LDS&S Newsletter 2004

Issued annually for the textbook *Linear Dynamic Systems and Signals*
Zoran Gajic, Prentice Hall, Upper Saddle River, New Jersey, 2003

Textbook website: http://www.ece.rutgers.edu/~gajic/systems.html

- ## *Solutions Manual*

  The first edition of the *Solutions Manual for Linear Dynamic Systems and Signals* textbook was published in May 2003. The solutions manual is available in its electronic form. Instructors using this textbook should contact either Professor Zoran Gajic or Prentice Hall to get information how to download the *Solutions Manual*.

  Minor corrections in Chapters 2, 3, 5, 8, and 10 were made in December 2003. Several problems from Chapter 4 were corrected in December 2003. The author is indebted to Professor James LeBlanc from Lulea University of Technology, Sweden, for correcting some solutions and providing more elegant solutions to some problems (see for example Problem 4.8e).

- ## *Solutions to MATLAB Laboratory Experiments*

  The first edition of the *Solutions to MATLAB Laboratory Experiments* for the textbook *Linear Dynamic Systems and Signals* was published in August 2003. The supplement *Solutions to MATLAB Laboratory Experiments* is also available in its electronic form. Instructors should contact either Professor Zoran Gajic or Prentice Hall to get an access to this supplement.

- ## *PowerPoint Slides and PDF-Transparences*

  1005-page PowerPoint-slides and PDF-transparences were completed in October 2003. The slides/transparences are available only in electronic forms. Please contact either Professor Zoran Gajic or Prentice Hall to get the link and password information.

- ## *CD with the Textbook Supplements*

  A CD containing the textbook supplements was completed in January 2004, featuring
  - Solutions Manual (311 pages, 6.5” x 9’’ format, with detailed solutions to all 491 problems);
  - Solutions to MATLAB Laboratory Experiments (119 pages, 6.5’’ x 9’’ format, with detailed solutions to all 16 experiments formulated at the end of each textbook chapter);
  - MATLAB/Simulink Programs (for 104 problems and 16 experiments);
  - PDF Transparences (1005 pages);
  - PowerPoint Slides (1005 pages).

  Instructors interested in the CD should send an email request to Professor Zoran Gajic at gajic@ece.rutgers.edu

- ## *List of Textbook Corrections/Typos*

  The list of textbook corrections (divided in four parts: text, problems, answers, MATLAB programs) was updated in January 2004. The author is thankful to Professor Gerald Cook from George Mason University, USA, and Professor James LeBlanc from Lulea University of Technology, Sweden, for indicating to some typos and required corrections. The list of textbook corrections is posted on the textbook website *http://www.ece.rutgers.edu/~gajic/systems.html*.

- ## *Featured Topic*

Derivations of the Fourier Transforms of the Unit Step and Signum Signals

Using the notion of the generalized derivative, we have

$$F\{u_h(t)\} = \frac{1}{j\omega}, \quad \omega \neq 0$$

Formula (3.54) gives the Fourier transform for the signum signal

$$F\{\text{sgn}(t)\} = \frac{2}{j\omega}, \quad \omega \neq 0$$

Note that for $\omega = 0$, for the signum signal we obtain

$$F\{\text{sgn}(t)\}_{|\omega=0} = \int_{-\infty}^{\infty} \text{sgn}(t)dt = \int_{-\infty}^{0} (-1)dt + \int_{0}^{\infty} 1dt = 0 \quad \Rightarrow \qquad F\{\text{sgn}(t)\} = \begin{cases} \dfrac{2}{j\omega}, & \omega \neq 0 \\ 0, & \omega = 0 \end{cases}$$

However, for the unit step signal, we have

$$F\{u_h(t)\}_{|\omega=0} = \int_{0}^{\infty} 1dt = \frac{1}{2} \times \int_{-\infty}^{\infty} 1dt = \frac{1}{2} \times 2\pi\delta(\omega) = \pi\delta(\omega)$$

$$\Rightarrow \qquad F\{u_h(t)\} = \begin{cases} \dfrac{1}{j\omega}, & \omega \neq 0 \\ \pi\delta(\omega), & \omega = 0 \end{cases}$$

The author is thankful to Professor Gerald Cook from George Mason University, USA, who initiated a discussion on this topic.

Comment: Note that in the recent papers: L. Johnson, “A correction to impulse invariance,” *IEEE Signal Processing Letters*, Vol. 7, 273-275, 2000, and W. Mekclenbrauker, “Remarks on and correction to the impulse invariant method for the design of IIR digital filters,” *Signal Processing*, Vol. 80, 1687-1690, 2000, the need for the discrete-time “Heaviside” unit step signal ($u_h[0] = 0.5, \quad u[k] = 1, k > 1$) was considered.

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