

**1. The P-N junction Diode :**

Shockley's equation and volt-amp characteristics of P-N junction. Static and Dynamic resistance of diode. Transition Capacitance and Diffusion Capacitance. Effect of temperature.

Various practical applications of diodes. Design of Rectifier and Filter Circuits. Special purpose diodes.

**2. The Bipolar junction Transistor:**

Transistor Action. Transistor Current equations;  $\alpha$  and  $\beta$  of a transistor. Transistor Configurations and Transistor Characteristic curves. Base width modulation and early voltage. Ebers-Moll equations and Ebers-Moll model. Concept of amplification. Transistor biasing circuits, Bias stability and Stability factor. Thermal Run-Away. BJT as a switch.

Incremental small signal models of BJT; h-parameter model, Determination of h-parameters and Conversion Formulae of h-parameters;  $\pi$ -model and r-parameter model. Analysis of amplifiers with the help of incremental models. Comparison of performance of CE, CB & CC configurations. Designing of a single stage BJT amplifier. Darlington amplifier, Cascode amplifier and Difference amplifier. Some ideas about high speed analysis such as Miller effect and dominant pole approximation.

Multi-Stage Amplifiers; PNP and NPN combinations. Gain calculation in dB. Methods of coupling between stages. Frequency response of amplifiers and Band-Width.

**3. Field Effect Transistors:**

Principle and construction of JFET. Characteristic curves of JFET. JFET Biasing circuits. Small signal model of JFET. Analysis of JFET amplifiers. Designing of JFET amplifier.

MOS-FET. E-MOSFET and D-MOSFET. MOSFET amplifiers. MOSFET switch.

**4. Feedback in amplifiers and Oscillators:**

Negative and Positive feedback. Different feedback configurations. Advantages of negative feedback. Applications of positive feedback and Barkhausen Criteria for oscillations. RC oscillators LC oscillators and Crystal oscillators; their conditions of oscillation and frequency of oscillation. Designing of oscillators.

**5. Power amplifiers:**

Classification of power amplifiers as Class-A, Class-B, Class-C and Class-AB. R-C coupled and transformer coupled class-A power amplifier. Efficiency of Class-A power

amplifier. Non-linear distortion and second harmonic distortion. Class-B Push-pull power amplifier. Class-AB amplifier. Class-C amplifier. Designing of Power Amplifier.

#### 6. **Fabrication techniques of IC:**

Introduction to device fabrication methods and fabrication of I.C.s. Simple descriptions of processes such as ion diffusion, photolithography, ion implantation, metallization and crystal growing techniques.

#### **Reference Books:**

1. Integrated Electronics :: Millman- Halkias (PHI)
2. Electronic Devices and Circuits :: David A Bell (Oxford)
3. Electronic Devices and Circuits :: Boylestead & Nashelsky (PHI)
4. Electronic Principles Physics, Models and Circuits :: Paul E. Gray and Campbell L Searle
5. Electronics Principles :: Malvino (TMH)