Differences in Notation between Franklin’s Textbook [1] and Lundberg’s Lecture Notes

Controls ENGR 3370

February 2, 2015

• In Section 3.4 and Figure 3.22, Franklin defines the time-domain overshoot $M_p$ as the maximum amount the step response overshoots its final value divided by its final value. (This definition is also illustrated on the inside back cover.)

Lundberg defines the *peak overshoot of the step response* $P_o$ as the maximum value of the unit step response. The percentage overshoot (abbreviated *P.O.*) is the maximum amount the step response overshoots its final value divided by its final value. The relationship is

$$P.O. = 100\% (P_o - 1).$$

• In Section 6.1 and Figure 6.5, Franklin defines the resonant peak $M_r$ as the maximum value of the frequency response magnitude. (This definition is also illustrated on the inside back cover.)

Lundberg calls the maximum value of the frequency response the *magnitude peaking in the frequency domain* $M_p$.

• Note that Lundberg’s notation for peak overshoot $P_o$ and magnitude peaking $M_p$ is consistent with the electrical engineering literature. For examples, see Section 3.5 and Figure 3.17 in [2] and Section 14.11 and Figure 14.19 in [3].

• In Section 6.1 and Equation 6.8, Franklin gives the transfer function of a lead compensator as

$$D(s) = \frac{Ts + 1}{\alpha Ts + 1}$$

where $\alpha$ is less than one. (This definition is repeated in Section 6.7.2 and Equation 6.38.) The transfer function of a lag compensator is given in Section 6.7.4 and Equation 6.51 as

$$D(s) = \alpha \frac{Ts + 1}{\alpha Ts + 1}$$

where $\alpha$ is greater than one.

Lundberg always uses values of $\alpha$ greater than unity, so a lead compensator is

$$G_c(s) = \frac{\alpha Ts + 1}{\tau s + 1}$$

and a lag compensator is

$$G_c(s) = \frac{\tau s + 1}{\alpha \tau s + 1}.$$  

• In footnote 3 on page 305, Franklin gives the abbreviation of the decibel as db. The correct abbreviation is dB.\footnote{Seriously, “db” violates the naming convention for SI units. It doesn’t matter what abbreviation Bode [4] used. He also used “megacycles” instead of “megahertz” and $\mu\mu F$ instead of picofarads. Units have evolved since 1945.}

References


