Power Magnetic Devices: A Multi-Objective Design Approach

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Errata

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Chapter 1

Section 1.8, 3rd Paragraph, Pages 30-31.

After the sentence,

"The first step in Kung's method is to sort the members of P from best to worst in terms of the first objective."

Add the sentence

"When performing this initial sort, if multiple members of the population have the same fitness in the first objective, then these members are ordered by the second, or if necessary subsequent objectives."

Chapter 2

Section 2.7. Equation (2.7-45).

This equation should read

$$w_{e1} = w_{e2} = w_e + \frac{1}{2}(w_s - w_w) \tag{2.7-45}$$

Problems. Problem 21.

The last sentence of the problem statement should read

"Then, using the NAFA, compute $\mathbf{R}_N$ and $\mathbf{F}_N$."

Problems. Problem 22.

The last sentence of the problem statement should read

"Using the MAFA, compute $\mathbf{P}_N$ and $\mathbf{\Phi}_N$."

Chapter 4

Section 4.7. Text following (4.7-1).

Consider the paragraph which contains (4.7-1). Change the paragraph at the point starting with

"In addition, from (4.6-2) the …"

to read

"With these conditions, a magnetic system that can be described by (4.7-1) is referred to as being magnetically linear. Note that such a system is not conservative unless **L** is also symmetric."

Chapter 5

Section (5.2). Equation (5.2-24).

This equation should read

$$r_{mx} = \min(w_e, w_c / 2) \tag{5.2-24}$$

Section (5.2). Equation (5.2-25).

This equation should read

$$P_{hslf} = \frac{\mu_0(3d_s - 2d_w)}{3\pi} \ln\left(1 + \frac{\pi \min(w_e, w_c / 2)}{w_s}\right) \tag{5.2-25}$$

Section (5.3). Equation (5.2-35).

This equation should read

$$\frac{\partial P_{eg}}{\partial g} = \frac{\partial P_{egd}}{\partial g} + \frac{\partial P_{efoc}}{\partial g} + \frac{\partial P_{efic}}{\partial g} + 2\frac{\partial P_{eff}}{\partial g} \tag{5.2-35}$$

Chapter 6

Section (6.1). Equation (6.1-17).

$$\ln(1+y) = y - \frac{1}{2}y^2 + \frac{1}{3}y^3 - \frac{1}{4}y^4 + H \tag{6.1-17}$$

Section (6.3). Example 6.3B.

In the problem statement, "k_h = 40.8 W/m^3" should read "k_h = 40.08 W/m^3"

Chapter 7

Section (7.4). Equation (7.4-40).

This equation should read

$$J_x = \frac{|I_x|}{a_{xc} N_{xpr} N_{xcp}} \tag{7.4-40}$$

Section (7.5). Equation (7.5-40).

This equation should read

$$l_{cbl} = w_{cs} + w_{ce} \tag{7.5-40}$$

Section (7.5). Equation (7.5-43).

This equation should read

$$V_c = 2(A_{cbl} w_c + A_{cel} d_{cs} - \pi r_c^2 w_{cb}) \tag{7.5-43}$$

Chapter 8

Section (8.2). The end of the first sentence on page 266 should read

(8.1-14) and (8.1-15)

Chapter 9

Section (9.3). Equation (9.3-11).

This equation should read

$$\theta_{st} = 2\pi / S_s - \theta_{tt} \tag{9.3-11}$$

Section (9.3). Equation (9.3-21).

This equation should read

$$a_{tt} = \frac{1}{2}\begin{pmatrix} 2w_{tt}d_{tte} + (w_{tb} + w_{tt})(r_{si}\cos(\theta_{ti}/2) - r_{st}\cos(\theta_{tt}/2) - d_{tte}) \\ -r_{st}^2\theta_{tt} + r_{st}w_{tt}\cos\left(\theta_{tt}/2\right) + r_{si}^2\theta_{ti} - r_{si}w_{tb}\cos\left(\theta_{ti}/2\right) \end{pmatrix} \tag{9.3-21}$$

Section (9.9). Equation (9.9-5).

This equation should read

$$\mathbf{\Phi}_{t1c,\, j+J(i-1)} = \mathbf{\Phi}_{ts:\mathrm{mod}(2S_s/P-i+1,2S_s/P)+1,\, j} \tag{9.9-5}$$

Section (9.10). Text above Equation (9.10-15).

$B_{rbnc,mx}$ should be $B_{rbrnc,mx}$

Section (9.9). Equations (9.10-17),(9.10-18),(9.10-23),(9.10-24)

These equations should read

$$c_8 = lte(B_{rbtnc,mx}, B_{r,lim}) \tag{9.10 -17}$$

$$c_9 = lte(B_{rbrnc,mx}, B_{r,lim}) \tag{9.10-18}$$

$$c_{13} = lte(B_{rbt,mx}, B_{r,lim}) \tag{9.10-23}$$

$$c_{14} = lte(B_{rbr,mx}, B_{r,lim}) \tag{9.10-24}$$

Chapter 10

Section (10.3). Equation (10.3-22).

This equation should read

$$T_{lx} = c_{2x} l_{\Omega x}^2 + c_{1x} l_{\Omega x} \tag{10.3-22}$$

Section (10.3). Equation (10.3-26).

This equation should read

$$T_{x,pk} = \begin{cases} \max(0, T_{lx}) & c_{2x} = 0 \text{ or } (c_{2x} \neq 0 \text{ and } (x_e < 0 \text{ or } x_e > l_{\Omega x})) \\ \max(0, T_{ex}, T_{lx}) & c_{2x} \neq 0 \text{ and } 0 \le x_e \le l_{\Omega x} \end{cases} \tag{10.3-26}$$

Section (10.4). Equation (10.4-36).

This equation should read

$$R_{\Omega ir} = \frac{1}{2k_{\Omega r}\theta_\Omega l_{\Omega z}} \left(\frac{2r_{\Omega o}^2}{r_{\Omega o}^2 - r_{\Omega i}^2} \ln\left(\frac{r_{\Omega o}}{r_{\Omega i}}\right) - 1 \right) \tag{10.4-36}$$

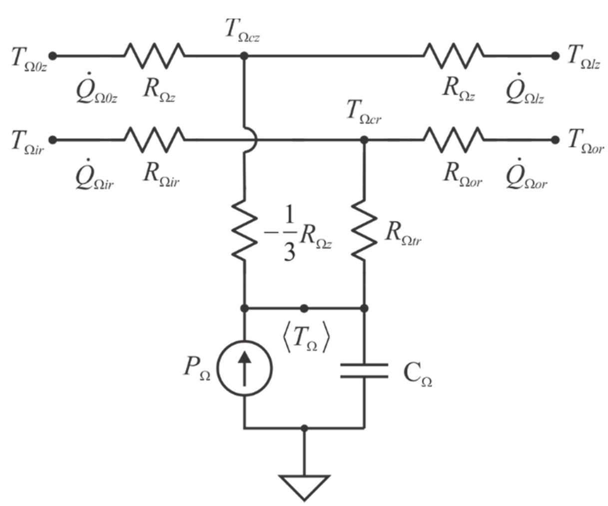
Section (10.4). Equation (10.4-38).

This equation should read

$$R_{\Omega or} = \frac{1}{2k_{\Omega r}\theta_\Omega l_{\Omega z}} \left(1 - \frac{2r_{\Omega i}^2}{r_{\Omega o}^2 - r_{\Omega i}^2} \ln\left(\frac{r_{\Omega o}}{r_{\Omega i}}\right) \right) \tag{10.4-38}$$

Section (10.4). Figure 10.10.

This figure should appear as



Section (10.4). Equation (10.4-51).

This equation should read

$$T_{er} = \frac{1}{2} c_{lr} \left(\ln\left(-\frac{c_{lr}}{2c_{2r}} \right) - 1 \right) \tag{10.4-51}$$

Section (10.4). Equation (10.4-54).

This equation should read

$$c_0 = \langle T_\Omega \rangle - \left(\frac{1}{2} c_{2r} \left(r_{\Omega o}^2 + r_{\Omega i}^2 \right) + c_{lr} \left(\frac{r_{\Omega o}^2 \ln(r_{\Omega o}) - r_{\Omega i}^2 \ln(r_{\Omega i})}{r_{\Omega o}^2 - r_{\Omega i}^2} - \frac{1}{2} \right) + \frac{1}{3} c_{2z} l_{\Omega z}^2 + \frac{1}{2} c_{1z} l_{\Omega z} \right)$$

(10.4-54)

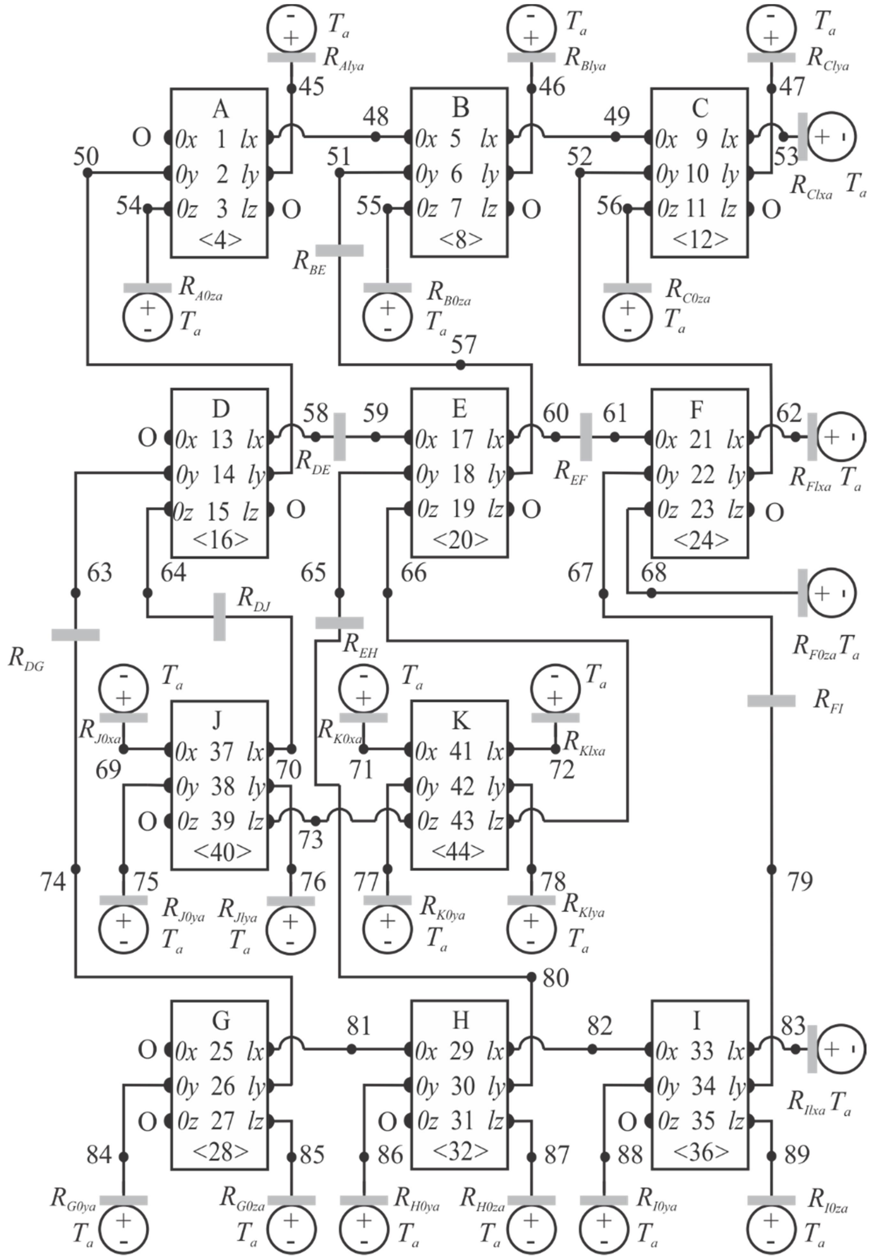
Section (10.5). Equation (10.5-18).

This equation should read

$$R_{x2} = \frac{w_c + w_i}{k_i d_i l} + \frac{w_a}{k_a d_i l} \tag{10.5-18}$$

Section (10.8). Figure 10.19.

This figure should appear as



Section (10.8). Page 391. Second to last paragraph before subheading ‘‘Electro-Thermal Analysis’

The second sentence of that paragraph should read,

“As can be seen, all 0y and lz nodes are connected to the ambient, as is the lx node of element I.”

Chapter 11

Section (11.1). Replace text starting with the 2nd paragraph on Page 404 up until equation (11.1-8) on page 405 with the following:

“Let us consider the loop formed by the dashed line in Figure 11.1-1(a). From Maxwell’s equations in integral form we have

$$\oint \mathbf{E}\cdot dl = -\int_S \frac{\partial \mathbf{B}}{\partial t}\cdot d\mathbf{S} \tag{11.1-1}$$

Applying (11.1-1) to the dashed path in Figure 11.1-1(a) while ignoring end effects (the contribution of the z-component of the fields at the $y = 0$ and $y = l$ conductor ends to the path integral)

$$E_y(r)l - E_y(0)l = -\int_0^r -\frac{\partial B_x}{\partial t} l dr \tag{11.1-2}$$

The minus sign in (11.1-2) arises from the fact that the path in Figure 11.1(a) defines the flux density as being into the page whereas the direction of the x-axis is out of the page. Simplifying (11.1-2)

$$E_y(r) - E_y(0) = \int_0^r \frac{\partial B_x}{\partial t} dr \tag{11.1-3}$$

In the frequency domain, (11-3) becomes

$$\tilde{E}_y(r) - \tilde{E}_y(0) = j\omega\int_0^r \tilde{B}_x dr \tag{11.1-4}$$

Differentiating (11.1-4) with respect to r we have”

Section (11.2). Equation (11.2-1).

This equation should read

$$2\pi r \mathrm{H}_x(r) = \int_0^r \mathrm{J}_y(r) 2\pi r dr$$

Section (11.2). Equation (11.2-2).

This equation should read

$$r\frac{\partial \mathrm{H}_x(r)}{\partial r} + \mathrm{H}_x(r) = \mathrm{J}_y(r) r$$

Section (11.5). Equation (11.5-1).

This equation should read

$$\overline{p}_{wr} = c_{xwr}\overline{\left(\frac{dB_x}{dt}\right)^2} + c_{ywr}\overline{\left(\frac{dB_y}{dt}\right)^2}$$

Section (11.5). Equation (11.5-2).

This equation should read

$$c_{xwr} = \frac{1}{12}\sigma d_{cw}^3 w_{cw} l_{cwr}$$

Section (11.5). Equation (11.5-3).

This equation should read

$$c_{ywr} = \frac{1}{12}\sigma w_{cw}^3 d_{cw} l_{cwr}$$