BEEE Unit–5 Notes Basic Electronics Easy & Detailed Explanation for RGPV Students

UNIT–5 TOPICS COVERED

Digital Electronics
• Number Systems
• Number Conversion
• De Morgan’s Theorem
• Logic Gates
• Half Adder
• Full Adder
• R-S Flip Flop
• J-K Flip Flop

Semiconductor Electronics
• Semiconductors
• Diodes
• V-I Characteristics
• Bipolar Junction Transistor (BJT)
• CB, CE & CC Configurations
• Modes of Operation of BJT

1. NUMBER SYSTEMS

A number system is a method of representing numbers using digits or symbols.

Types of Number Systems:
• Decimal Number System
• Binary Number System
• Octal Number System
• Hexadecimal Number System

Decimal to Binary Conversion:
Repeatedly divide the number by 2 and write remainders.

Binary to Decimal Conversion:
Multiply binary digits with powers of 2 and add them.

Applications:
Computers, digital systems and electronic devices.

2. DE MORGAN’S THEOREM

First Theorem:
(A+B)' = A'B'

Second Theorem:
(AB)' = A'+B'

Applications:
Logic circuit simplification and digital circuit design.

3. LOGIC GATES

Logic gates are electronic circuits used to perform logical operations.

Types of Gates:
• AND Gate

• OR Gate
• NOT Gate
• NAND Gate
• NOR Gate
• XOR Gate

Applications:
Computers, calculators and digital systems.

4. HALF ADDER

Half adder adds two binary digits.

Sum = A XOR B
Carry = AB

Limitation:
Cannot add carry input.

5. FULL ADDER

Full adder adds three binary digits including carry input.

Sum = A XOR B XOR C
Carry = AB + BC + CA

Applications:
Computers and calculators.

6. R-S FLIP FLOP

Basic memory element storing one bit.

Inputs:
• Set (S)
• Reset (R)

Applications:
Registers and memory circuits.

7. J-K FLIP FLOP

Improved version of R-S flip flop.

Advantages:
• No invalid state
• Toggle operation possible

Applications:
Counters and registers.

8. SEMICONDUCTORS

Semiconductors are materials having conductivity between conductors and insulators.

Examples:
• Silicon
• Germanium

Types:
• Intrinsic Semiconductor
• Extrinsic Semiconductor

9. DIODE

A diode allows current in one direction only.

Forward Bias:
Current flows easily.

Reverse Bias:
Very small current flows.

Applications:
Rectifiers and voltage regulators.

10. V-I CHARACTERISTICS OF DIODE

Forward Bias Region:
Current increases rapidly after knee voltage.

Reverse Bias Region:
Very small reverse current flows.

Breakdown Region:
Large reverse current suddenly flows.

11. BIPOLAR JUNCTION TRANSISTOR (BJT)

A transistor is a three terminal semiconductor device used for amplification and switching.

Types:
• NPN Transistor
• PNP Transistor

Terminals:
• Emitter
• Base
• Collector

Applications:
Amplifiers and switching circuits.

12. TRANSISTOR CONFIGURATIONS

Common Base (CB):
• Low input resistance
• High voltage gain

Common Emitter (CE):
• High current gain
• High voltage gain

Common Collector (CC):
• High input resistance
• Low output resistance

13. MODES OF OPERATION OF BJT

1. Active Region:
Used for amplification.

2. Cutoff Region:
Transistor OFF.

3. Saturation Region:
Transistor fully ON.

MOST IMPORTANT 14 MARK QUESTIONS

1. Explain number systems and conversions.
2. Explain De Morgan’s theorem.
3. Explain logic gates with truth tables.
4. Explain half adder and full adder.
5. Explain R-S and J-K flip flop.
6. Explain semiconductors and types.
7. Explain diode and V-I characteristics.
8. Explain BJT and working principle.
9. Explain transistor configurations.
10. Explain modes of operation of BJT.

EXAM TIPS

• Learn truth tables properly.
• Practice number conversions daily.
• Draw transistor diagrams neatly.
• Learn logic gate symbols.
• Practice Boolean simplification.