

Detailed Syllabus (Theory)

Unit Topics with Contents

1

Fundamentals of digital electronics.

- 1.1 Define digital Electronics and digital signal.
- 1.2 Compare between digital and analog signal.
- 1.3 Describe logic level, Negative logic level and positive logic level,
- 1.4 Explain the parameter Frequency, Time period, Rise time, Fall time, Rising edge, falling edge, On time, Off time and Duty cycle of digital signal.

2

Number systems and codes

- 2.1 Define Number system and Base of number system.
- 2.2 Describe Decimal, Binary, Octal and Hexadecimal number system.
- 2.3 Convert Decimal, Binary, Octal and Hexadecimal number system. from each other.
- 2.4 Determine 1's & 2's complement of binary number.
- 2.5 Compute binary arithmetic.
- 2.6 Describe 8421, Excess-3code, Gray code, BCD code, Hamming code, ASCII code and Unicode.
- 2.7 Convert one code to another.
- 2.8 Describe the addition and subtraction of BCD coded number.

3

Logic gates

- 3.1 Define logic gate.
- 3.2 Classify logic gate.
- 3.3 Describe logic symbol, logic statements, truth table and Boolean equation of different logic gates.
- 3.4 Analyze the electrical circuit for basic gates.
- 3.5 Describe pin and signals of different gate I

4

Simplification of logic circuits

- 4.1 Define Boolean algebra.
- 4.2 Describe the laws and rules of Boolean Algebra.
- 4.3 State the DE Morgan's theorems.
- 4.4 Derive standard SOP and POS equation from truth table.
- 4.5 Explain shorthand notation $Y = m_1 + m_3 + m_4 + \dots = (1, 3, 4 \dots)$ and $Y = m_1 \cdot m_3 \cdot m_4 \cdot \dots = (1 \cdot 3 \cdot 4 \dots)$
- 4.6 Simplify Boolean expression and logic circuit using Boolean algebra and DE-Morgan theorem.
- 4.7 Define Karnaugh map.
- 4.8 Describe the structure and simplification methods of Karnaugh map.
- 4.9 Simplify up to four variable standard and nonstandard Boolean expression using Karnaugh map.

5

Digital IC and Logic Family

- 5.1 Define Logic Family.
- 5.2 Classify digital IC based on scale of integration.
- 5.3 List the advantages of using IC in digital system.
- 5.4 Mention the different types of IC logic families
- 5.5 Explain fan-in, fan-out, noise-margin, propagation delay, TTL and CMOS logic levels and power dissipation
- 5.6 Describe the TTL, DTL, CMOS circuitry of NOT, NAND & NOR gates.

6

Combinational logic circuits

- 5.7 Define Combinational logic circuit.
- 5.8 Explain the operation of Binary comparator circuits.
- 5.9 Describe the Pin diagram of commonly used 4-bit comparator ICs.
- 5.10 Describe the operation of parity generator and detector circuit.
- 5.11 Describe the logic circuit error detection and correction with humming code.

7

Arithmetic logic circuits

- 7.1 Describe the operation of half adder, full adder and 4-bit parallel adder.
- 7.2 Explain the operation of half Sub tractor, full Sub tractor and 4-bit subtraction circuit.
- 7.3 Mention the Basic principle of ALU
- 7.4 Describe the pin and signals of ALU chips.
- 7.5 Explain the operation of shift and add multiplier circuit.
- 7.6 List the application of combinational logic circuit.

8

Multiplexers and Demultiplexer

- 8.1 Define multiplexers and demultiplexer.
- 8.2 Describe the operation of 2:1, 4:1 and 8:1 multiplexer with logic diagram.
- 8.3 Describe the operation of 1:2, 1:4 and 1:8 demultiplexers with logic diagram.
- 8.4 List the use of multiplexer & demultiplexer.
- 8.5 Describe the Pin diagram of commonly used 4-bit comparator ICs

9

Encoder and Decoder

- 9.1 Define Encoder and Decoder.
- 9.2 Explain the logic circuit of 4 to 2, 8 to 3 & priority Encoder.
- 9.3 Analyze the logic circuit of 2 to 4, 3 to 8 decoder circuit.
- 9.4 Describe the pins and signals of 74138 and 74154 decoder IC.
- 9.5 State the working principle of LCD, LED, Seven-segment and Dot matrix display.
- 9.6 Sketch the diagram of commonly used 4-bit BCD encoder/driver for seven segment display of common Anode/Cathode type.
- 9.7 Distinguish between Decoder and Demultiplexer.

10

Sequential logic circuits

- 10.1 Define sequential logic circuit.
- 10.2 Describe the operation of SR latch, D Latch with truth table and timing diagram.
- 10.3 Mention the disadvantages of SR Latch.
- 10.4 Discuss positive level, negative level and edge triggering.
- 10.5 Explain the operation of SR Flip-Flop, JK Flip-Flop, D Flip-Flop and Master-slave Flip-Flop with truth table and timing diagram.
- 10.6 Define three state logic.
- 10.7 Describe the pin and signals of 7474, 7476, 74273 and 74573 IC
- 10.8 List the application of different types of Flip-Flops.
- 10.9 Describe internal block diagram of 555 timer IC.
- 10.10 Explain the operation of Clock generator circuit using 555 timer.

The End