

Unit - I

Chapter 1 : Electronic Components 1-1 to 1-36

Syllabus : Introduction to electronics, Brief History of electronic components, Active and passive components.

Resistors : Concept of resistors, Specification of resistor, Classification of resistors, Fixed type and variable type resistors with applications, Color coding of resistors, Light dependent resistance (LDR) - symbol and working.

Capacitors : Concept of capacitor, Classification of capacitors, Capacitor specifications, Fixed capacitor, Specification and application of ceramic disk capacitor, Polyester capacitor, Mica capacitor, Aluminium electrolytic capacitor, Tantalum capacitor, Variable capacitor - application of air gang PVC gang, and Trimmer capacitor – mica, Coding of capacitors using directly printed codes and color band system.

Inductors : Faraday's laws of electromagnetic induction, Self-inductance, Mutual inductance, Inductor specifications, Introduction to air core, Iron core and Ferrite core inductor, Toroidal inductor, Color coding of inductors.

- 1.1 Introduction to Electronics..... 1-2
 - 1.1.1 Brief History of Electronic Components 1-2
- 1.2 Classification of the Materials 1-3
- 1.3 Types of Electronic Components 1-3
 - 1.3.1 Active Components 1-3
 - 1.3.2 Passive Components 1-3
 - 1.3.3 Comparison of Active and Passive Components 1-4
- 1.4 Resistors 1-4
 - 1.4.1 Resistance (R) 1-4
 - 1.4.2 Factors Affecting the Resistance 1-4
- 1.5 Classification of Resistors 1-5
 - 1.5.1 Linear Resistors 1-5
 - 1.5.2 Nonlinear Resistors 1-5
- 1.6 Specifications of Resistors 1-6
- 1.7 Fixed Resistors 1-7
 - 1.7.1 Carbon Composition Resistor 1-7
 - 1.7.2 Wire-wound Resistors 1-7

- 1.7.3 Film Type Resistors1-8
- 1.7.4 High Value Resistors1-8
- 1.8 Colour Coding of Resistors1-9
 - 1.8.1 Types of Resistor Colour Codes1-9
 - 1.8.2 Colour Coding with Four Bands1-9
 - 1.8.3 Colour Coding with Three Bands1-10
 - 1.8.4 Colour Coding for Five Band Colour Code 1-10
- 1.9 Variable Resistors 1-11
 - 1.9.1 Potentiometers 1-12
 - 1.9.2 Applications of Variable Resistors ... 1-12
- 1.10 Light Dependent Resistor (LDR) 1-12
 - 1.10.1 Applications of LDR 1-14
- 1.11 Concept of Capacitor 1-14
 - 1.11.1 Capacitance 1-14
 - 1.11.2 Classification of Capacitors 1-14
- 1.12 Capacitors Specifications 1-15
- 1.13 Classification of Fixed Capacitors 1-16
 - 1.13.1 Air Capacitors 1-16
 - 1.13.2 Paper Capacitors 1-16
 - 1.13.3 Mica Capacitors 1-16
 - 1.13.4 Ceramic Capacitors 1-17
 - 1.13.5 Polycarbonate Capacitors 1-17
 - 1.13.6 Aluminium Electrolytic Capacitors .. 1-18
 - 1.13.7 Glass Capacitors 1-18
 - 1.13.8 Tantalum Electrolytic Capacitors 1-18
 - 1.13.9 Tantalum Foil Capacitor 1-19
- 1.14 Colour Coding of Capacitors 1-19
 - 1.14.1 Using Numerals 1-19
 - 1.14.2 Using Colour Band System 1-19
 - 1.14.3 By Means of Characters 1-20
 - 1.14.4 Directly Printed Codes 1-20
- 1.15 Variable Capacitors 1-20
 - 1.15.1 Types of Variable Capacitors 1-20
 - 1.15.2 Air Gang Capacitor 1-21
 - 1.15.3 Trimmer Capacitor 1-22
- 1.16 Electromagnetic (EM) Induction 1-22
 - 1.16.1 Faraday's Laws of EM Induction 1-22
 - 1.16.2 Fleming's Right Hand Rule 1-23



1.16.3	Lenz's Law	1-23	2.2	Extrinsic Semiconductors	2-3
1.17	Nature of the Induced E.M.F.	1-23	2.2.1	n-type Semiconductors	2-4
1.17.1	Self-Induced E.M.F.	1-24	2.2.2	p-type Semiconductors	2-5
1.17.2	Self-inductance (L)	1-24	2.2.3	Comparison of p Type and n Type Semiconductors	2-6
1.17.3	Mutually Induced E.M.F.	1-24	2.3	Diffusion	2-6
1.17.4	Mutual Inductance (M)	1-24	2.4	P-N Junction Diode	2-7
1.17.5	Difference between Self Inductance and Mutual Inductance	1-25	2.4.1	Depletion Layer	2-8
1.18	Inductors	1-25	2.4.2	Barrier Potential or Junction Potential (V _j)	2-9
1.18.1	Construction and Symbol	1-25	2.5	Working of a p-n Junction Diode	2-9
1.18.2	Specifications of Inductor	1-25	2.5.1	Working when Forward Biased	2-9
1.18.3	Types of Inductor	1-26	2.5.2	Forward Voltage Drop	2-10
1.18.4	Types of Fixed Inductor	1-26	2.5.3	Power Dissipation	2-10
1.18.5	Air-core Inductor	1-26	2.5.4	Forward Voltage Dissipation	2-10
1.18.6	Iron-core Inductor	1-26	2.5.5	Working when Reverse Biased	2-10
1.18.7	Ferrite Core Inductor	1-27	2.6	The V-I Characteristic of a Diode	2-12
1.19	Toroidal Inductor	1-27	2.6.1	Forward Characteristic	2-12
1.19.1	Toroidal Inductor	1-27	2.6.2	Cut-in voltage or Knee voltage	2-13
1.19.2	Applications of Fixed Inductors	1-28	2.6.3	Reverse Characteristic of a Diode	2-13
1.19.3	Variable Inductors	1-28	2.6.4	Reverse Power Dissipation	2-13
1.19.4	Slug-tuned Inductor	1-28	2.6.5	Peak inverse voltage (PIV)	2-13
1.20	Colour Code of Inductors	1-29	2.6.6	V-I Characteristic of Silicon and Germanium Diodes	2-13
1.20.1	Four Band Colour Code	1-29	2.7	1 Mark or 2 Marks UQs with Answers	2-15
1.20.2	Five Band Colour Code	1-30		• Review Questions	2-14
1.21	Symbols of Various Components	1-31			
1.22	1 Mark or 2 Marks UQs with Answers.....	1-34			
	• Review Questions	1-31			

Unit - II

Chapter 2 : PN Junction Diode 2-1 to 2-16

Syllabus : PN Junction diode : P-type and N-type semiconductor, Construction of PN junction diode, Symbol, Working and characteristic of PN junction diode, Forward voltage drops, Reverse leakage current, Power dissipation, Breakdown voltage, Peak Inverse Voltage (PIV).

2.1	Semiconductors.....	2-2
2.1.1	Types of Semiconductors	2-2
2.1.2	Conduction in Intrinsic Semiconductors	2-3

Chapter 3 : Rectifiers 3-1 to 3-24

Syllabus : Rectifier : Need of rectifier, Definition, **Types of rectifiers** : Half wave rectifier, Full wave center tap and bridge rectifier, Output voltage, Current, Ripple voltage, Ripple factor, Ripple frequency, PIV of a diode, Transformer utilization factor, Efficiency of half wave and full wave rectifiers. **Filters** : Need and applications of rectifier filters, **Types of filters** : Shunt capacitor and Pi filter.

3.1	A DC Power Supply.....	3-2
3.1.1	The Transformers	3-2
3.2	Rectifiers	3-3
3.2.1	Classification of Rectifiers	3-3
3.3	Half Wave Rectifier (HWR)	3-3



3.3.1	Performance Parameters of HWR	3-5	3.10.6	Comparison of C and π Filters	3-21
3.3.2	Advantages of HWR	3-7	3.11	1 Mark or 2 Marks UQs with Answers	3-24
3.3.3	Disadvantages of Half Wave Rectifier	3-7		• Review Questions.....	3-21
3.3.4	Applications of HWR	3-7	Unit - III		
3.4	Full Wave Rectifier with Center Tapped Transformer	3-7	Chapter 4 : Special Purpose Diodes 4-1 to 4-18		
3.4.1	Performance Parameters of FWR	3-9	Syllabus : Zener diode : Symbol, Construction, Characteristics and application as a voltage regulator. Symbol, Construction and application of Varactor diode, Schottky barrier diode, Crystal diode. Symbol, Construction and application of Photodiode, Light Emitting Diode (LED) and Multi color LED.		
3.4.2	Advantages of Full Wave Rectifier	3-11	4.1	Introduction	4-2
3.4.3	Disadvantages of Full Wave Rectifier	3-11	4.2	Zener Diode	4-2
3.4.4	Applications of FWR	3-11	4.2.1	V-I Characteristics of a Zener Diode	4-3
3.5	Bridge Rectifier	3-11	4.2.2	Comparison of Zener Diode and p-n Junction Diode	4-3
3.5.1	Performance Parameter of a Bridge Rectifier	3-12	4.2.3	Applications of Zener Diode	4-4
3.5.2	Advantages of Bridge Rectifier	3-14	4.3	The Zener Voltage Regulator	4-4
3.5.3	Disadvantages of Bridge Rectifier	3-14	4.3.1	Limitations of Zener Regulators	4-5
3.5.4	Applications of Bridge Rectifier	3-14	4.3.2	Merits of Zener Regulator	4-5
3.6	Comparison of Rectifying Circuits	3-14	4.4	Varactor (Varicap) Diode	4-6
3.7	Need of Filter Circuits	3-15	4.4.1	Applications of Varactor Diode	4-7
3.8	Types of Filters	3-15	4.5	Schottky Diode	4-7
3.9	Shunt Capacitor Filter or C Filter	3-15	4.5.1	I-V Characteristics of Schottky Diode	4-8
3.9.1	Ripple Factor and DC Output Voltage	3-17	4.5.2	Applications of Schottky Diode	4-8
3.9.2	DC Output Voltage	3-17	4.5.3	Comparison of Schottky Barrier Diode and p-n Junction Diode	4-9
3.9.3	Dependence of Ripple Factor on the Value of Load	3-18	4.6	Crystal Diode	4-9
3.9.4	Advantages of Capacitor Input Filter	3-18	4.6.1	Characteristic of Crystal Diode	4-10
3.9.5	Disadvantages (Limitations)	3-18	4.6.2	Features of Crystal Diode	4-10
3.9.6	Applications of Capacitor Input Filter	3-18	4.6.3	Applications of Crystal Diode	4-10
3.9.7	HWR with Shunt Capacitor Filter	3-18	4.7	Light Emitting Diodes (LED)	4-11
3.9.8	Bridge Rectifier with Shunt Capacitor Filter	3-19	4.7.1	Output Characteristics of LED	4-12
3.10	π Type Filter (CLC Filter)	3-19	4.7.2	Applications of LED	4-12
3.10.1	Advantages	3-20	4.7.3	Multi colour LED	4-12
3.10.2	Disadvantages	3-20	4.8	Photodiode	4-12
3.10.3	Applications	3-20	4.8.1	Photodiode Characteristics	4-13
3.10.4	π type Filter with Half Wave Rectifier	3-20	4.8.2	Application of Photodiode	4-14
3.10.5	π Type Filter with Bridge Rectifier	3-20			



4.8.3	Other Applications of Photodiode ..4-14
4.8.4	Comparison of Diodes4-14
4.9	1 Mark or 2 Marks UQs with Answers4-18
	• Review Questions4-14

Unit - IV

Chapter 5 : Introduction to Transistors 5-1 to 5-22

Syllabus : Transistor NPN and PNP symbol, Construction, Working, Amplifying action. Transistor configuration and input output characteristics of NPN transistors in Common base (CB), Common emitter (CE) and Common collector (CC) configuration.

Relation between current gain of CB, CE and CC configuration, Alpha, Beta and Gama of transistor.

Transistor as switch in cutoff and saturation region.

5.1	Introduction 5-2
5.1.1	Basics of Transistor 5-2
5.2	Construction of a BJT 5-2
5.2.1	An Unbiased Transistor 5-3
5.3	Transistor Biasing in the Active Region 5-3
5.3.1	Biasing 5-3
5.3.2	Regions of Operation 5-3
5.3.3	Transistor Biasing for Forward Active Region 5-4
5.3.4	Transistor Biasing for Forward Active Region 5-4
5.4	Transistor Operation 5-4
5.4.1	Operation of npn Transistor 5-4
5.4.2	Operation of PNP Transistor 5-5
5.4.3	Circuit Symbols and Conventions 5-6
5.5	Transistor Configurations 5-6
5.6	Common Base (CB) Configuration 5-6
5.6.1	Current Amplification Factor or Current Gain (α or α_{dc}) 5-7
5.6.2	Characteristics of a Transistor in Common Base Configuration 5-7
5.6.3	Input Characteristic 5-7
5.6.4	Output Characteristic of Transistor in CB Configuration 5-8
5.6.5	Features of CB Configuration 5-9
5.7	Common Emitter (CE) Configuration 5-10
5.7.1	Current Gain β of CE Configuration 5-10

5.7.2	Relation between α_{dc} and β_{dc} 5-10
5.7.3	Input Characteristic 5-11
5.7.4	Output Characteristic 5-12
5.7.5	Features of CE Configuration 5-13
5.8	Common Collector (CC) Configuration 5-14
5.8.1	Input Characteristics of n-p-n Transistor in CC Configuration 5-15
5.8.2	Output Characteristics of a n-p-n Transistor in CC Configuration 5-15
5.8.3	Features of CC Configuration 5-15
5.9	Comparison of Configurations 5-16
5.10	Transistor as Amplifier 5-16
5.10.1	Block Diagram of an Amplifier 5-17
5.10.2	Amplifier Characteristics 5-17
5.10.3	Transistor as a Current Amplifier 5-18
5.10.4	Transistor as a Voltage Amplifier 5-18
5.11	Transistor as a Switch 5-19
5.11.1	Applications of Transistor 5-20
5.12	1 Mark or 2 Marks UQs with Answers 5-22
	• Review Questions 5-20

Unit - V

Chapter 6 : Handling Electronic Waste 6-1 to 6-06

Syllabus : Concept of electronic waste. Sustainability and electronic waste management. Methods to handle electronic waste. Strategies of electronic waste management in the small electronic Industries.

6.1	Concept of Electronic Waste.....6-2
6.1.1	List of Common E-waste Items6-2
6.1.2	E-waste Problems6-2
6.2	Sustainability and E-waste Management6-2
6.2.1	Sustainable Management of E-Waste6-3
6.2.2	Advantages of E-waste Management6-4
6.3	Methods to Handle Electronic Waste6-4
6.3.1	Tips for Individuals to Manage E-waste.....6-5
6.4	Strategies of E-Waste Management6-6
	• Review Questions6-06

□□□