Reg. No. | | | | | | | | |

G. VENKATASWAMY NAIDU COLLEGE (AUTONOMOUS), KOVILPATTI – 628 502.

UG DEGREE END SEMESTER EXAMINATIONS - APRIL 2025.

(For those admitted in June 2023 and later)

PROGRAMME AND BRANCH: B.Sc., INFORMATION TECHNOLOGY

SEM	CATEGORY	COMPONENT	COURSE CODE	COURSE TITLE
I	PART - III	ELECTIVE GENERIC - 1	U23IT1A1	DIGITAL LOGIC FUNDAMENTALS

Date & Session:24.04.2025/AN **Time : 3 Hours** **Maximum 75 Marks**

Course Outcome	Bloom's K-level	Q. No.	**SECTION – A (10 X 1 = 10 Marks)** **Answer ALL Questions.**
CO1	K1	1.	What is the binary equivalent of the decimal number 10? a) 1010 b) 1001 c) 1100 d) 1110
CO1	K2	2.	Which of the following is a code used for error detection? a) ASCII b) Excess-3 Code c) Gray Code d) Binary Code
CO2	K1	3.	The Sum of Products (SOP) method is used in: a) Boolean Algebra b) Arithmetic Operations c) Memory Design d) Data Storage
CO2	K2	4.	In a Karnaugh Map, pairs are used for: a) Simplifying expressions b) Combining adjacent 1s c) Creating truth tables d) Designing circuits
CO3	K1	5.	The 2's complement of a binary number is used for: a) Addition only b) Subtraction c) Multiplication d) Division
CO3	K2	6.	Which of the following circuits is used for binary addition? a) Decoder b) Full Adder c) Multiplexer d) Flip-Flop
CO4	K1	7.	An RS Flip-Flop is primarily used for: a) Counting b) Storing a single bit c) Arithmetic operations d) Data transmission
CO4	K2	8.	A Synchronous Counter is characterized by: a) Asynchronous inputs b) All flip-flops being triggered simultaneously c) Ripple effect d) No clock signal
CO5	K1	9.	Random Access Memory (RAM) is: a) Non-volatile b) Volatile c) Permanent storage d) Read-only
CO5	K2	10.	The primary function of a Multiplexer is to: a) Store data b) Select one of many inputs c) Perform arithmetic operations d) Decode signals
Course Outcome	**Bloom's K-level**	**Q. No.**	**SECTION – B (5 X 5 = 25 Marks)** **Answer ALL Questions choosing either (a) or (b)**
CO1	K3	11a.	Convert the decimal number 25.625 to its binary equivalent. Show all steps. **(OR)**
CO1	K3	11b.	Explain the Gray code and its significance in minimizing errors in digital systems.

CO2	K3	12a.	Simplify the Boolean expression F = A'B + AB' + AB using Karnaugh Map. **(OR)**
CO2	K3	12b.	Design a 2-to-4 decoder using basic logic gates and write its truth table.
CO3	K4	13a.	Implement a 4-bit binary adder-subtractor circuit using Full Adders. Explain its working with a diagram. **(OR)**
CO3	K4	13b.	Discuss the arithmetic operations in 2's complement representation with examples of addition and subtraction.
CO4	K4	14a.	Design a 3-bit synchronous up-counter using JK flip-flops. Include the state table and logic diagram. **(OR)**
CO4	K4	14b.	Explain the working of a shift register and its applications in data storage and transfer.
CO5	K3	15a.	Describe the architecture of a RAM with a block diagram. How is memory decoding achieved? **(OR)**
CO5	K3	15b.	Explain the working of a 555 Timer in astable mode and derive the expression for its output frequency.

Course Outcome	**Bloom's K-level**	**Q. No.**	**SECTION – C (5 X 8 = 40 Marks)** **Answer ALL Questions choosing either (a) or (b)**
CO1	K3	16a.	Design a 7-segment display decoder using logic gates. Include the truth table, K-map simplification, and circuit diagram. **(OR)**
CO1	K3	16b.	Evaluate the advantages of using Gray code over binary code in rotary encoders and error correction systems.
CO2	K5	17a.	Implement a 4:1 multiplexer using universal gates (NAND/NOR) and verify its operation with a truth table. **(OR)**
CO2	K5	17b.	Analyze the role of don't care conditions in K-map simplification with a real-world example (e.g., BCD to 7-segment decoder).
CO3	K5	18a.	Design an 8-bit Arithmetic Logic Unit (ALU) capable of performing addition, subtraction, AND, and OR operations. Use block diagrams and explain control signals. **(OR)**
CO3	K5	18b.	Compare sign-magnitude and 2's complement representations for signed integers. Discuss their impact on arithmetic operations.
CO4	K6	19a.	Develop a mod-10 ripple counter using JK flip-flops. Include timing diagrams and explain propagation delays. **(OR)**
CO4	K6	19b.	Simulate a 4-bit shift register using D flip-flops and demonstrate serial-in-parallel-out (SIPO) operation with waveforms.
CO5	K5	20a.	Design a digital voltmeter circuit using an ADC (Analog-to-Digital Converter) and a 7-segment display. Explain each component's role. **(OR)**
CO5	K5	20b.	Propose a programmable logic device (PLD)-based solution for a traffic light controller. Include state diagrams and HDL code snippets.