

Electronic Circuits and PCB Designing

(Credits: Theory-04, Practicals-02)

PPT presented by M. Pal (Assistant Professor of RKMVCC)

Unit-1

(12 Lectures)

Network theorems (DC analysis only): Review of Ohms law, Kirchhoff's laws, voltage divider and current divider theorems, open and short circuits.

Thevenin's theorem, Norton's theorem and interconversion, superposition theorem, maximum power transfer theorem.

Unit 2

(13 Lectures)

Semiconductor Diode and its applications: PN junction diode and characteristics, ideal diode and diode approximations. Block diagram of a Regulated Power Supply, Rectifiers: HWR, FWR- center tapped and bridge FWRs. Circuit diagrams, working and waveforms, ripple factor & efficiency(no derivations).Filters: circuit diagram and explanation of shunt capacitor filter with waveforms.

Zener diode regulator: circuit diagram and explanation for load and line regulation, disadvantages of Zener diode regulator.

Unit-3 (17 Lectures)

BJT and Small Signal amplifier: Bipolar Junction Transistor: Construction, principle & working of NPN transistor, terminology. Configuration: CE, CB, CC. Definition of α , β and γ and their interrelations, leakage currents. Study of CE Characteristics, Hybrid parameters. Transistor biasing: need for biasing, DC load line, operating point, thermal runaway, stability and stability factor. Voltage divider bias: circuit diagrams and their working, Q point expressions for voltage divider biasing. Small signal CE amplifier: circuit, working, frequency response, re model for CE configuration, derivation for A_v , Z_{in} and Z_{out} .

Unit-4 (18 Lectures)

Types of PCB: Single sided board, double sided, Multilayer boards, Plated through holes technology, Benefits of Surface Mount Technology (SMT), Limitation of SMT, Surface mount components: Resistors, Capacitor, Inductor, Diode and IC's.

Layout and Artwork: Layout Planning: General rules of Layout, Resistance, Capacitance and Inductance, Conductor Spacing, Supply and Ground Conductors, Component Placing and mounting, Cooling requirement and package density, Layout check. Basic artwork approaches, Artwork taping guidelines, General artwork rules: Artwork check and Inspection.

Contd....Unit-4 (18 Lectures)

Laminates and Photoprinting: Properties of laminates, Types of Laminates, Manual cleaning process, Basic printing process for double sided PCB's, Photo resists, wet film resists, Coating process for wet film resists, Exposure and further process for wet film resists, Dry film resists

Etching and Soldering: Introduction, Etching machine, Etchant system. Principles of Solder connection, Solder joints, Solder alloys, Soldering fluxes. Soldering, De-soldering tools and Techniques.

Electronic Circuits and PCB Designing Lab (Hardware and Circuit Simulation Software)

60 lectures

1. Verification of Thevenin's theorem
2. Verification of Super position theorem
3. Verification of Maximum power transfer theorem.
4. Half wave Rectifier – without and with shunt capacitance filter.
5. Centre tapped full wave rectifier – without and with shunt capacitance filter.
6. Zener diode as voltage regulator – load regulation.
7. Transistor characteristics in CE mode – determination of r_i , r_o and β .
8. Design and study of voltage divider biasing.
9. Designing of an CE based amplifier of given gain
10. Designing of PCB using artwork, its fabrication and testing.
11. Design, fabrication and testing of a 9 V power supply with zener regulator

Suggested Books:

1. Electronic Devices and circuit theory, Robert Boylestead and Louis Nashelsky, 9th Edition, 2013, PHI
2. Electronics text lab manual, Paul B. Zbar.
3. Electric circuits, Joeseeph Edminister, Schaum series.
4. Basic Electronics and Linear circuits, N.N. Bhargava, D.C. Kulshresta and D.C Gupta -TMH.
5. Electronic devices, David A Bell, Reston Publishing Company/DB Tarapurwala Publ.
6. Walter C.Bosshart "PCB DESIGN AND TECHNOLOGY" Tata McGraw Hill Publications, Delhi. 1983
7. Clyde F.Coombs "Printed circuits Handbook" III Edition, McGraw Hill.

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