Modern Circuit Analysis Syllabus

Course Introduction

Content of course

The main contents in this course has: The application pulls the Laplace transformation proceeds electric circuit analysis, apply the topology and matrix the electric circuit analyzes and the analytic appearance in network changes the method of deal.

Study the profession: The electronics information engineering.

Take the course first: Electric circuit analysis, line algebra, signal and system


1. The property and the mission of the course

The modern electric circuit analysis course is a profession lesson of the electricity, electronics profession. Its main mission is an application to pull the Laplace transformation proceeds the electric circuit the analysis and apply the diagram talks about to proceed with matrix the electric circuit analyzes and the analytic appearance in network changes the method of deal.

2. Basic request of the course

Pass this curricular study, make the student control the analytic and basic theories, basic method in electric circuit in solution in method in applied mathematics.
3. Applying to the profession

Electronics information engineering.

4. Curricular contact of this course and others

Take first the course: Electric circuit analysis, line algebra, signal and system; Follow-up course: Not line electric circuit analysis, electric circuit and system.

5. Assign when content of course arrange, request, learn and homework

Chapter 1 THE LAPLACE TRANSFORM (C)

1.1 The Step and Impulse Functions: The Physical Significance of \( u(t) \) and \( \delta(t) \), Practical Considerations, Scaling, Time-Shifting, The Sifting Property

1.2 The Laplace Transform: Transform Pairs, Convergence

1.3 Operational Transforms: Linearity, Differentiation, Integration, Time Shifting, Frequency, Shifting, Scaling, Convolution, Periodic Functions, Initial and Final Values

1.4 The Inverse Laplace Transform: Real and Distinct Poles, Complex Conjugate Poles, Repeated, Real Poles, Repeated Complex Pole Pairs, Improper Rational Functions

1.5 Application to Differential Equations: The Forced and Natural Response Components, the Network Function \( H(s) \)

1.6 Application to Circuit Analysis: Circuit Element Models, Circuit Analysis Using Laplace Transforms

1.7 Convolution: Graphical Convolution, Numerical Convolution

Chapter 2 NETWORK FUNCTIONS (C)

2.1 Complex Frequency: Complex Exponential Signals, An Illustrative Example, Generalized, Impedance and Admittance, s-Domain Circuit Analysis

2.2 Network Functions: Zeros and Poles, Physical Interpretation of Zeros and Poles, Procedure for Finding Network Functions
2.3 The Natural Response Using $H(s)$: Critical Frequencies of Source-Free Circuits, Concluding, Remarks


Chapter 3 CIRCUIT TOPOLOGY AND GENERAL CIRCUIT ANALYSIS (C)

3.1 Source transformations: The V Shift Property, The I Shift Property.

3.2 Kirchhoff’s laws revisited: KCL equations based on cut sets, Graph, subgraph, and loop, KVL equations based on loops

3.3 Cut sets and loops based on a tree: Tree, The fundamental cut-set matrix associated with a tree, The fundamental loop matrix associated with a tree, Relation between $Q$ and $B$

3.4 linear time-invariant circuit analysis: Cut-set analysis, Loop analysis, Mesh analysis

6. Experiment the contents and requests

None


7.2 Reference book:

1. 王震宇著, 电路分析, 科学出版社, 2006 年 3 月
2. 邱关源著, 电路, 高等教育出版社, 1998 年 1 月

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1st JUN. 2006