I. Feedback
   A. The General Feedback Structure
   B. Some Properties of Negative Feedback
      a. Gain Desensitivity
      b. Bandwidth Extension
      c. Noise Reduction
      d. Reduction in Nonlinear Distortion
   C. The Four Basic Feedback Topologies
      a. Voltage Amplifiers
      b. Current Amplifiers
      c. Transconductance Amplifiers
      d. Transresistance Amplifiers
   D. The Series-Shunt Feedback Amplifier
      a. The Ideal Situation
      b. The Practical Situation
   E. $s$-Domain Analysis: Poles, Zeros, and Bode Plots
   F. The Stability Problem
      a. Transfer Function of the Feedback Amplifier
      b. The Nyquist Plot
   G. Effect of Feedback on the Amplifier Poles
      a. Stability and Pole Location
      b. Poles of the Feedback Amplifier
      c. Amplifier with Single-Pole Response
      d. Amplifier with Two-Pole Response
      e. Amplifiers with Three or More Poles
   H. Stability Study Using Bode Plots
      a. Gain and Phase Margins
      b. Effect of Phase Margin on Closed-Loop Response
      c. An Alternative Approach for Investigating Stability
   I. SPICE Simulation Example

II. Operational-Amplifier and Data-Converter Circuits
   A. The Two-Stage CMOS Op Amp
      a. The Circuit
      b. Input Common-Mode Range and Output Swing
      c. Voltage Gain
      d. Frequency Response
      e. Slew Rate
   B. The Folded-Cascode CMOS Op Amp
      a. The Circuit
      b. Input Common-Mode Range and the Output Voltage Swing
      c. Voltage Gain
      d. Frequency Response
      e. Slew Rate
      f. Increasing the Input Common-Mode Range: Rail-to-Rail Input Operation
      g. Increasing the Output Voltage Range: The Wide-Swing Current Mirror
   C. The 741 Op-Amp Circuit
      a. Bias Circuit
b. Short-Circuit Protection Circuitry
c. The Input Stage
d. The Second Stage
e. The Output Stage
f. Device Parameters

D. Data Converters
   a. Digital Processing of Signals
   b. Sampling of Analog Signals
   c. Signal Quantization
   d. The A/D and D/A Converters as Functional Blocks

E. D/A Converter Circuits
   a. Basic Circuit Using Binary-Weighted Resistors
   b. R-2R Ladders
   c. A Practical Circuit Implementation
   d. Current Switches

F. A/D Converter Circuits
   a. The Feedback-Type Converter
   b. The Dual-Slope A/D Converter
   c. The Parallel or Flash Converter
   d. The Charge-Redistribution Converter
   e. SPICE Simulation Example

III. Digital CMOS Logic Circuits
A. Digital Circuit Design: An Overview
   a. Digital IC Technologies and Logic-Circuit Families
   b. Logic-Circuit Characterization
   c. Styles for Digital System Design
   d. Design Abstraction and Computer Aids

B. Design and Performance Analysis of the CMOS Inverter
   a. Circuit Structure
   b. Static Operation
   c. Dynamic Operation
   d. Dynamic Power Dissipation

C. CMOS Logic-Gate Circuits
   a. Basic Structure
   b. The Two-Input NOR Gate
   c. The Two-Input NAND Gate
   d. A Complex Gate
   e. Obtaining the PUN from the PDN and Vice Versa
   f. The Exclusive-OR Function
   g. Summary of the Synthesis Method
   h. Transistor Sizing
   i. Effects of Fan-In and Fan-Out on Propagation Delay

D. Pass-Transistor Logic Circuits
   a. Operation with NMOS Transistors as Switches
   b. The Use of CMOS Transmission Gates as Switches
   c. Pass-Transistor Logic Circuit Examples

E. Dynamic Logic Circuits
   a. Basic Principle
   b. Nonideal Effects
   c. Domino CMOS Logic
IV. Filters and Tuned Amplifiers

A. Filter Transmission, Types, and Specification
   a. Filter Transmission
   b. Filter Types
   c. Filter Specification

B. The Filter Transfer Function
   a. Butterworth and Chebyshev Filters
   b. The Butterworth Filter
   c. The Chebyshev Filter

C. First-Order and Second-Order Filter Functions
   a. First-Order Filters
   b. Second-Order Filter Functions

D. The Second-Order LCR Resonator
   a. The Resonator Natural Modes
   b. Realization of Transmission Zeros
   c. Realization of the Low-Pass Function
   d. Realization of the High-Pass Function
   e. Realization of the Bandpass Function
   f. Realization of the Notch Functions
   g. Realization of the All-Pass Function

E. Second-Order Active Filters Based on Inductor Replacement
   a. The Antoniou Inductance-Simulation Circuit
   b. The Op Amp-RC Resonator
   c. Realization of the Various Filter Types
   d. The All-Pass Circuit

F. Second-Order Active Filters Based on the Two-Integrator-Loop Topology
   a. Derivation of the Two-Integrator-Loop Biquad
   b. Circuit Implementation
   c. An Alternative Two-Integrator-Loop Biquad Circuit

G. Single-Amplifier Biquadratic Active Filters
   a. Synthesis of the Feedback Loop
   b. Injecting the Input Signal
   c. Generation of Equivalent Feedback Loops

H. Sensitivity
I. Switched-Capacitor Filters
J. Tuned Amplifiers
K. The Basic Principle
L. Inductor Losses
M. Use of Transformers
N. Amplifiers with Multiple Tuned Circuits
O. The Cascode and the CC-CB Cascade
P. Synchronous Tuning
Q. Stagger-Tuning

V. Signal Generators and Waveform-Shaping Circuits

A. Basic Principles of Sinusoidal Oscillators
   a. The Oscillator Feedback Loop
   b. The Oscillation Criterion
   c. Nonlinear Amplitude Control
   d. A Popular Limiter Circuit for Amplitude Control
B. Op Amp-RC Oscillator Circuits
   a. The Wien-Bridge Oscillator
   b. The Phase-Shift Oscillator
   c. The Quadrature Oscillator
   d. The Active-Filter-Tuned Oscillator

C. LC and Crystal Oscillators
   a. LC-Tuned Oscillators
   b. Crystal Oscillators

D. Bistable Multivibrators
   a. The Feedback Loop
   b. Transfer Characteristics of the Bistable Circuit
   c. Triggering the Bistable Circuit
   d. The Bistable Circuit as a Memory Element
   e. A Bistable Circuit with Noninverting Transfer Characteristics
   f. Application of the Bistable Circuit as a Comparator
   g. Making the Output Levels More Precise

E. Generation of Square and Triangular Waveforms Using Astable Multivibrators
   a. Operation of the Astable Multivibrator
   b. Generation of Triangular Waveforms

F. Generation of a Standardized Pulse--The Monostable Multivibrator

G. Integrated-Circuit Timers
   a. The 555 Circuit
   b. Implementing a Monostable Multivibrator Using the 555 IC
   c. An Astable Multivibrator Using the 555 IC

H. Nonlinear Waveform-Shaping Circuits
   a. The Breakpoint Method
   b. The Nonlinear-Amplification Method

I. Precision Rectifier Circuits
J. Precision Half-Wave Rectifier?The "Superdiode"
K. An Alternative Circuit
L. An Application: Measuring AC Voltages
M. Precision Full-Wave Rectifier
N. A Precision Bridge Rectifier for Instrumentation Applications
O. Precision Peak Rectifiers
P. A Buffered Precision Peak Detector
Q. A Precision Clamping Circuit

VI. Output Stages and Power Amplifiers
A. Classification of Output Stages
B. Class A Output Stage
   a. Transfer Characteristic
   b. Signal Waveforms
   c. Power Dissipation
   d. Power-Conversion Efficiency
C. Class B Output Stage
   a. Circuit Operation
   b. Transfer Characteristic
   c. Power-Conversion Efficiency
   d. Power Dissipation
   e. Reducing Crossover Distortion
   f. Single-Supply Operation
D. Class AB Output Stage
   a. Circuit Operation
   b. Output Resistance

E. Biasing the Class AB Circuit
   a. Biasing Using Diodes
   b. Biasing Using the $V_{BE}$ Multiplier

F. Power BJTs
   a. Junction Temperature
   b. Thermal Resistance
   c. Power Dissipation Versus Temperature
   d. Transistor Case and Heat Sink
   e. The BJT Safe Operating Area
   f. Parameter Values of Power Transistors

G. Variations on the Class AB Configuration
   a. Use of Input Emitter Followers
   b. Use of Compound Devices
   c. Short-Circuit Protection
   d. Thermal Shutdown

H. IC Power Amplifiers
   a. A Fixed-Gain IC Power Amplifier
   b. Power Op Amps
   c. The Bridge Amplifier

I. MOS Power Transistors
   a. Structure of the Power MOSFET
   b. Characteristics of Power MOSFETs
   c. Temperature Effects
   d. Comparison with BJTs
   e. A Class AB Output Stage Utilizing MOSFETs
   f. SPICE Simulation Example