



**PROBLEM 13.1:**

$$x[n] = 3 + 2e^{j0.2\pi n} + 2e^{-j0.2\pi n} - 7je^{j0.7\pi n} + 7je^{-j0.7\pi n}$$

$\swarrow$   $7e^{j\pi/2}$        $\swarrow$   $7e^{j\pi/2}$   
 $\searrow$   $7e^{-j\pi/2}$        $\searrow$   $7e^{-j\pi/2}$

(a)

$\hat{\omega} = -0.2\pi$  is same as  $\hat{\omega} = 2\pi - 0.2\pi = 1.8\pi$   
 $\hat{\omega} = -0.7\pi \rightarrow \hat{\omega} = 2\pi - 0.7\pi = 1.3\pi$



(b)  $x_b[n] = x[n]e^{j0.4\pi n}$

All frequencies will be increased by  $0.4\pi$

$0 \rightarrow 0.4\pi$        $0.7\pi \rightarrow 1.1\pi$        $1.8\pi \rightarrow 2.2\pi$   
 $0.2\pi \rightarrow 0.6\pi$        $1.3\pi \rightarrow 1.7\pi$        $\leftarrow = 2.2\pi - 2\pi = 0.2\pi$



(c)  $(-1)^n = e^{j\pi n}$ , so all frequencies increase by  $\pi$ .

$0 \rightarrow \pi$        $0.7\pi \rightarrow 1.7\pi$        $1.8\pi \rightarrow 2.8\pi \rightarrow 0.8\pi$   
 $0.2\pi \rightarrow 1.2\pi$        $1.3\pi \rightarrow 2.3\pi \rightarrow 2.3\pi - 2\pi = 0.3\pi$



# Signal Processing First Solution Chapter 13

**Alexandru Gromezescu**



### **Signal Processing First Solution Chapter 13:**

**Discrete Communication Systems** Stevan Berber, 2021 This is the first textbook which presents the theory of pure discrete communication systems and its relation to the existing theory of digital communication It is written for undergraduate and graduate students and for practicing engineers *Smart Grid as a Solution for Renewable and Efficient Energy* Ahmad, Ayaz, Hassan, Naveed Ul, 2016-04-20 As the need for proficient power resources continues to grow it is becoming increasingly important to implement new strategies and technologies in energy distribution to meet consumption needs The employment of smart grid networks assists in the efficient allocation of energy resources Smart Grid as a Solution for Renewable and Efficient Energy features emergent research and trends in energy consumption and management as well as communication techniques utilized to monitor power transmission and usage Emphasizing developments and challenges occurring in the field this book is a critical resource for researchers and students concerned with signal processing power demand management energy storage procedures and control techniques within smart grid networks **Ripples in**

**Mathematics** A. Jensen, Anders la Cour-Harbo, 2011-06-28 This introduction to the discrete wavelet transform and its applications is based on a novel approach to discrete wavelets called lifting After an elementary introduction connections of filter theory are presented and wavelet packet transforms are defined The time frequency plane is used for interpretation of signals problems with finite length signals are detailed and MATLAB is used for examples and implementation of transforms

**Optimizing and Measuring Smart Grid Operation and Control** Reoui, Abdelmadjid, Bentarzi, Hamid, 2020-11-13 Smart grid SG also called intelligent grid is a modern improvement of the traditional power grid that will revolutionize the way electricity is produced delivered and consumed Studying key concepts such as advanced metering infrastructure distribution management systems and energy management systems will support the design of a cost effective reliable and efficient supply system and will create a real time bidirectional communication means and information exchange between the consumer and the grid operator of electric power Optimizing and Measuring Smart Grid Operation and Control is a critical reference source that presents recent research on the operation control and optimization of smart grids Covering topics that include phase measurement units smart metering and synchrophasor technologies this book examines all aspects of modern smart grid measurement and control It is designed for engineers researchers academicians and students **Organic**

**Chemistry, 5e Student Study Guide and Solutions Manual** David R. Klein, Laurie S. Starkey, 2025-03-18 Success in organic chemistry requires mastery in two core aspects fundamental concepts and the skills needed to apply those concepts and solve problems With Organic Chemistry Student Study Guide and Solutions Manual 5th Edition students can learn to become proficient at approaching new situations methodically based on a repertoire of skills These skills are vital for successful problem solving in organic chemistry [Linux Application Development](#) Michael K. Johnson, Erik W. Troan, 1998

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software tool is used in the context of a presentation of systems concepts and analysis techniques Use of MATLAB helps students to understand what the mathematical abstractions represent which helps them to understand the behavior of a variety of systems In response to a wide range of signal inputs The software provides students with instantaneous feedback which encourages them to explore problems further Topics covered in the text include signals systems convolution Fourier series and transforms Laplace transforms analog filters sampling the discrete time Fourier transform DTFT FFT z transforms and digital filters All basic concepts are illustrated by worked examples End of chapter problems include simple drills as well as more challenging exercises that develop or extend the concepts covered A unique but optional feature of this text is the software supplied on disk which contains ready to run demonstrations interactive programs and full fledged general purpose programs The software runs under MATLAB and includes routines developed for plotting functions generating random signals regular and periodic convolution analytical and numerical solution of differential and difference equations Fourier analysis frequency response asymptotic Bode plots closed form expressions for Laplace and z transforms and inverse transforms classical analog filter design sampling quantization interpolation FIR and IIR filter design using various methods and more So as not to affect the continuity and logical flow of the text material the programs are described and used only in the accompanying documentation on disk A MATLAB appendix to each chapter lists the appropriate programs and each section that can be tied to the software is marked

**SSP--the Spreadsheet Signal Processor** Sylvan Charles Bloch,1992  
**Mathematics in Signal Processing** Tariq S. Durrani,1987 Proceedings of the first IMA International Conference on Mathematics in Signal Processing held at the University of Bath September 1985  
**Programming with Intel Wireless MMX Technology** Nigel C. Paver,Bradley C. Aldrich,Moinul H. Khan,2004  
**Chemical news and Journal of physical science** ,1876  
Real Time Signal Processing VI Keith Bromley,1983  
**Emulsions** Alexandru Grumezescu,2016-06-13  
Emulsions the third volume of the Nanotechnology in the Food Industry series is an invaluable resource for anyone in the food industry who needs the most recent information about scientific advances in nanotechnology on this topic This volume focuses on basic and advanced knowledge about nanoemulsion and presents an overview of the production methods materials solvents emulsifiers and functional ingredients and current analytical techniques that can be used for the identification and characterization of nanoemulsions The book also discusses the applications of nanoemulsion with special emphasis on systems suitable for utilization within the food industry This book is useful to a wide audience of food science research professionals and students who are doing research in this field as well as others interested in recent nanotechnological progress worldwide Presents fundamentals of nanoemulsions methods of preparation high energy and low energy techniques and applications in the food industry Includes research studies of nanoemulsification technology to improve bioavailability of food ingredients and research analysis Offers benefits and methods of risk assessment to ensure food safety Presents cutting edge encapsulating systems to improve the quality of functional compounds Provides a variety of

methods such as high shear stirring high pressure homogenizers self emulsification phase transitions and phase inversion to further research in this field IEEE Circuits & Devices ,2005

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