

1. Record Nr.	UNINA9910820449703321
Autore	Basso Christophe P.
Titolo	Linear circuit transfer functions : an introduction to fast analytical techniques // Christophe Basso
Pubbl/distr/stampa	Chichester, West Sussex ; ; Hoboken, NJ : , : Wiley, , 2016 [Piscataway, New Jersey] : , : IEEE Xplore, , [2016]
ISBN	1-119-23635-5 1-119-23636-3
Descrizione fisica	1 online resource (463 p.)
Collana	Wiley - IEEE
Disciplina	621.3815
Soggetti	Transfer functions Electric circuits, Linear
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Includes index.
Nota di contenuto	About the Author ix -- Preface xi -- Acknowledgement xiii -- 1 Electrical Analysis / Terminology and Theorems 1 -- 1.1 Transfer Functions, an Informal Approach 1 -- 1.1.1 Input and Output Ports 3 -- 1.1.2 Different Types of Transfer Function 6 -- 1.2 The Few Tools and Theorems You Did Not Forget . . . 11 -- 1.2.1 The Voltage Divider 11 -- 1.2.2 The Current Divider 12 -- 1.2.3 Thevenin's Theorem at Work 14 -- 1.2.4 Norton's Theorem at Work 19 -- 1.3 What Should I Retain from this Chapter? 25 -- 1.4 Appendix 1A / Finding Output Impedance/Resistance 26 -- 1.5 Appendix 1B / Problems 37 -- Answers 39 -- 2 Transfer Functions 41 -- 2.1 Linear Systems 41 -- 2.1.1 A Linear Time-invariant System 43 -- 2.1.2 The Need for Linearization 43 -- 2.2 Time Constants 44 -- 2.2.1 Time Constant Involving an Inductor 47 -- 2.3 Transfer Functions 49 -- 2.3.1 Low- entropy Expressions 54 -- 2.3.2 Higher Order Expressions 59 -- 2.3.3 Second-order Polynomial Forms 60 -- 2.3.4 Low-Q Approximation for a 2nd-order Polynomial 62 -- 2.3.5 Approximation for a 3rd-order Polynomial 68 -- 2.3.6 How to Determine the Order of the System? 69 -- 2.3.7 Zeros in the Network 76 -- 2.4 First Step Towards a Generalized 1st-order Transfer Function 78 -- 2.4.1 Solving 1st-order Circuits with Ease, Three Examples 82 -- 2.4.2 Obtaining the Zero with the Null Double Injection 89 -- 2.4.3 Checking Zeros Obtained in Null

Double Injection with SPICE 94 -- 2.4.4 Network Excitation 95 -- 2.5
 What Should I Retain from this Chapter? 100 -- References 101 -- 2.6
 Appendix 2A / Problems 102 -- Answers 105 -- 3 Superposition and
 the Extra Element Theorem 116 -- 3.1 The Superposition Theorem 116
 -- 3.1.1 A Two-input/Two-output System 120 -- 3.2 The Extra
 Element Theorem 126 -- 3.2.1 The EET at Work on Simple Circuits 130
 -- 3.2.2 The EET at Work / Example 2 132 -- 3.2.3 The EET at Work /
 Example 3 137 -- 3.2.4 The EET at Work / Example 4 138 -- 3.2.5 The
 EET at Work / Example 5 140 -- 3.2.6 The EET at Work / Example 6
 146 -- 3.2.7 Inverted Pole and Zero Notation 150.
 3.3 A Generalized Transfer Function for 1st-order Systems 153 --
 3.3.1 Generalized Transfer Function / Example 1 156 -- 3.3.2
 Generalized Transfer Function / Example 2 159 -- 3.3.3 Generalized
 Transfer Function / Example 3 163 -- 3.3.4 Generalized Transfer
 Function / Example 4 170 -- 3.3.5 Generalized Transfer Function /
 Example 5 174 -- 3.4 Further Reading 180 -- 3.5 What Should I Retain
 from this Chapter? 180 -- References 182 -- 3.6 Appendix 3A /
 Problems 183 -- Answers 185 -- References 218 -- 4 Second-order
 Transfer Functions 219 -- 4.1 Applying the Extra Element Theorem
 Twice 219 -- 4.1.1 Low-entropy 2nd-order Expressions 227 -- 4.1.2
 Determining the Zero Positions 231 -- 4.1.3 Rearranging and Plotting
 Expressions 233 -- 4.1.4 Example 1 / A Low-Pass Filter 235 -- 4.1.5
 Example 2 / A Two-capacitor Filter 241 -- 4.1.6 Example 3 / A Two-
 capacitor Band-stop Filter 245 -- 4.1.7 Example 4 / An LC Notch Filter
 248 -- 4.2 A Generalized Transfer Function for 2nd-Order Systems 255
 -- 4.2.1 Inferring the Presence of Zeros in the Circuit 256 -- 4.2.2
 Generalized 2nd / order Transfer Function / Example 1 257 -- 4.2.3
 Generalized 2nd / order Transfer Function / Example 2 262 -- 4.2.4
 Generalized 2nd / order Transfer Function / Example 3 266 -- 4.2.5
 Generalized 2nd / order Transfer Function / Example 4 273 -- 4.3
 What Should I Retain from this Chapter ? 277 -- References 279 -- 4.4
 Appendix 4A / Problems 279 -- Answers 282 -- References 311 -- 5
 Nth-order Transfer Functions 312 -- 5.1 From the 2EET to the NEET
 312 -- 5.1.1 3rd-order Transfer Function Example 317 -- 5.1.2
 Transfer Functions with Zeros 320 -- 5.1.3 A Generalized Nth-order
 Transfer Function 327 -- 5.2 Five High-order Transfer Functions
 Examples 335 -- 5.2.1 Example 2: A 3rd-order Active Notch Circuit
 341 -- 5.2.2 Example 3: A 4th-order LC Passive Filter 349 -- 5.2.3
 Example 4: A 4th-order Band-pass Active Filter 355 -- 5.2.4 Example
 5: A 3rd-order Low-pass Active GIC Filter 368 -- 5.3 What Should I
 Retain from this Chapter ? 383.
 References 385 -- 5.5 Appendix 5A / Problems 385 -- Answers 388 --
 References 431 -- Conclusion 433 -- Glossary of Terms 435 -- Index
 439.

Sommario/riassunto

Linear Circuit Transfer Functions: An introduction to Fast Analytical
 Techniques teaches readers how to determine transfer functions of
 linear passive and active circuits by applying Fast Analytical Circuits
 Techniques. Building on their existing knowledge of classical
 loop/nodal analysis, the book improves and expands their skills to
 unveil transfer functions in a swift and efficient manner. Starting with
 simple examples, the author explains step-by-step how expressing
 circuits time constants in different configurations leads to writing
 transfer functions in a compact and insightful way. By learning how to
 organize numerators and denominators in the fastest possible way,
 readers will speed-up analysis and predict the frequency response of
 simple to complex circuits. In some cases, they will be able to derive
 the final expression by inspection, without writing a line of algebra. Key
 features: * Emphasizes analysis through employing time constant-

based methods discussed in other text books but not widely used or explained. * Develops current techniques on transfer functions, to fast analytical techniques leading to low-entropy transfer functions immediately exploitable for analysis purposes. * Covers calculation techniques pertinent to different fields, electrical, electronics, signal processing etc. * Describes how a technique is applied and demonstrates this through real design examples. * All Mathcad files used in examples and problems are freely available for download. An ideal reference for electronics or electrical engineering professionals as well as BSEE and MSEE students, this book will help teach them how to: become skilled in the art of determining transfer function by using less algebra and obtaining results in a more effectual way; gain insight into a circuit's operation by understanding how time constants rule dynamic responses; apply Fast Analytical Techniques to simple and complicated circuits, passive or active and be more efficient at solving problems.
