

Enrollment No./Seat No.:

GUJARAT TECHNOLOGICAL UNIVERSITY
M.SC INTEGRATED - SEMESTER - III EXAMINATION - WINTER 2025

Subject Code: 1330504

Date: 01-12-2025

Subject Name: Digital Electronics

Time: 10:30 AM TO 01:00 PM

Total Marks: 70

Instructions

- 1. Attempt all questions.**
- 2. Make suitable assumptions wherever necessary.**
- 3. Figures to the right indicate full marks.**
- 4. Use of simple calculators and non-programmable scientific calculators are permitted.**

	Marks
Q.1 (a) Explain BCD and XS-3 codes with examples.	03
(b) Draw logic circuit for the boolean expression : $(A + AB).(B+BC).(C+AB)$	04
(c) Explain the binary, octal, decimal, and hexadecimal number systems. Describe all inter-conversion methods with suitable examples.	07
Q.2 (a) What are 'don't care' conditions? Explain their role in Boolean simplification using K-maps.	03
(b) List all standard SOP and POS terms corresponding to all possible combinations of three input variables (A, B, C).	04
(c) Discuss universal gates (NAND and NOR). Explain how they can be used to implement any Boolean function with examples.	07
OR	
(c) State De-Morgan's theorem and prove the given boolean expression using boolean algebra simplification.	07
$\overline{\overline{ABC + \overline{A.B} + BC}} = \overline{A.B}$	
Q.3 (a) Draw and explain the working of a 4-bit parallel binary adder using full adders.	03
(b) Explain the function of Full Subtractor circuit. Derive its Boolean expression and draw the corresponding logic diagram.	04
(c) What is a Demultiplexer (DeMUX)? Explain the working of a 1-to-4 demultiplexer with a logic diagram and truth table.	07
OR	
(a) Explain in detail the difference between combinational and sequential circuits.	03
(b) Explain the function of Full Adder circuit. Derive its Boolean expression and draw the corresponding logic diagram.	04
(c) Explain in detail the concept of encoder and decoder circuits. Describe their construction, working principles, truth tables, and logic diagrams.	07

- Q.4** (a) Define a latch. Explain its operation and list two types of latches with their applications. **03**
- (b) Explain the concept of edge-triggered flip-flop with suitable diagram. **04**
- (c) Using T flip-flops, design a Mod-10 asynchronous counter. Show the circuit diagram and describe how it counts from 0 to 9. **07**

OR

- (a) What is a T flip-flop? Draw its logic diagram and explain its operation. **03**
- (b) Convert a J-K flip-flop into a D flip-flop and explain its working. **04**
- (c) Explain the construction and working of a Master-Slave J-K flip-flop. **07**
- Q.5** (a) Explain the working of Serial-In Parallel-Out shift registers with suitable diagram. **03**
- (b) Explain in brief the concept and operation of synchronous and asynchronous counters. **04**
- (c) Describe the various types of ROM and state their characteristics and applications. **07**

OR

- (a) Explain the working of Parallel-In Parallel-Out shift registers with suitable diagram. **03**
- (b) Explain the operation of a 4-bit ripple counter. Discuss its advantages and limitations. **04**
- (c) Describe the internal structure and operation of SRAM and DRAM. Highlight the major differences between them with suitable examples. **07**
