

3 PRINCIPLES AND THEOREMS FOR LINEAR NETWORKS

3.1 Linear Network

A linear circuit is made of linear components connected with voltage and current sources. The voltage/current ratio of a linear component is a straight line through the origin. For a resistor, $V = RI$. This relationship is a straight line through the origin with slope equal to R . When the input to a linear circuit is doubled the response is also doubled. Linear networks also obey Superposition theorem. The circuits in Fig. 3.1(a), (b), and (c) are examples of linear networks.

A **two port network** is introduced in Fig. 3.1(d) and (e). A two port network has two ports or four terminals. The current in the input terminals are equal and opposite. The current in the output terminals are equal and opposite. A single resistor can also form two port networks as illustrated in Fig. 3.2.

Problem 3.1

Calculate the currents in the resistors of Fig. 3.1 (a), (b) and (c). Compare the results.

Solution

Fig. 3.1 (a)

The total resistance is $2\ \Omega$ in series with the parallel combination of $3\ \Omega$ and $1\ \Omega$ and is given as

$$R_T = 2 + 3//1 = 2 + \frac{3 \times 1}{3+1} = \frac{11}{4}\ \Omega.$$

$$\therefore I_1 = \frac{5}{\frac{11}{4}} = \frac{20}{11} = 1.8182\text{ A}$$

I_2 and I_3 are obtained with current divide ratio.

$$I_2 = I_1 \frac{3}{3+1} = \frac{20}{11} \times \frac{3}{4} = \frac{15}{11} = 1.3636\text{ A}$$

$$I_3 = I_1 \frac{1}{3+1} = \frac{20}{11} \times \frac{1}{4} = \frac{5}{11} = 0.4545\text{ A}$$

Fig. 3.1 (b)

The total resistance is the same as in Fig. 3.1(a)

$$R_T = \frac{11}{4}\ \Omega$$

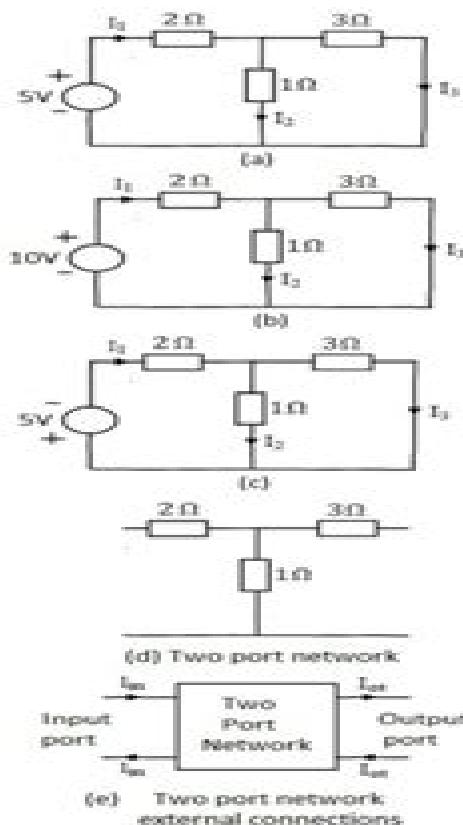


Fig. 3.1 Two port networks.

Principles Of Linear Networks

Mr. Rohit Manglik



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comprehensive and technically rich view of the wireless communications scene from a cooperation point of view *GATE ECE - Network Theory* Mr. Rohit Manglik, 2024-06-19 EduGorilla Publication is a trusted name in the education sector

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Misra, 2010 Communication networks and distributed system technologies are undergoing rapid advancements The last few years have experienced a steep growth in research on different aspects in these areas Even though these areas hold great promise for our future there are several challenges that need to be addressed This review volume discusses important issues in selected emerging and matured topics in communication networks and distributed systems It will be a valuable reference for students instructors researchers engineers and strategists in this field **Information Processing and Network**

Provisioning Michel Kadoch, **Basic Electrical Engineering: Principles, Designs and Applications** Vibhav Kumar Sachan, Syed Akhtar Imam, 2024-11-18 Basic Electrical Engineering Principles Designs and Applications has been widely utilized in recent years in electrical engineering microprocessors electrical drives and power electronics research among other fields This book aims to cater to the needs of the undergraduate courses in the discipline of Electronics Communication Engineering Electronics Instrumentation Engineering Electrical Electronics Engineering Instrumentation and Control Engineering and postgraduate students specializing in Electronics Control Engineering It will also serve as reference material for engineers employed in industry The fundamental concepts and principles behind transformers three phase circuits and electrical generators and motors are explained in a simple easy to understand manner Each chapter contains a good number of short answers and of multiple choice questions with explanation which makes the book quite useful for Indian Engineering Service IES Graduate Aptitude Test in Engineering GATE National Eligibility Test NET State Eligibility Test SET University Grants Commission Council of Scientific Industrial Research UGC CSIR and other entrance examinations

Transmission Networks and Wave Filters Timothy Edward Shea, 1929 *Mathematical Perspectives on Neural Networks* Paul Smolensky, Michael C. Mozer, 2013-05-13 Recent years have seen an explosion of new mathematical results on learning and processing in neural networks This body of results rests on a breadth of mathematical background which even few specialists possess In a format intermediate between a textbook and a collection of research articles this book has been assembled to present a sample of these results and to fill in the necessary background in such areas as computability theory computational complexity theory the theory of analog computation stochastic processes dynamical systems control theory time series analysis Bayesian analysis regularization theory information theory computational learning theory and mathematical statistics Mathematical models of neural networks display an amazing richness and diversity Neural networks can be formally modeled as computational systems as physical or dynamical systems and as statistical analyzers Within each

of these three broad perspectives there are a number of particular approaches For each of 16 particular mathematical perspectives on neural networks the contributing authors provide introductions to the background mathematics and address questions such as Exactly what mathematical systems are used to model neural networks from the given perspective What formal questions about neural networks can then be addressed What are typical results that can be obtained and What are the outstanding open problems A distinctive feature of this volume is that for each perspective presented in one of the contributed chapters the first editor has provided a moderately detailed summary of the formal results and the requisite mathematical concepts These summaries are presented in four chapters that tie together the 16 contributed chapters three develop a coherent view of the three general perspectives computational dynamical and statistical the other assembles these three perspectives into a unified overview of the neural networks field

Semiconductor Devices and Integrated Electronics A. G. Milnes, 2012-12-06 For some time there has been a need for a semiconductor device book that carries diode and transistor theory beyond an introductory level and yet has space to touch on a wider range of semiconductor device principles and applications Such topics are covered in specialized monographs numbering many hundreds but the voluminous nature of this literature limits access for students This book is the outcome of attempts to develop a broad course on devices and integrated electronics for university students at about senior year level The educational prerequisites are an introductory course in semiconductor junction and transistor concepts and a course on analog and digital circuits that has introduced the concepts of rectification amplification oscillators modulation and logic and Switching circuits The book should also be of value to professional engineers and physicists because of both the information included and the detailed guide to the literature given by the references The aim has been to bring some measure of order into the subject area examined and to provide a basic structure from which teachers may develop themes that are of most interest to students and themselves Semiconductor devices and integrated circuits are reviewed and fundamental factors that control power levels frequency speed size and cost are discussed The text also briefly mentions how devices are used and presents circuits and comments on representative applications Thus the book seeks a balance between the extremes of device physics and circuit design

Network Theory Joseph B. Murdoch, 1970

Encyclopedia of Optimization Christodoulos A. Floudas, Panos M. Pardalos, 2008-09-04 The goal of the Encyclopedia of Optimization is to introduce the reader to a complete set of topics that show the spectrum of research the richness of ideas and the breadth of applications that has come from this field The second edition builds on the success of the former edition with more than 150 completely new entries designed to ensure that the reference addresses recent areas where optimization theories and techniques have advanced Particularly heavy attention resulted in health science and transportation with entries such as Algorithms for Genomics Optimization and Radiotherapy Treatment Design and Crew Scheduling

Network Flows and Monotropic Optimization R. Tyrell Rockafellar, 1999-06-01 A rigorous and comprehensive treatment of network flow theory and monotropic optimization by one

of the world's most renowned applied mathematicians. This classic textbook covers extensively the duality theory and the algorithms of linear and nonlinear network optimization and their significant extensions to monotropic programming separable convex constrained optimization problems including linear programs. It complements our other book on the subject of network optimization. **Network Optimization: Continuous and Discrete Models** Athena Scientific, 1998. Monotropic programming problems are characterized by a rich interplay between combinatorial structure and convexity properties. Rockafellar develops for the first time algorithms and a remarkably complete duality theory for these problems. Among its special features, the book: a) Treats in depth the duality theory for linear and nonlinear network optimization; b) Uses a rigorous step-by-step approach to develop the principal network optimization algorithms; c) Covers the main algorithms for specialized network problems such as max flow, feasibility, assignment, and shortest path; d) Develops in detail the theory of monotropic programming based on the author's highly acclaimed research; e) Contains many examples, illustrations, and exercises; f) Contains much new material not found in any other textbook.

Active Network Synthesis Kendall Ling-chiao Su, 1965. *An Information-Theoretic Approach to Neural Computing* Gustavo Deco, Dragan Obradovic, 2012-12-06. Neural networks provide a powerful new technology to model and control nonlinear and complex systems. In this book, the authors present a detailed formulation of neural networks from the information theoretic viewpoint. They show how this perspective provides new insights into the design theory of neural networks. In particular, they show how these methods may be applied to the topics of supervised and unsupervised learning, including feature extraction, linear and non-linear independent component analysis, and Boltzmann machines. Readers are assumed to have a basic understanding of neural networks, but all the relevant concepts from information theory are carefully introduced and explained. Consequently, readers from several different scientific disciplines, notably cognitive scientists, engineers, physicists, statisticians, and computer scientists, will find this to be a very valuable introduction to this topic.

Concise Handbook of Electronics and Electrical Engineering VK Khanna, 1997. The Primary Goal of this handbook is to provide in a simple and easy way a concise and coherent presentation of the core material, namely the key terminology, fundamental concepts, principles, laws, facts, figures, formulae, mathematical methods, and applications of electrical and electronics engineering. A necessary corollary objective of this handbook is to prepare the reader for specialist literature. The material presented in this handbook is intended to serve as a platform from where the reader can launch to an exploration of a specialised field of interest.

Basic Engineering Circuit Analysis Mr. Rohit Manglik, 2024-07-06. EduGorilla Publication is a trusted name in the education sector, committed to empowering learners with high quality study materials and resources. Specializing in competitive exams and academic support, EduGorilla provides comprehensive and well-structured content tailored to meet the needs of students across various streams and levels.

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