive."

p.300: Example 7.10: Step 2:

$$X_C = \dots = \frac{(480)^2}{-102 \times 10^5} = \dots$$

should read

$$X_C = \dots = \frac{(480)^2}{-102 \times 10^3} = \dots$$

p.303: The second equation that reads:

$$C = \frac{1}{\omega X_C} = \dots$$

should read:

$$C = -\frac{1}{\omega X_C} = \dots$$

p.334: Problem 7.53: "a. The plot number." should read "a. The slot number."

p.336: Problem 7.65: "b. Node analysis." should read "b. Node analysis, or"

p.370: The last equation on the page which begins " $Z_S = R_1 + j\omega L = \dots$ " should read " $Z_S(j\omega) = R_1 + j\omega L + \dots$ "

p.383: Equation 8.76 should be $v(t) = AV \sin \omega t$.

p.383: Equation 8.77 should be $\frac{dv(t)}{dt} = \omega AV \cos \omega t$.

p.383: Equation 8.78 should be $\left. \frac{dv(t)}{dt} \right|_{max} = \omega \times AV = S_0$.

p.393: Figures P8.6, P8.7, P8.8, P8.9, and P8.10: The +/- terminals on the op-amps are reversed.

p.395: Figures P8.15, P8.17, and P8.19: The +/- terminals on the op-amps are reversed.

p.396: Figure P8.22: The +/- terminals on the op-amps are reversed.

p.396: Problem 8.24: "(See Table 2.1 ...)" should read "(See Table 2.2 ...)"

p.399: Figure P8.42: The +/- terminals on the op-amps are reversed.

p.403: Figure P8.65: The +/- terminals on the op-amps are reversed.

p.408: Learning Objectives: 4: "Section 9.4." should read "Sections 9.4, 9.5."

p.424: " $P = 2.5 \text{ W} - (75^\circ \text{ C} \times 0.02 \text{ mW}/^\circ\text{C}) \dots$ " should read " $P = 2.5 \text{ W} - (75^\circ \text{ C} \times 0.02 \text{ W}/^\circ\text{C}) \dots$ "

p.428: Figure 9.35: The diode on circuit model should be a resistor in series with a battery. The figure instead shows a resistor in series with a capacitor.

p.433: "Figure 9.43(b) depicts ..." should read "Figure 9.43(c) depicts ..."

p.473: "... to the collector characteristic curves of Figure 10.19 ..." should read "... to the collector characteristic curves of Figure 10.25 ..."

p.478: Figure 10.28: The time scale on the analog signal should reset to 0 at 24 hours. The next marks would then represent 4 and 8, respectively.

p.481: "... that diode D_2 is still forward-biased, but diode D_1 is now reverse biased because of the 5-V potential at v_2 ..." should read "... that diode D_2 is still forward-biased, but diode D_1 is now reverse biased because of the 5-V potential at v_1 ..."

p.481: " $v_{out} = V_{CC} - I_C R_3 = \dots$ " should read " $v_{out} = V_{CEsat} = 0.2 \text{ V}$ "

p.487: Figure P10.36: There should be a dot at the intersection of the circuit paths joining R_1 , R_2 , C_b , and the transistor to indicate that the two crossing paths are connected.

p.492: "... predominantly discuss enhancement MOSFETs in this chapter, although a brief discussion of depletion devices and JFETs is also included." should read "...discuss enhancement MOSFETs in this chapter."

p.498: "...intersection of the load line with the $V_{GS} = 2.4 \text{ V}$ curve." should read "...intersection of the load line with the $v_{GS} = 2.4 \text{ V}$ curve."

p.500: In the **Find:** section, delete "and quiescent drain-source voltage v_{DSQ} ."

p.504: The second equation of 11.11 is missing a term. However, the whole second equation may be eliminated because it is duplicated with the missing term present in the first equation of 11.12.

p.506: " $V_{DD} - V_B < v_G - V_T$, so actually ..." should read "so actually ..."

p.512: CHECK YOUR UNDERSTANDING: Answer should be 83.3Ω

p.513: The analysis is botched and cannot be easily corrected. When an input is off (low voltage), the corresponding NMOS will be off and the corresponding PMOS will be on. When an input is high, the corresponding NMOS will be on and the corresponding PMOS will be off. Therefore, the analysis for case 1 ($v_1 = v_2 = 0$) should be that M_1 and M_2 are on and M_3 and M_4 are off, as is indicated in Figure 11.21. This will result in $v_{out} = 5 \text{ V}$. The analysis for case 2 ($v_1 = 5 \text{ V}$ and $v_2 = 0 \text{ V}$) should be that v_1 turns M_1 off and M_3 on. Since v_2 still is 0, M_2 remains on and M_4 remains off. This will result in $v_{out} = 0 \text{ V}$. There is no figure that corresponds to this configuration shown. The analysis for case 3 ($v_1 = 0 \text{ V}$ and $v_2 = 5 \text{ V}$) should be that v_1 leaves M_1 on and M_3 off as it did in case 1. Since v_2 is now 5 V, M_2 will be off and M_4 will be on as is depicted in Figure 11.22 (b). This will result in $v_{out} = 0 \text{ V}$. The analysis for case 4 is

correct and corresponds to Figure 11.22(c). Figure 11.22(a) can not be created using the inputs available to Figure 11.20. In the table, when $v_1 = v_2 = 0$ V, M_3 will be **Off**; when $v_1 = 0$ V and $v_2 = 5$ V, M_4 will be **On**. Otherwise, the table is correct.

p.515: Problem 11.2: “b. In the active region” should read “b. In the saturation region”

p.516: Problem 11.6: “... $v_{GS} = 5$ V, $R_{DS} = 500$ Ω , and $v_{GD} = 4$ V.” should read “... $v_{GS} = 5$ V.”

p.518: Problem 11.19: “Determine the output current ...” should read “Determine the drain current ...”

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p.522: Learning Objectives: 7. “Section 12.7” should read “Section 12.6”

p.565: Figure 12.64(b): Note that the Preset and Clear are on for most of the timing diagram. Therefore, the timing of the enable is not effectively shown. The timing of the enable will be shown in the lecture.

p.565: Figure 12.64(c): This is the schematic for a $\bar{R}\bar{S}$ quad latch (latch is another name for a flip-flop), rather than the RS latch described in parts (a) and (b).

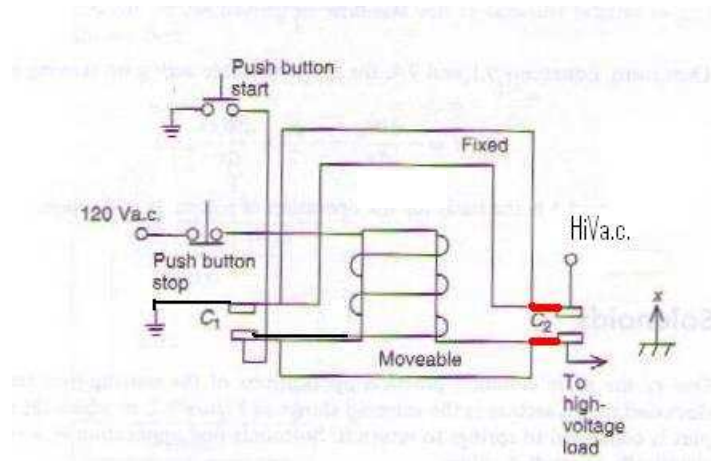
p.574: The analysis section assumes (without explicitly stating) that the Preset and Clear are only effective on a clock pulse. Although this doesn't correlate to statements earlier in the text, it is correct for many commercially available latches.

p.583: Figure P12.70: There should not be a dot where the horizontal line from the x input crosses the vertical line from the y input.

p.602: CHECK YOUR UNDERSTANDING: Answer should be 1.4 μ A-turns/Wb

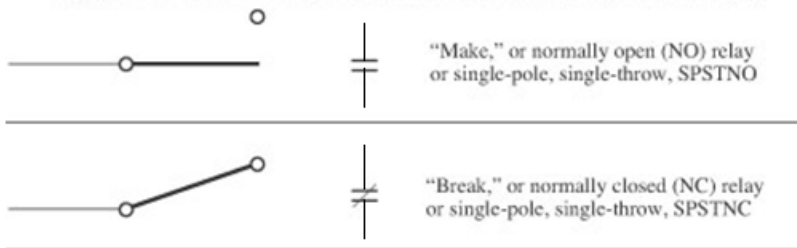
p.604: “A rule of thumb used to account for fringing is to add the length of the gap to the actual cross-sectional area.” should read “A rule of thumb used to account for fringing is to add the length of the gap to each dimension of the cross-sectional area.”

p.625: Figure 13.39 is not correct. Please refer to the following figure:



p.626: Figure 13.40: The upper two figures should look as:

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p.639: Problem 13.28: "... $\mathcal{R}(x)=7 \times 10^8 \dots$ " should read "... $\mathcal{R}(x)=7 \times 10^8 \dots$ "

p.641: Figure P13.41: The electrical portion of this figure is incorrect. See the correction to Figure 13.39 on p.625 above.

p.656: Figure 14.6(a): The arrows on the belt are pointing the wrong way. They should be reversed.

p.658: Figure 14.11: N and S are reversed

p.660: Configuration of DC machines: This is not errata, per se. However, for the novice reader, it may not be clear that this section has abandoned the assumption that the field is created by a permanent magnet. This section addresses creation of the field magnetism. Again, this is not errata, per se. There are no errors in this section, but the novice reader could easily become confused.

p.673: Equation 14.53: should read:

$$T(t) = k_{T,PM} I_a(t) = T_{load}(t) + b\omega_m(t) + J \frac{d\omega_m(t)}{dt}$$

p. 675: The equation below “Knowing the motor constant ...”

$$\omega_m = \frac{E_a}{k_a \phi} = \dots$$

should read

$$\omega_m = \frac{E_b}{k_a \phi} = \dots$$

p.680: the equation:

$$\Omega_m(s) = \dots - T_{load}(s)$$

should read:

$$\Omega_m(s) = \dots (-T_{load}(s))$$

p.697: “... reaching a maximum value called the **pull-up torque** ...” should read “... reaching a minimum value called the **pull-up torque** ...”

p.699: The synchronous speed for an eight pole motor should be 900 rpm.

p.702: Problem 14.7: “Assuming it is delivering rated current at rated speed, ...” should read “Assuming it is delivering rated current at rated power, ...”

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There are a dozen pages of errata contained here. At first blush, this might be considered excessive. However, the errors are generally minor and are of the type that the knowledgeable reader would tend to “self-correct” when reading the material.

But, since this is a text intended for the student, these errors can cause self-doubt and can get in the way of learning the material. The student may tend to believe that the error is in their understanding rather than in the printing of the book. For this reason, this errata file has been very picky.

I would recommend that the student adopt one of two strategies with this errata file:

- 1) Go through the entire errata file and mark the changes in the book.
- 2) Go through the entire errata file and put a prominent red dot on each page where an erratum occurs.

I believe the first strategy is the best. This allows the student to have the correct information at the point when it is needed. However, the second strategy will alert the student to a possible point of confusion. If a topic on the page in question causes confusion, the student can make the change at that time. If the topic causing confusion was in error, the student will have the corrected material. If the topic causing confusion was not the one in error, the student will know to keep working to understand the area of confusion.

What I do NOT recommend is the filing of the errata then going to it only when confusion arises.

In my classes, I teach the analysis of circuits. I also teach the engineering methods used to reduce the chance of errors. Engineering is a field where errors may cause the loss of life. (Another is medicine.) Because of this grave responsibility, we need to learn how to minimize errors. One of the methods used to minimize errors is multiple cumulative review. This errata file represents the start of this process. I am certain that I have not found all of the errors in this text. Any student who sends me a reference to an undocumented error in this text will receive extra-credit points.

p. 29: The last sentence of the first paragraph should read:

An example of this dual behavior is exhibited by the photodiode which can act either in a passive mode (as a light sensor) or in an active mode (as a solar cell).

The reference to chapter 9 is a remnant of Dr. Rizzoni's previous book. This book does not cover photodiodes.

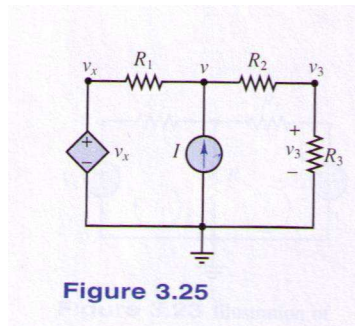
p. 44: CHECK YOUR UNDERSTANDING: The first sentence should read: "Compute the full-scale (i.e., largest) output voltage for the force-measuring apparatus of Example 2.16."

p.77: Figure 3.18: v_1 in the figure for analysis for mesh 2 does not enter into the analysis for mesh 2 so it should not be on that figure.

p. 81: **Analysis:** "We follow the Focus on Measurement ..." should read "We follow the Focus on Methodology ..."

p. 83: on the second line: "(transistors are introduced in Chapter9)" should read "(transistors are introduced in Chapter 10)"

p. 85: Figure 3.25 should be:



p.85: CHECK YOUR UNDERSTANDING: Answer should be $v = \frac{21}{11}V$; $v_3 = \frac{14}{11}V$

p.119: Figure P3.20: The resistor with the missing value should have a value of 4Ω .

p. 133: "**Find:** Charge separation at nominal voltage ..." should read, "**Find:** Charge storage at nominal voltage"

p. 133: The line that reads, "Since we know that the discharge current is 25 A and the available charge separation is 250 F ..." should read, "Since we know that the discharge current is 25 A and the available charge separation is 250 C"

p. 134: CHECK YOUR UNDERSTANDING: Should read, "Compare the charge storage achieved in this ultracapacitor with a (similarly sized) electrolytic capacitor used in power electronics applications, by calculating the charge storage for a 2,000 μF electrolytic capacitor rated at 400 V."

p. 138: CHECK YOUR UNDERSTANDING: Should read, “Compare the energy stored in this ultracapacitor with a (similarly sized) electrolytic capacitor used in power electronics applications, by calculating the energy stored in a 2,000 μF electrolytic capacitor rated at 400 V.”

p. 146: Under “Why Sinusoids?”: “... regarding the analysis of electric power circuits. Note that the methods ...” should read, “... regarding the analysis of electric power circuits. The more ambitious reader may wish to explore **Fourier Analysis** on the web to obtain a more comprehensive explanation of the importance of sinusoidal signals. Note that the methods”

p.148: Equation (4.27) should read:

$$W = TP_{AV} = T\langle p(t) \rangle = \int_0^T p(t') dt' = \int_0^T Ri_{ac}^2(t') dt' = TI_{eff}^2 R$$

p.149: Equation (4.28) should read:

$$I_{eff} = \sqrt{\frac{1}{T} \int_0^T i_{ac}^2(t') dt'} = I_{rms}$$

p. 182: “By analogy with equation 5.8, we call ...” should read “By analogy with equation 5.7, we call ...”

p.184: “using the principle of continuity of inductor voltage and current” should read “using the principle of continuity of capacitor voltage and inductor current.”

p.191: FOCUS ON METHODOLOGY: Step 2: “ $v_C = v_C(0^-)$ ” should read “ $v_C(0^+) = v_C(0^-)$ ”

p.195: Step 4: “... with reference to equation 5.22” should read “... with reference to equation 5.24.”

p.197: Figure 5.19: The vertical scale on the graph should be labeled “Ratio of capacitor voltage to source voltage (v_C/V_B)” and the horizontal scale should be labeled “Time constants (RC)”

p.197: Figure 5.20: The direction of i_L should be counter-clockwise. The vertical scale on the graph should be labeled “Ratio of Inductor current to source current (i_L/I_B)” and the horizontal scale should be labeled “Time constants (L/R)”

p.202: “... with reference to equation 5.25 ...” should read “... with reference to equation 5.24 ...”

p.204: Step 2: “(equation 5.25)” should read “(equation 5.22)”

p.204: Step 4: “... with reference to equation 5.22 ...” should read “... with reference to equation 5.24 ...”

p.210: Under equation 5.49: “In equation 5.48 ...” should read “In equation 5.49 ...”

p.211: “... $\zeta = 0.2$ in the differential equation 5.48 ...” should read “... $\zeta = 0.2$ in the differential equation 5.49 ...”

p.214: "... in the form of equation 5.50, with $K_S = 1$, $\omega_n^2 = 1/LC$..." should read "... in the form of equation 5.50, with $\omega_n^2 = 1/LC$..."

p.214: "... by inspection that $K_S = 1$; $\omega_n = 1/\sqrt{LC}$..." should read "... by inspection that $\omega_n = 1/\sqrt{LC}$..."

p.214: "... we have $s_{1,2} = -12.5 \pm j316.2$..." should read "... we have $s_{1,2} = -12.6 \pm j316.0$..." The second line of the equation immediately below this should then be:

$$= \alpha_1 e^{(-12.6+j316.0)t} + \alpha_2 e^{(-12.6-j316.0)t}$$

p. 215: Caption for Figure 5.43: "Natural response of underdamped ..." should read "Natural response of overdamped ..."

p.216: "... the exponential decay term $2\alpha e^{-\zeta\omega_n t}$." should read "... the exponential decay term $2\alpha e^{-\zeta\omega_n t}$."

p.218: FOCUS ON METHODOLOGY: Step 2: "... $i_L(0^+) = i + L(0^-)$..." should read "... $i_L(0^+) = i_L(0^-)$..."

p.218: FOCUS ON METHODOLOGY: Step 3: "(equation 5.9 or 5.49)" should read "(equation 5.13 or 5.49)"

p.219: Step 2: "... continuity of inductor voltage and capacitor currents ..." should read "... continuity of inductor current and capacitor voltage ..."

p.221: **Find:** "... the differential equation in $i_L(t)$ describing ..." should read "... the differential equation in $v_C(t)$ describing ..."

p.221: **Schematics ...:** " $R = 500 \Omega$ " should read " $R = R_S = 1000 \Omega$ "

p.222: Step 2: "... continuity of inductor voltage and capacitor currents ..." should read "... continuity of inductor current and capacitor voltage ..."

p.224: Step 2: "... continuity of inductor voltage and capacitor currents ..." should read "... continuity of inductor current and capacitor voltage ..."

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p.249: CHECK YOUR UNDERSTANDING: The answers are incorrect. They should be 800, 800, and 800; phase (degrees) -22.918E-6, -229.18E-6, and -22.919E-3

p.254: The equation at the bottom of the page is missing the equal sign between $H(j\omega)$ and the fraction.

p.255: "... around the frequency of 300 rad/s, the magnitude ..."
should read "... around the frequency of 800 rad/s, the magnitude ..."

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p.285: In the **Known Quantities:** section: "load resistance and inductance values" should read "load resistance and capacitance values."

p.290: Under FOCUS ON METHODOLOGY: step 4. should read, "If Q is negative, the load is capacitive; if positive, the load is inductive."

p.290: The equation at the bottom of the page: " $= 86.6 + j50 \text{ W}$ " should read " $= 86.6 + j50 \text{ VA}$ "

p.291: The equation at the bottom of the page: " $= 1,192 - j316 \text{ W}$ " should read " $= 1,192 - j316 \text{ VA}$ "

p.293: Under 1: The equation that reads " $S_a = \dots = 503 + j839 \text{ W}$ "
should read " $S_a = \dots = 503 + j839 \text{ VA}$ "

p.297: The equation at the bottom of the page: " $S = \dots = 68.4 + j118.6 \text{ W}$ "
should read " $S = \dots = 68.4 + j118.6 \text{ VA}$ "

p.300: Example 7.10: Step 2:

$$X_C = \dots = \frac{(480)^2}{-102 \times 10^5} = \dots$$

should read

$$X_C = \dots = \frac{(480)^2}{-102 \times 10^3} = \dots$$

p.302: "where we have selected the positive value of $\arccos(\text{pf}_1)$ because pf_1 is lagging and the negative value of $\arccos(\text{pf}_2)$..." should read "where we have selected the negative value of $\arccos(\text{pf}_1)$ because pf_1 is lagging and the positive value of $\arccos(\text{pf}_2)$..."

p.302: "where, once again ..." should read "where, now ..."

p.303: The second equation that reads:

$$C = \frac{1}{\omega X_C} = \dots$$

should read:

$$C = -\frac{1}{\omega X_C} = \dots$$

p.303: “discussed in Chapter 14.” should read “discussed in Chapter 13.”

p.304: “... as explained in Chapter 14.” should read “as explained in Chapter 13.”

p.306: The equation at the end of the example that reads:

$$\tilde{I}_{primary} = \frac{7,500 \text{ W}}{4,800 \text{ A}} = 1.5625 \text{ A}$$

should read:

$$\tilde{I}_{primary} = \frac{7,500 \text{ W}}{4,800 \text{ V}} = 1.5625 \text{ A}$$

p.306: CHECK YOUR UNDERSTANDING: The answer should be: $n_1 = 6,000$

p.313: “... as will be explained in Chapter 15 ...” should read “... as will be explained in Chapter 14 ...”

p.316: CHECK YOUR UNDERSTANDING: The second answer should be: $S_L = 69.12 \text{ kW} + j207.4 \text{ kVA}$

p.318: Equation 7.64: $(\tilde{I}_{an})_y$ “” should be $(\tilde{I}_a)_y$ ”

p. 326: Conclusion 2: “... (that for which the user is charged) ...” should be changed to “... (that which does work for the user) ...” A sentence should be added after this sentence which would read, “However, the user is charged for all of the power supplied by the utility company, both real and reactive.

p.326: Conclusion 2: “... and it can be minimized by ...” should be replaced by “... and the reactive power can minimized by ...”

p.334: Problem 7.53: “a. The plot number.” should read “a. The slot number.”

p.336: Problem 7.65: “b. Node analysis.” should read “b. Node analysis, or”

p.356: “... which is discussed in Section 8.6.” should read “... which is discussed in Section 8.5.”

p. 361: “The second amplifier, and inverting ...” should read “The second amplifier, an inverting ...”

p.362: “... ranging from 1 to 50 ...” should read “... ranging from 1 to 10 ...”

p.363: “(see Table 2.1)” should read “(see Table 2.2)”

p.363: “... inspection of Table 2.1 reveals ...” should read “... inspection of Table 2.2 reveals ...”

p.363: “... as explained in Section 8.6.” should read “... as explained in Section 8.5.”

p.367: "... filter response for frequencies is significantly higher ..." should read "... filter response for frequencies significantly higher ..."

p.370: The last equation on the page which begins " $= R_1 + j\omega L = \dots$ " should read " $Z_S(j\omega) = R_1 + j\omega L + \dots$ "

p.371: Figure 8.28: The dashed lines in the two diagrams refer to the circuit in Figure 8.20. The solid lines in the two diagrams refer to the circuit in Figure 8.27 (Example 8.7).

p.371: CHECK YOUR UNDERSTANDING: "... for the filter of Example 8.6 at the cutoff ..." should read "... for the filter of Example 8.7 at the cutoff ..."

p.372: "... the **analog computer**, which is discussed in Section 8.5. Example 8.8 illustrates ..." should read "... the **analog computer**. Example 8.8 illustrates ..."

p.383: Equation 8.76 should be $v(t) = AV \sin \omega t$.

p.383: Equation 8.77 should be $\frac{dv(t)}{dt} = \omega AV \cos \omega t$.

p.383: Equation 8.78 should be $\left| \frac{dv(t)}{dt} \right|_{max} = \omega \times AV = S_0$.

p.393: Figures P8.6, P8.7, P8.8, P8.9, and P8.10: The +/- terminals on the op-amps are reversed.

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p.408: Learning Objectives: 4: "*Section 9.4.*" should read "*Sections 9.4, 9.5.*"

p.424: " $P = 2.5 \text{ W} - (75^\circ \text{C} \times 0.02 \text{ mW}/^\circ\text{C}) \dots$ " should read " $P = 2.5 \text{ W} - (75^\circ \text{C} \times 0.02 \text{ W}/^\circ\text{C}) \dots$ "

p.426: The equation " $R_T = R_1 + R_2 + R_3 \parallel R_4 = \dots$ " should read " $R_T = R_3 + R_4 + R_1 \parallel R_2 = \dots$ "

p.428: Figure 9.35: The diode on circuit model should be a resistor in series with a battery. The figure instead shows a resistor in series with a capacitor.

p.433: "... shown in Figure 9.43(a) for the case ..." should read "... shown in Figure 9.43(a&b) for the case ..."

p.433: "Figure 9.43(b) depicts ..." should read "Figure 9.43(c) depicts ..."

p.433: "Figure 9.43(b) depicts ..." should read "Figure 9.43(c) depicts ..."

p.433: "... waveform of Figure 9.43(b) is not ..." should read "... waveform of Figure 9.43(c) is not ..."

p.434: "... similar to that in Figure 9.25, is used ..." should read "... similar to that in Figure 9.29, is used ..."

p.436: CHECK YOUR UNDERSTANDING: "... rectifier of Figure 9.40, assuming ..." should read "... rectifier of Figure 9.41, assuming ..."

p442: The equation:

$$\dots + V_Z \left(\frac{R_S \parallel R_L}{r_Z \parallel R_L + R_S} \right) = \dots$$

should read

$$\dots + V_Z \left(\frac{R_S \parallel R_L}{R_S \parallel R_L + r_Z} \right) = \dots$$

p.448: Problem 9.36: "... that of Figure 9.25 in the text ..." should read "... that of Figure 9.20 in the text ..."

p.448: Problem 9.37: "... that of Figure 9.25 in the text ..." should read "... that of Figure 9.20 in the text ..."

p.460: " $V_C = V_3 = 8 \text{ V}$ " should read " $V_C = V_3 = 4 \text{ V}$ " This changes the following equations:

$$"I_C = \dots = \frac{12 - 8}{1,000} = 4 \text{ mA}" \text{ should read } "I_C = \dots = \frac{12 - 4}{1,000} = 8 \text{ mA},"$$

$$"\frac{I_C}{I_B} = \beta = 80" \text{ should read } "\frac{I_C}{I_B} = \beta = 160,"$$

$$\text{and } "V_{CE} = \dots = 8 - 1.3 = 6.7 \text{ V}" \text{ should read } "V_{CE} = \dots = 4 - 1.3 = 2.7 \text{ V}"$$

to values which now match Figures 10.8 and 10.9.

p.465: "Thus, the diode operating at a higher temperature ..." should read "Thus, the transistor operating at a higher temperature ..."

p.472: " $V_{CE} = 7 \text{ V}$ $I_{CQ} = 22 \text{ mA}$..." should read " $V_{CE} = 6 \text{ V}$ $I_{CQ} = 25 \text{ mA}$..." This leads to changing " $P_{CQ} = \dots = 154 \text{ mW}$." to " $P_{CQ} = \dots = 150 \text{ mW}$."

p.473: "... to the collector characteristic curves of Figure 10.19 ..." should read "... to the collector characteristic curves of Figure 10.25 ..."

p.478: "... $R_C = 1 \text{ k}\Omega$, $\beta = 100$, and $V_{CC} = \dots$ " should read "... $R_C = 1 \text{ k}\Omega$, $\beta = 100$, and $V_{CC} = \dots$ "

p.478: Figure 10.28: The time scale on the analog signal should reset to 0 at 24 hours. The next marks would then represent 4 and 8, respectively.

p.479: "... if both v_A and v_B are 0." should read "... if both v_A and v_B are 0."

p.481: "... that diode D_1 is still forward-biased, but diode D_2 is now reverse biased because of the 5-V potential at v_2 ..." should read "... that diode D_2 is still forward-biased, but diode D_1 is now reverse biased because of the 5-V potential at v_1 ..."

p.481: " $v_{out} = V_{CC} - I_C R_3 = \dots$ " should read " $v_{out} = V_{CEsat} = 0.2 \text{ V}$ "

p.484: Problem 10.12: "With reference to Figure 10.18 ..." should read "With reference to Figure 10.12"

p.485: Problem 10.22: "Find the minimum value of β required ..." should read "Find the value of R_B and the minimum value of β required"

p.487: Figure P10.36: There should be a dot at the intersection of the circuit paths joining R_1 , R_2 , C_b , and the transistor to indicate that the two crossing paths are connected.

p.492: "... predominantly discuss enhancement MOSFETs in this chapter, although a brief discussion of depletion devices and JFETs is also included." should read "... discuss enhancement MOSFETs in this chapter."

p.498: "... intersection of the load line with the $V_{GS} = 2.4 \text{ V}$ curve." should read "... intersection of the load line with the $v_{GS} = 2.4 \text{ V}$ curve."

p.499: The equation " $i_{DQ} = K(v_{GS} - V_T)^2 = 48.5(2.4 - 1.4) = 48.5 \text{ mA}$ " should read " $i_{DQ} = K(v_{GS} - V_T)^2 = 48.5 \times 10^{-3}(2.4 - 1.4)^2 = 48.5 \text{ mA}$ "

p.500: In the **Find:** section, replace "and quiescent drain-source voltage v_{DSQ} " with "and quiescent gate-source voltage v_{GSQ} ."

p.504: The second equation of 11.11 is missing a term. However, the whole second equation may be eliminated because it is duplicated with the missing term present in the first equation of 11.12.

p.506: " $V_{DD} - V_B < v_G - V_T$, so actually ..." should read "so actually ..."

p.512: " $v_{GSQ} = 0 \text{ V}$..." should read " $v_{GSQ} = 2.5 \text{ V}$..."

p.512: CHECK YOUR UNDERSTANDING: Answer should be 83.3Ω

p.513: The analysis is botched and cannot be easily corrected. When an input is off (low voltage), the corresponding NMOS will be off and the corresponding PMOS will be on. When an input is high, the corresponding NMOS will be on and the corresponding PMOS will be off. Therefore, the analysis for case 1 ($v_1 = v_2 = 0$) should be that M_1 and M_2 are on and M_3 and M_4 are off, as is indicated in Figure 11.21. This will result in $v_{out} = 5 \text{ V}$. The analysis for case 2 ($v_1 = 5 \text{ V}$ and $v_2 = 0 \text{ V}$) should be that v_1 turns

M_1 off and M_3 on. Since v_2 still is 0, M_2 remains on and M_4 remains off. This will result in $v_{out} = 0$ V. There is no figure that corresponds to this configuration shown. The analysis for case 3 ($v_1 = 0$ V and $v_2 = 5$ V) should be that v_1 leaves M_1 on and M_3 off as it did in case 1. Since v_2 is now 5 V, M_2 will be off and M_4 will be on as is depicted in Figure 11.22 (b). This will result in $v_{out} = 0$ V. The analysis for case 4 is correct and corresponds to Figure 11.22(c). Figure 11.22(a) can not be created using the inputs available to Figure 11.20. In the table, when $v_1 = v_2 = 0$ V, M_3 will be **Off**; when $v_1 = 0$ V and $v_2 = 5$ V, M_4 will be **On**. Otherwise, the table is correct.

p.515: Problem 11.2: “b. In the active region” should read “b. In the saturation region”

p.516: Problem 11.6: “... $v_{GS} = 5$ V, $R_{DS} = 500 \Omega$, and $v_{GD} = 4$ V.” should read “... $v_{GS} = 5$ V.”

p.518: Problem 11.19: “Determine the output current ...” should read “Determine the drain current ...”

p.522: Learning Objectives: 7. “Section 12.7” should read “Section 12.6”

p.535: Example 12.3: “Rules 2 and 6” should read “Rules 2, 6, and 14”

p.546: “... four-variable map of Figure 12.29 are shown in Figure 12.32.” should read “... four-variable map of Figure 12.31 are shown in Figure 12.32.”

p.547: The partial equation: “... $+\bar{W} \cdot \bar{X} \cdot Y \cdot \bar{Z} + \bar{W} \cdot X \cdot Y \cdot \bar{Z} + W \cdot X \cdot Y \cdot \bar{Z} + W \cdot \bar{X} \cdot Y \cdot \bar{Z}$ ” should read “... $+\bar{W} \cdot \bar{X} \cdot \bar{Y} \cdot Z + \bar{W} \cdot X \cdot \bar{Y} \cdot Z + W \cdot X \cdot \bar{Y} \cdot Z + W \cdot \bar{X} \cdot \bar{Y} \cdot Z$ ”

P.555: “Find a minimum product-of-sums realization ...” should read “Find a minimum sum-of-products realization ...”

p.556: “... selecting three of the four don’t care entries ...” should read “... selecting four of the five don’t care entries ...”

p.564: “... whenever the enable input is high, the flip-flop is set.” should read “... whenever the enable input is high, the flip-flop is set to the value of S .”

p.565: Figure 12.64(b): Note that the Preset and Clear are on for most of the timing diagram. Therefore, the timing of the enable is not effectively shown. The timing of the enable will be shown in the lecture.

p.565: Figure 12.64(c): This is the schematic for a $\bar{R}\bar{S}$ quad latch (latch is another name for a flip-flop), rather than the RS latch described in parts (a) and (b).

p.569: **Find**: “Output of RS flip-flop ...” should read “Output of JK flip-flop ...”

p.574: The analysis section assumes (without explicitly stating) that the Preset and Clear are only effective on a clock pulse. Although this doesn’t correlate to statements earlier in the text, it is correct for many commercially available latches.

p.583: There should not be a dot where the horizontal line from the x input crosses the vertical line from the y input.

p.597: "In equation 13.24, l represents the length of the coil wire;"
should read "In equation 13.24, l represents the length of the core;"

p.602: CHECK YOUR UNDERSTANDING: Answer should be 1.4 μA -turns/Wb

p.604: Figure 13.19: The length of the gap should be 0.0025 m

p.604: "A rule of thumb used to account for fringing is to add the length of the gap to the actual cross-sectional area." should read "A rule of thumb used to account for fringing is to add the length of the gap to each dimension of the cross-sectional area."

p.605: The equation " $\mathcal{R}_{gap} = \dots = 3.98 \times 10^7$ A-turns/Wb"
should read " $\mathcal{R}_{gap} = \dots = 2.55 \times 10^7$ A-turns/Wb"

p.605: The equation " $\mathcal{R}_{eq} = \dots = 4 \times 10^7$ A-turns/Wb"
should read " $\mathcal{R}_{eq} = \dots = 2.57 \times 10^7$ A-turns/Wb"

p.605: The equation " $\phi = \dots = 2.51 \times 10^{-6}$ Wb"
should read " $\phi = \dots = 3.92 \times 10^{-6}$ Wb"

p.620: "The force we must overcome is $mg = 98$ N."
should read "The force we must overcome is $mg = 49$ N."

p.620: The equation:

$$i^2 = f_{gravity} \frac{\frac{\mu_0 A}{2} \left(\frac{2x}{\mu_0 A} + \frac{l_1 + l_2}{\mu_0 \mu_r A} \right)^2}{N^2} = 6.5 \times 10^4 \text{ A} \quad i = 255 \text{ A}$$

should read:

$$i^2 = f_{gravity} \frac{\frac{\mu_0 A}{1} \left(\frac{2x}{\mu_0 A} + \frac{l_1 + l_2}{\mu_0 \mu_r A} \right)^2}{N^2} = 5.2 \times 10^5 \text{ A} \quad i = 721 \text{ A}$$

p.620: The equation:

$$i^2 = f_{gravity} \frac{\frac{\mu_0 A}{2} (l_1 + l_2)^2}{N^2} = 2.1056 \times 10^{-3} \text{ A}$$

$$i = 0.0459 \text{ A}$$

should read:

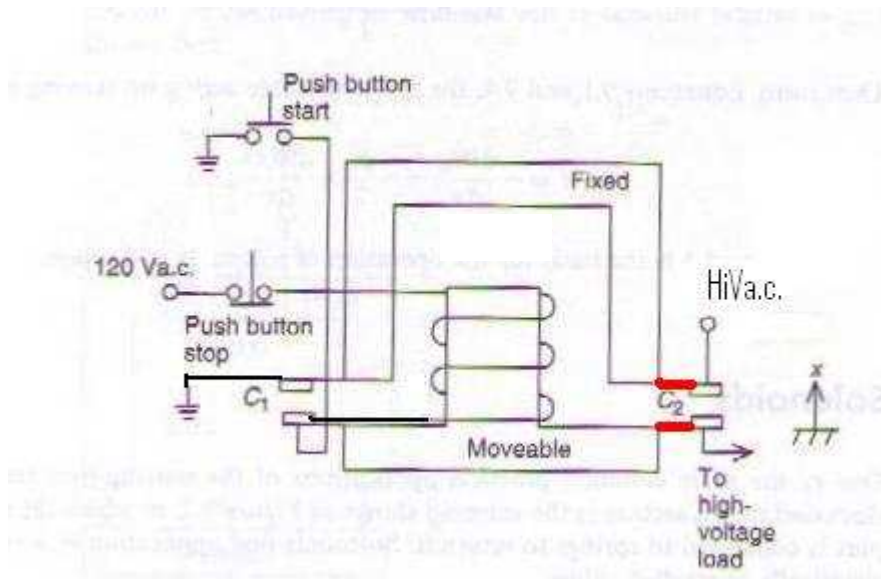
$$i^2 = f_{gravity} \frac{\frac{\mu_0 A}{1} (l_1 + l_2)^2}{N^2} = 4.21 \times 10^{-3} \text{ A}$$

$$i = 64.9 \text{ mA}$$

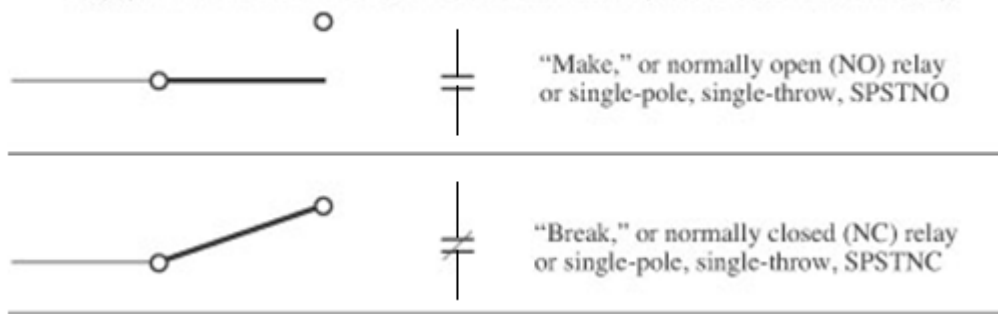
p.622: The equation “ $Ni = \dots = 56.4 \text{ A-turns}$ ” should read “ $Ni = \dots = 178 \text{ A-turns}$ ”

P.625: “... bypassing the resistor through the NC switch, connecting the resistor in series ...”
 should read “... bypassing the resistor through the NC switch. When the solenoid closes, the NC switch opens, connecting the resistor in series ...”

p.625: Figure 13.39 is not correct. Please refer to the following figure:



p.626: Figure 13.40: The upper two figures should look as:



p.628: Figure 13.42: In order to match the example, the gap should be shown as $x = 5$ cm rather than $x = 0.5$ cm. If the $\frac{1}{2}$ cm gap is used, the required current will be approximately 200 mA.

p.630: “The **Bli** law just illustrated ...” should read “The **Blu** law just illustrated ...”

p.630: Equation 13.62: “ $P_M - f_{ext}u = \dots$ ” should read “ $P_M = f_{ext}u = \dots$ ”

p.639: Problem 13.28: “... $\mathcal{R}(x)=7 \times 108 \dots$ ” should read “... $\mathcal{R}(x)=7 \times 10^8 \dots$ ”

p.641: Figure P13.41: The electrical portion of this figure is incorrect. See the correction to Figure 13.39 on p.625 above.

p.652: The equation:

$$SR\% = \dots = \frac{1,800 - 1,760}{1,800} \times \dots$$

should read:

$$SR\% = \dots = \frac{1,800 - 1,760}{1,760} \times \dots$$

p.656: Figure 14.6(a): The arrows on the belt are pointing the wrong way. They should be reversed.

p.658: Figure 14.11: N and S are reversed

p.658: “The north and south poles indicated in the figure are a consequence of the fact that the flux exits the bottom part of the structure (thus, the north pole indicated in the figure) and enters the top half of the structure (thus, the south pole).” should read “The north and south poles indicated in the figure are a consequence of the fact that the flux exits the top part of the structure (thus, the north pole indicated in the figure) and enters the bottom half of the structure (thus, the south pole).”

p.660: Configuration of DC machines: This is not errata, per se. However, for the novice reader, it may not be clear that this section has abandoned the assumption that the field is created by a permanent magnet. This section addresses creation of the field magnetism. Again, this is not errata, per se. There are no errors in this section, but the novice reader could easily become confused.

p.673: Equation 14.53: should read:

$$T(t) = k_{T,PM}I_a(t) = T_{load}(t) + b\omega_m(t) + J \frac{d\omega_m(t)}{dt}$$

p. 675: The equation below "Knowing the motor constant ..."

$$\omega_m = \frac{E_a}{k_a\phi} = \dots$$

should read

$$\omega_m = \frac{E_b}{k_a\phi} = \dots$$

p.679: The equation:

$$-K_{T,PM}I_a(t) + \dots = T_{load}(t)$$

should read:

$$-K_{T,PM}I_a(t) + \dots = -T_{load}(t)$$

p.679: The equation:

$$-K_{T,PM}I_a(s) + \dots = T_{load}(s)$$

should read:

$$-K_{T,PM}I_a(s) + \dots = -T_{load}(s)$$

p.679: The equation:

$$\begin{bmatrix} sL_a + R_a & K_{a,PM} \\ -K_{T,PM} & sJ + b \end{bmatrix} \begin{bmatrix} I_a(s) \\ \Omega_m(s) \end{bmatrix} = \begin{bmatrix} V_L(s) \\ T_{load}(s) \end{bmatrix}$$

should read:

$$\begin{bmatrix} sL_a + R_a & K_{a,PM} \\ -K_{T,PM} & sJ + b \end{bmatrix} \begin{bmatrix} I_a(s) \\ \Omega_m(s) \end{bmatrix} = \begin{bmatrix} V_L(s) \\ -T_{load}(s) \end{bmatrix}$$

p.679: The equation:

$$\Omega_m(s) = \frac{\det \begin{bmatrix} sL_a + R_a & V_L(s) \\ K_{T,PM} & T_{load}(s) \end{bmatrix}}{\det \begin{bmatrix} sL_a + R_a & K_{a,PM} \\ -K_{T,PM} & sJ + b \end{bmatrix}}$$

should read:

$$\Omega_m(s) = \frac{\det \begin{bmatrix} sL_a + R_a & V_L(s) \\ -K_{T,PM} & -T_{load}(s) \end{bmatrix}}{\det \begin{bmatrix} sL_a + R_a & K_{a,PM} \\ -K_{T,PM} & sJ + b \end{bmatrix}}$$

p.680: the equation:

$$\Omega_m(s) = \dots T_{load}(s)$$

should read:

$$\Omega_m(s) = \dots (-T_{load}(s))$$

p.695: "... using the circuit model of Figures 13.39 to 14.41."

should read "... using the circuit model of Figures 13.38 to 14.40."

p.697: "... reaching a maximum value called the **pull-up torque** ..." should read "... reaching a minimum value called the **pull-up torque** ..."

p.699: The synchronous speed for an eight pole motor should be 900 rpm.

p.702: Problem 14.7: "Assuming it is delivering rated current at rated speed, ..." should read "Assuming it is delivering rated current at rated power, ..."