

ANALOG SYSTEMS AND APPLICATIONS

Semiconductor Diodes: p and n type semiconductors. Energy Level Diagram. Conductivity and Mobility, Concept of Drift velocity. PN Junction Fabrication (Simple Idea). Barrier Formation in PN Junction Diode. Static and Dynamic Resistance. Current Flow Mechanism in Forward and Reverse Biased Diode. Drift Velocity. Derivation for Barrier Potential, Barrier Width and Current for Step Junction. (8 Lectures)

Two-terminal Devices and their Applications: (1) Rectifier Diode: Half-wave Rectifiers. Centre-tapped and Bridge Full-wave Rectifiers, Calculation of Ripple Factor and Rectification Efficiency, (2) Zener Diode and Voltage Regulation. Principle and structure of (1) LEDs (2) Photodiode (3) Solar Cell. (5 Lectures)

Bipolar Junction transistors: n-p-n and p-n-p Transistors. Characteristics of CB, CE and CC Configurations. Current gains α and β Relations between α and β . Load Line analysis of Transistors. DC Load line and Q-point. Physical Mechanism of Current Flow. Active, Cutoff and Saturation Regions. (5 Lectures)

Amplifiers: Transistor Biasing and Stabilization Circuits. Fixed Bias and Voltage Divider Bias. Transistor as 2-port Network. h-parameter Equivalent Circuit. Analysis of a single-stage CE amplifier using Hybrid Model. Input and Output Impedance. Current, Voltage and Power Gains. Classification of Class A, B, and C Amplifiers. (8 Lectures)

Coupled Amplifier: RC-coupled amplifier and its frequency response. (3 Lectures)

Feedback in Amplifiers: Effects of Positive and Negative Feedback on Input Impedance, Output Impedance, Gain, Stability, Distortion and Noise. (3 Lectures)

Sinusoidal Oscillators: Barkhausen's Criterion for Self-sustained Oscillations. RC Phase Shift Oscillator, determination of Frequency. Colpitts oscillator. (3 Lectures)

Operational Amplifiers (Black Box approach): Characteristics of an Ideal and Practical Op-Amp. (IC 741) Open-loop and Closed-loop Gain. Frequency Response. CMRR. Slew Rate and concept of Virtual ground. (3 Lectures)

Applications of Op-Amps: (1) Inverting and non-inverting amplifiers, (2) Adder, (3) Subtractor, (4) Differentiator, (5) Integrator, (6) Log amplifier, (7) Zero crossing detector (8) Wein bridge oscillator. (7 Lectures)

Conversion: Resistive network (Weighted and R-2R Ladder). Accuracy and Resolution. A/D Conversion (successive approximation) (3 Lectures)

Reference Books:

- Integrated Electronics, J. Millman and C.C. Halkias, 1991, Tata Mc-Graw Hill.
 - Electronics : Fundamentals and Applications, J.D. Ryder, 2004, Prentice Hall.
 - Solid State Electronic Devices, B.G. Streetman & S.K. Banerjee, 6th Edn., 2009, PHI Learning.
 - Electronic Devices and circuits, S. Salivahanan & N. S. Kumar, 3rd Ed., 2012, Tata Mc-Graw Hill
 - OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall
 - Electronic circuits: Handbook of design and applications, U. Tietze, Ch. Schenk, 2008, Springer
 - Semiconductor Devices: Physics and Technology, S.M. Sze, 2nd Ed., 2002, Wiley India.
 - Electronic Devices: Conventional Current Version, 7/e Thomas L. Floyd, 2008, Pearson India
 - Electronic Devices and Circuits, 6/e, Theodore F. Bogart, 2003, Pearson India
 - Transistors, D.L. Croisette, 1979, Prentice Hall.
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