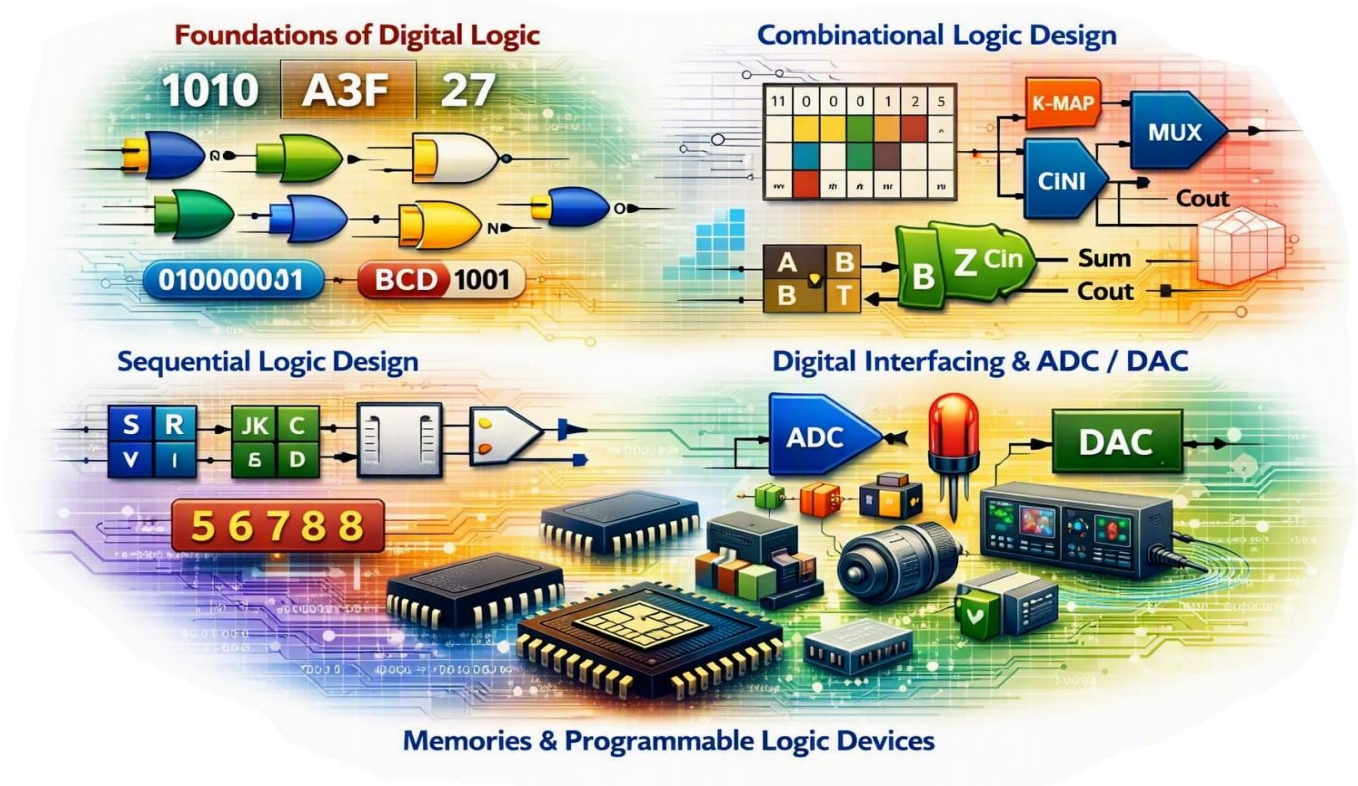
CENTRAL POLYTECHNIC COLLEGE,THARAMANI – 600113.

(An Autonomous Institution)

DEPARTMENT OF COMPUTER ENGINEERING

QUESTION BANK

ECS31010 - DIGITAL LOGIC DESIGN



U.NO	Q NO	QUESTIONS
1	1	Which number system uses only 0 and 1? (a) Decimal (b) Octal (c) Binary (d) Hexadecimal **Ans:(C)**
1	2	What is the 1's complement of binary number 0101? (a) 1010 (b) 1011 (c) 1101 (d) 1111 **Ans:(A)**
1	3	What is the hexadecimal equivalent of binary number 11011010? (a) DA (b) AC (c) BC (d) D9 **Ans:(A)**
1	4	Which code is widely used for character representation in computers? (a) BCD (b) ASCII (c) HEX (d) Graycode **Ans:(B)**
1	5	The NOT gate inverts the input signal. What is the output of NOT 0? (a) 0 (b) 1 (c) 2 (d) Undefined **Ans:(B)**
1	6	Which of the following represents 1's complement of 10110? (a) 1001 (b) 110 (c) 10111 (d) 111 **Ans:(A)**
1	7	Which gate outputs HIGH only when both inputs are HIGH? (a) OR (b) AND (c) NOT (d) NOR **Ans:(B)**
1	8	The binary equivalent of decimal 25 is (a) 11001 (b) 11010 (c) 10110 (d) 11101 **Ans:(A)**
1	9	Which of the following is a universal gate? (a) XOR (b) NAND (c) OR (d) AND **Ans:(B)**
1	10	The result of binary subtraction 1001-0100 is (a) 1100 (b) 11 (c) 101 (d) 1000 **Ans:(C)**

U.NO	Q NO	QUESTIONS
1	11	Which logic gate gives a HIGH output only when inputs differ? (a) AND (b) OR (c) XOR (d) NAND **Ans:(C)**
1	12	What is the decimal equivalent of binary 1010? (a) 8 (b) 9 (c) 10 (d) 11 **Ans:(C)**
1	13	The full form of BCD is (a) Binary Coded Decimal (b) Basic Coded Decimal (c) Binary Central Decoder (d) Base Code Device **Ans:(A)**
1	14	Binary addition of 1001+0011equals (a) 10100 (b) 1100 (c) 1110 (d) 1010 **Ans:(B)**
1	15	Which gate performs logical multiplication? (a) OR (b) NOT (c) AND (d) NAND **Ans:(C)**
1	16	ASCII code for letter ‘A’ is: (a) 65 (b) 66 (c) 67 (d) 64 **Ans:(A)**
1	17	The 1's complement of 1100 is (a) 1100 (b) 11 (c) 1001 (d) 1010 **Ans:(B)**
1	18	Convert 27 to binary (a) 11001 (b) 11011 (c) 10101 (d) 11100 **Ans:(B)**
1	19	Which gate has the symbol $\oplus$? (a) OR (b) NAND (c) XOR (d) AND **Ans:(C)**
1	20	What is the BCD representation of decimal 92? (a) 10010010 (b) 10100011 (c) 10010110 (d) 1101001 **Ans:(A)**

U.NO	Q NO	QUESTIONS
1	21	Logic gates are implemented using: (a) Ics (b) Diodes (c) Transistors (d) All of the Above **Ans:(D)**
1	22	Binary equivalent of hexadecimal F is: (a) 1110 (b) 1111 (c) 1010 (d) 1100 **Ans:(B)**
1	23	The NAND gate is a combination of: (a) AND+NOT (b) OR+NOT (c) NOT+XOR (d) AND+XOR **Ans:(A)**
1	24	Which logic gate has only one input? (a) AND (b) OR (c) NOT (d) XOR **Ans:(C)**
1	25	Binary subtraction of 1011-0101: (a) 100 (b) 110 (c) 1110 (d) 1000 **Ans:(B)**
1	26	Decimal equivalent of binary 11100 is: (a) 28 (b) 30 (c) 32 (d) 34 **Ans:(B)**
1	27	What is the logic level for binary 1? (a) 0V (b) 2V (c) 5V (d) HIGH **Ans:(D)**
1	28	Which gate's output is HIGH only if all inputs are LOW? (a) OR (b) NAND (c) NOR (d) AND **Ans:(C)**
1	29	Binary to octal:110101 converts to: (a) 33 (b) 45 (c) 65 (d) 32 **Ans:(A)**
1	30	ASCII value of digit ‘0’ is: (a) 47 (b) 48 (c) 49 (d) 50 **Ans:(B)**

U.NO	Q NO	QUESTIONS
1	31	Decimal 85 in hexadecimal is: (a) 55 (b) 4A (c) 5B (d) 40 **Ans:(C)**
1	32	What is ASCII value of character ‘A’? (a) 41 (b) 65 (c) 97 (d) 60 **Ans:(B)**
1	33	Which number system uses base 16? (a) Binary (b) Decimal (c) Octal (d) Hexadecimal **Ans:(D)**
1	34	Find the result:1101+0110 (a) 11 (b) 1011 (c) 10011 (d) 1111 **Ans:(D)**
1	35	A logic gate with output LOW for all HIGH inputs is: (a) NAND (b) AND (c) OR (d) NOT **Ans:(A)**
1	36	Hexadecimal ‘C’ equals: (a) 11 (b) 12 (c) 13 (d) 14 **Ans:(B)**
1	37	Which gate is used to detect inequality of inputs? (a) AND (b) OR (c) XOR (d) XNOR **Ans:(C)**
1	38	What will be output of NAND gate with inputs A=1,B=1? (a) 1 (b) 0 (c) Undefined (d) Depends on circuit **Ans:(B)**
1	39	What is 2’s complement of binary number 1001? (a) 111 (b) 1101 (c) 1111 (d) 111 **Ans:(A)**
1	40	What is the 1’s complement of 1110? (a) 1 (b) 0 (c) 11 (d) 0 **Ans:(A)**

U.NO	Q NO	QUESTIONS
1	41	Decimal equivalent of hexadecimal 1F: (a) 25 (b) 30 (c) 31 (d) 32 **Ans:(C)**
1	42	The AND gate outputs 1 only when: (a) Any input is 1 (b) All inputs are 1 (c) Any input is 0 (d) Both inputs are 0 **Ans:(B)**
1	43	Binary equivalent of decimal number 12: (a) 1010 (b) 1100 (c) 1110 (d) 1001 **Ans:(B)**
1	44	How many symbols are in hexadecimal system? (a) 8 (b) 10 (c) 12 (d) 16 **Ans:(D)**
1	45	Convert binary 101111 to decimal: (a) 47 (b) 48 (c) 46 (d) 45 **Ans:(A)**
1	46	What is the primary function of logic gates? (a) Store Data (b) Perform Calculations (c) Make decisions based on inputs (d) Transmit signals **Ans:(C)**
1	47	What is the decimal value of BCD 1001 0101? (a) 95 (b) 59 (c) 85 (d) 75 **Ans:(A)**
1	48	What is the output of an OR gate when both inputs are 0? (a) 1 (b) 0 (c) Undefined (d) Depends on Input **Ans:(B)**
1	49	Convert octal 75 to binary: (a) 111101 (b) 100110 (c) 111110 (d) 101100 **Ans:(C)**
1	50	Which logic gate is used to build flip-flops? (a) OR (b) AND (c) XOR (d) NAND **Ans:(D)**

U.NO	Q NO	QUESTIONS
1	51	Which binary number is equivalent to decimal 45? (a) 101101 (b) 101011 (c) 110101 (d) 100101 **Ans:(101101) Decimal 45 is 32+8+4+1, giving 101101.**
1	52	What is the 2's complement of 00101100? (a) 11010100 (b) 11010011 (c) 10110100 (d) 11110100 **Ans:(11010100) Invert the bits to 11010011 and add 1 to obtain 11010100.**
1	53	Which Boolean expression represents an AND operation? (a) A+B (b) A·B (c) A⊕B (d) A' **Ans:(A·B) The AND operation is represented by multiplication (A·B).**
1	54	What is the hexadecimal representation of binary 11101111? (a) EF (b) FE (c) DF (d) EE **Ans:(EF) Grouping 1110 and 1111 gives E and F, respectively.**
1	55	Which gate is known as a universal gate? (a) XOR (b) AND (c) NAND (d) NOT **Ans:(NAND) NAND is a universal gate because any Boolean function can be implemented using NAND gates.**
2	1	Which Boolean law states that A+A=A? (a) Associative Law (b) Idempotent Law (c) Absorption Law (d) Commutative Law **Ans:(B)**
2	2	Simplify the Boolean expression A+AB (a) AB (b) A (c) B (d) A+B **Ans:(B)**
2	3	What is the result of A·(A+B)? (a) A (b) B (c) AB (d) A+B **Ans:(A)**
2	4	Which theorem is expressed by (AB)'=A'+B'? (a) Consensus (b) De-Morgan's Theorem (c) Duality (d) Involution **Ans:(B)**
2	5	Which of the following is NOT a valid Boolean identity (a) A+0=A (b) A.1=A (c) A+A=0 (d) A.A=A **Ans:(C)**

U.NO	Q NO	QUESTIONS
2	6	What is the function of a full adder? (a) Adds two bits (b) Subtracts two bits (c) Adds three bits including carry (d) Converts binary to decimal **Ans:(C)**
2	7	K-map for 3 variables has how many cells? (a) 6 (b) 8 (c) 4 (d) 12 **Ans:(B)**
2	8	What is the simplified form of A'B +AB'? (a) A (b) B (c) A⊕B (d) A+B **Ans:(C)**
2	9	Which gate is used to build a half adder along with XOR? (a) AND (b) OR (c) NAND (d) NOR **Ans:(A)**
2	10	The output of a 2:1 multiplexer is controlled by: (a) 1 select line (b) 2 select line (c) 3 select line (d) 4 select line **Ans:(A)**
2	11	What is the output of a full subtractor when A=1, B=0, BorrowIn=1? (a) Difference=0,Borrow=0 (b) Difference=0,Borrow=1 (c) Difference=1,Borrow=0 (d) Difference=1,Borrow=1 **Ans:(B)**
2	12	Which Boolean expression represents an XOR gate? (a) A+B (b) AB (c) A'B+AB' (d) A'+B' **Ans:(C)**
2	13	What is the purpose of a decoder? (a) To convert 2^n inputs into n outputs (b) To amplify signals (c) To detect parity (d) To convert n inputs into 2^n outputs **Ans:(D)**
2	14	Which of the following expressions is correct for a 2-variable K-map cell placement? (a) Top-left=AB (b) Top-left=A'B' (c) Top-left=AB' (d) Top-left=A'B **Ans:(B)**
2	15	What is the binary sum of 1 +1using a half adder? (a) Sum=0, Carry=0 (b) Sum=1, Carry=1 (c) Sum=0, Carry=1 (d) Sum=1, Carry=0 **Ans:(C)**

U.NO	Q NO	QUESTIONS
2	16	Which law is illustrated by A+AB =A? (a) Absorption (b) Distributive (c) Associative (d) Commutative **Ans:(A)**
2	17	In a 4x1 multiplexer, how many select lines are required? (a) 1 (b) 2 (c) 3 (d) 4 **Ans:(B)**
2	18	Which logic function can a 4-variable K-map simplify? (a) Decimal Functions (b) ASCII codes (c) Boolean Expressions (d) Counters **Ans:(C)**
2	19	What is the simplified output of A+A'B? (a) A (b) B (c) A+B (d) A+A' **Ans:(A)**
2	20	A 3-variable K-map has how many m in terms? (a) 6 (b) 4 (c) 8 (d) 3 **Ans:(C)**
2	21	In Boolean algebra, what is A·0 equal to? (a) 1 (b) 0 (c) A (d) Undefined **Ans:(B)**
2	22	How many outputs does a 3-to-8 decoder have? (a) 3 (b) 8 (c) 6 (d) 9 **Ans:(B)**
2	23	What is the function of a comparator? (a) Perform Addition (b) Find Square Root (c) Compare Two Binary Numbers (d) Encode Binary Data **Ans:(C)**
2	24	The simplified form of AB+A'B is: (a) A (b) B (c) A+B (d) A XOR B **Ans:(B)**
2	25	Which Boolean expression is correct for NOR operation? (a) (A+B)' (b) (AB)' (c) A+B (d) A'+B **Ans:(A)**

U.NO	Q NO	QUESTIONS
2	26	Which of the following is not a standard logic gate? (a) AND (b) OR (c) NAND (d) SUM **Ans:(D)**
2	27	Which term represents grouping of 1s in K-map? (a) Cell (b) Loop (c) Quad (d) Don't care **Ans:(B)**
2	28	A combinational circuit has: (a) Memory (b) Feedback (c) No Memory (d) Clock **Ans:(C)**
2	29	What is the simplified result of A(A+B)? (a) A+B (b) AB (c) A (d) A^2 +AB **Ans:(C)**
2	30	The expression A+A’ is always: (a) A (b) A' (c) 0 (d) 1 **Ans:(D)**
2	31	A multiplexer can be used to implement: (a) Encoder (b) Decoder (c) Any Logic Function (d) Flip flop **Ans:(C)**
2	32	What is the dual of A+AB? (a) A(B+1) (b) A+B (c) A.(A+B) (d) A(B+A) **Ans:(C)**
2	33	How many input lines does a 1:4 demultiplexer have? (a) 1 (b) 2 (c) 3 (d) 4 **Ans:(A)**
2	34	A decoder converts binary information from: (a) n outputs to 2^n inputs (b) 2^n inputs to n outputs (c) n inputs to 2^n outputs (d) None of the above **Ans:(C)**
2	35	What is the SOP form of logic function? (a) Sum of Outputs (b) Sequence of Operations (c) Sum of Products (d) Standard Output Pattern **Ans:(C)**

U.NO	Q NO	QUESTIONS
2	36	Don’t care conditions can be used for simplifying Boolean expressions in (a) Registers (b) Terms (c) K Maps (d) Latches **Ans:(C)**
2	37	K-map helps to: (a) Write Code (b) Reduce Logic Expressions (c) Draw Truth Tables (d) Build Coumters **Ans:(B)**
2	38	Which function outputs 1 if A>B in 2-bit comparator? (a) A'B (b) AB' (c) A XOR B (d) A+B **Ans:(B)**
2	39	Half subtractor has how many outputs? (a) 1 (b) 2 (c) 3 (d) 4 **Ans:(B)**
2	40	In SOP form, product terms are: (a) ANDed Literals (b) ORed Literals (c) NOTed Literals (d) ExclusiveOR Literals **Ans:(A)**
2	41	How many m inter ms are in a 4-variable function? (a) 4 (b) 8 (c) 16 (d) 32 **Ans:(C)**
2	42	What does a full subtractor require? (a) 1 XOR gate (b) 2 XOR gates (c) 3 Logic gates (d) 2 bits only **Ans:(B)**
2	43	Which logic circuit selects one input from many? (a) Multiplexer (b) Decoder (c) Comparator (d) Adder **Ans:(A)**
2	44	Boolean identity: A+1 =? (a) A (b) 1 (c) 0 (d) A' **Ans:(B)**
2	45	SOP and POS are used for: (a) Timing (b) Optimization (c) Boolean Simplification (d) Looping **Ans:(C)**

U.NO	Q NO	QUESTIONS
2	46	The expression A'B+AB is equal to: (a) A+B (b) A⊕B (c) AB (d) A'B' **Ans:(B)**
2	47	What is the main function of a priority encoder? (a) Converts binary to Gray code (b) Gives output based on highest priority input (c) Adds two binary numbers (d) Multiplies two inputs **Ans:(B)**
2	48	In a 4-to-2 priority encoder, if inputs D3=0, D2=0, D1=1, D0=0, what will be the output? (a) 0 (b) 1 (c) 10 (d) 11 **Ans:(B)**
2	49	What happens when multiple inputs are active in a priority encoder? (a) All outputs become undefined (b) The lowest priority input is selected (c) The highest priority input determines the output (d) The output is always 0 **Ans:(C)**
2	50	Which of the following is true about a priority encoder? (a) It ignores input priority (b) It cannot handle multiple active inputs (c) It requires a separate output to indicate valid input (d) It outputs all active inputs simultaneously **Ans:(C)**
2	51	What is the decimal value of hexadecimal 3A? (a) 48 (b) 52 (c) 58 (d) 62 **Ans:(58) $3A_{16} = 3\times16 + 10 = 58$.**
2	52	Which circuit adds three one-bit inputs and produces Sum and Carry outputs? (a) Half adder (b) Full adder (c) Decoder (d) Multiplexer **Ans:(Full adder) A full adder adds two operand bits and an input carry.**
2	53	In a full adder, the Sum output is given by: (a) A+B+C (b) A⊕B⊕Cin (c) AB+Cin (d) A·B·Cin **Ans:(A⊕B⊕Cin) The full-adder Sum is the XOR of all three inputs.**
2	54	Which device converts n input lines into 2^n output lines? (a) Encoder (b) Decoder (c) Multiplexer (d) Comparator **Ans:(Decoder) A decoder activates one of 2^n outputs for each n-bit input combination.**
2	55	Which circuit selects one of several inputs and routes it to a single output? (a) Demultiplexer (b) Encoder (c) Multiplexer (d) Decoder **Ans:(Multiplexer) A multiplexer selects one input from multiple inputs and forwards it to the output.**

U.NO	Q NO	QUESTIONS
3	1	Which of the following devices serves as a memory for sequential circuits? (a) Multiplexer (b) Logic gates (c) Flip Flop (d) Decoder **Ans:(C)**
3	2	What is the key difference between combinational and sequential circuits? (a) Combinational circuits have memory, while sequential circuits do not. (b) Sequential circuits have memory, while combinational circuits do not. (c) Combinational circuits are faster than sequential circuits. (d) Sequential circuits are easier to design than combinational circuits. **Ans:(B)**
3	3	In a sequential circuit, the output depends on: (a) The present input only (b) The past output only (c) Both the present input and the past output (d) None of the above **Ans:(C)**
3	4	A synchronous counter is one where: (a) All flip-flops are clocked simultaneously. (b) Flip-flops are clocked one after the other. (c) The clock signal is not used. (d) The output is always changing. **Ans:(A)**
3	5	Which of the following is NOT a type of sequential circuit? (a) Flip-flop (b) Counter (c) Multiplexer (d) Shift register **Ans:(C)**
3	6	The main function of a flip-flop in digital circuits is to: (a) Store Data (b) Perform arithmetic operations (c) Act as a counter (d) Convert analog signals to digital **Ans:(A)**
3	7	Which of the following flip-flops has two inputs, Set (S) and Reset (R)? (a) JK Flip Flop (b) SR Flip Flop (c) D Flip Flop (d) T Flip Flop **Ans:(B)**
3	8	What does a JK flip-flop do when both J and K inputs are high (1)? (a) Toggle the output (b) Set the output to 1 (c) Reset the output to 0 (d) Hold the output **Ans:(A)**
3	9	A T flip-flop is derived from which of the following flip-flops? (a) JK Flip Flop (b) SR Flip Flop (c) D Flip Flop (d) T Flip Flop **Ans:(A)**
3	10	In a D flip-flop, what happens to the output when the clock signal is high and the data input is 1? (a) The output stays the same (b) The output becomes 1 (c) The output becomes 0 (d) The output toggles **Ans:(B)**

U.NO	Q NO	QUESTIONS
3	11	Which of the following is an application of flip flops (a) Registers (b) Counters (c) Latches (d) All of the above **Ans:(D)**
3	12	The variation of 0 to 1 is called (a) low level (b) Negative edge (c) Positive edge (d) High level **Ans:(C)**
3	13	During Toggle condition, the output Qn becomes (a) Qn = 0 (b) Qn = 1 (c) Qn = Qn (d) Qn = Qn' **Ans:(D)**
3	14	What is the primary function of a shift register? (a) Store data (b) Shift data serially or parallelly (c) Perform arithmetic operations (d) Convert analog signals to digital **Ans:(B)**
3	15	How many types of basic shift registers are there? (a) Two (b) Three (c) Four (d) Five **Ans:(C)**
3	16	Which shift register is used to convert serial data into parallel data? (a) Serial-in serial-out (SISO) (b) Parallel-in serial-out (PISO) (c) Serial-in parallel-out (SIPO) (d) Parallel-in parallel-out (PIPO) **Ans:(C)**
3	17	A 4-bit shift register can store how many bits of data? (a) 1 (b) 4 (c) 8 (d) 16 **Ans:(B)**
3	18	What is the function of a 'shift right' operation in a shift register? (a) It moves data towards the leftmost bit. (b) It moves data towards the rightmost bit. (c) It keeps data in place. (d) It resets the register. **Ans:(B)**
3	19	In a 4-bit parallel-in parallel-out (PIPO) shift register, how many data inputs are there? (a) 1 (b) 2 (c) 4 (d) 8 **Ans:(C)**
3	20	What is the role of a 'clock pulse' in a shift register? (a) It clears the data in the register. (b) It synchronizes the shifting of data. (c) It converts the data to parallel form. (d) It doubles the data in the register. **Ans:(B)**

U.NO	Q NO	QUESTIONS
3	21	Which of the following types of triggering is used in a flip-flop to change its state? (a) Level triggering (b) Edge triggering (c) Pulse triggering (d) Both A and B **Ans:(B)**
3	22	What type of triggering is used in a D flip-flop? (a) Level triggering (b) Edge triggering (c) Dual-edge triggering (d) None of the above **Ans:(B)**
3	23	In edge-triggered devices, what triggers a state change? (a) The level of the input signal (b) The rising or falling edge of the clock signal (c) The duration of the input signal (d) The number of clock pulses **Ans:(B)**
3	24	Which flip-flop is considered the simplest to implement? (a) D flip-flop (b) SR flip-flop (c) JK flip-flop (d) T flip-flop **Ans:(A)**
3	25	How many flip-flops are required to construct a 4-bit synchronous counter? (a) 1 (b) 2 (c) 4 (d) 8 **Ans:(C)**
3	26	In a synchronous counter, the output of each flip-flop depends on: (a) Its own input only (b) The clock signal only (c) The clock and the outputs of previous flip-flops (d) The inputs of other flip-flops only **Ans:(C)**
3	27	A 4-bit synchronous counter can count from: (a) 0 to 15 (b) 1 to 15 (c) 0 to 9 (d) 1 to 10 **Ans:(A)**
3	28	In an asynchronous counter, the clock pulse is applied to: (a) All flip-flops simultaneously (b) Only the first flip-flop (c) Only the last flip-flop (d) Only the middle flip-flop **Ans:(B)**
3	29	In an asynchronous counter, the output of one flip-flop is connected to: (a) The clock input of the next flip-flop (b) The data input of the next flip-flop (c) The reset input of the next flip-flop (d) The reset signal of the first flip-flop **Ans:(A)**
3	30	How many states does a 3-bit asynchronous counter have? (a) 3 (b) 6 (c) 8 (d) 16 **Ans:(C)**

U.NO	Q NO	QUESTIONS
3	31	A decade counter counts from: (a) 0 to 15 (b) 1 to 10 (c) 0 to 9 (d) 0 to 99 **Ans:(C)**
3	32	A decade counter resets after: (a) Reaching 5 (b) Reaching 9 (c) Reaching 10 (d) Reaching 15 **Ans:(B)**
3	33	A decade counter is also called a: (a) Mod-16 counter (b) Mod-10 counter (c) Mod-8 counter (d) Binary counter **Ans:(B)**
3	34	How many flip-flops are required to implement a decade counter? (a) 1 (b) 2 (c) 3 (d) 4 **Ans:(D)**
3	35	A decade counter is a type of: (a) Synchronous counter (b) Asynchronous counter (c) Modulo counter (d) Both A and B **Ans:(C)**
3	36	A decade counter counts in: (a) Binary (b) Hexadecimal (c) Decimal (d) Octal **Ans:(C)**
3	37	In a decade counter, what happens when the count reaches 10? (a) It resets to 0 (b) It starts counting down (c) It stops counting (d) It continues counting to 15 **Ans:(A)**
3	38	Which of the following is NOT a feature of a decade counter? (a) It counts in decimal numbers (b) It resets after 9 (c) It uses a binary counter (d) It requires only two flip-flops **Ans:(D)**
3	39	In a SR flip-flop, what happens when both S and R inputs are HIGH? (a) The output is undefined (b) The output remains unchanged (c) The output is set HIGH (d) The output is set LOW **Ans:(A)**
3	40	Which among the following is NOT a type of register? (a) Program Counter (b) General Purpose Register (c) Memory Address Register (d) Flash Drive **Ans:(D)**

U.NO	Q NO	QUESTIONS
3	41	Which of the following is true about a down counter? (a) It counts from a lower value to a higher value (b) It counts in reverse order, from the maximum value down to 0 (c) It only counts from 0 to 9 (d) It counts based on external triggers **Ans:(B)**
3	42	In a down counter, when the count reaches 0, what happens next? (a) It resets to the maximum value (b) It stops counting (c) It starts counting upwards (d) It holds the current value **Ans:(A)**
3	43	Which type of counter is used when you need to count in ascending order? (a) Down counter (b) Modulo Counter (c) Up counter (d) Both up and down counters **Ans:(C)**
3	44	What does LSB stand for in binary numbers? (a) Least Significant Byte (b) Least Significant Bit (c) Logical Set Bit (d) Low Signal Bit **Ans:(B)**
3	45	In a binary number, the MSB is the: (a) Bit with the lowest value (b) Bit with the highest value (c) Bit furthest to the left (d) Bit furthest to the right **Ans:(C)**
3	46	In a binary number 1101, which bit is the MSB? (a) The first bit (1) (b) The second bit (1) (c) The third bit (0) (d) The fourth bit (1) **Ans:(A)**
3	47	What is the output of an SR flip-flop when S=0 and R=0? (a) Set (b) Reset (c) No Change (d) Toggle **Ans:(C)**
3	48	In a JK flip-flop, what happens when J=1, K=0? (a) Reset (b) Toggle (c) Set (d) Hold **Ans:(C)**
3	49	What is the condition of a D flip-flop when D=0 at the clock edge? (a) Q = 1 (b) Q = 0 (c) Q toggles (d) Q is undefined **Ans:(B)**
3	50	Which flip-flop has only one input besides the clock? (a) SR flip-flop (b) D flip-flop (c) JK flip-flop (d) T flip-flop **Ans:(B)**

U.NO	Q NO	QUESTIONS
3	51	Which flip-flop has no invalid state when its inputs are complementary? (a) SR flip-flop (b) D flip-flop (c) T flip-flop (d) JK flip-flop **Ans:(D flip-flop) The D flip-flop uses a single data input, avoiding the invalid SR input combination.**
3	52	A register that shifts data in one direction is called a: (a) Bidirectional register (b) Unidirectional shift register (c) Counter (d) Decoder **Ans:(Unidirectional shift register) A unidirectional shift register shifts data in only one direction.**
3	53	Which counter changes state on each active clock pulse? (a) Asynchronous counter (b) Binary counter (c) Ring counter (d) Johnson counter **Ans:(Binary counter) A binary counter advances its binary state for each active clock pulse.**
3	54	What is the primary purpose of a flip-flop? (a) Store one bit (b) Add two numbers (c) Decode an address (d) Generate a clock **Ans:(Store one bit) A flip-flop is a bistable circuit capable of storing one binary bit.**
3	55	In a synchronous counter, all flip-flops receive: (a) Different clocks (b) The same clock (c) No clock (d) Only inverted clocks **Ans:(The same clock) Synchronous counters use a common clock signal for all flip-flops.**
4	1	What is a sensor? (a) A device that processes data (b) A device that stores data (c) A device that detects changes in the environment (d) A device that transmits signals **Ans:(C)**
4	2	Which of the following is a temperature sensor? (a) LDR (b) Thermistor (c) PIR sensor (d) Microphone **Ans:(B)**
4	3	An LDR (Light Dependent Resistor) is used to detect: (a) Sound (b) Motion (c) Temperature (d) Light **Ans:(D)**
4	4	A microphone is an example of which type of sensor? (a) Light sensor (b) Sound sensor (c) Motion sensor (d) Temperature sensor **Ans:(B)**
4	5	What does TTL stand for in digital electronics? (a) Transistor to Load Logic (b) Transistor-Transistor Logic (c) Time Transfer Logic (d) Transmission Timing Logic **Ans:(B)**

U.NO	Q NO	QUESTIONS
4	6	What does CMOS stand for? (a) Central Metal Oxide Semiconductor (b) Current Mode Output Signal (c) Complementary Metal-Oxide-Semiconductor (d) Complex Mode Output System **Ans:(C)**
4	7	TTL logic typically operates at which voltage level? (a) 1.2 V (b) 3.3 V (c) 5 V (d) 12 V **Ans:(C)**
4	8	What is the primary function of a switch in electronic circuits? (a) Store data (b) Open or close a circuit (c) Increase voltage (d) Convert AC to DC **Ans:(B)**
4	9	A relay is typically used to: (a) Generate signals (b) Store electricity (c) Control a high voltage circuit with a low voltage signal (d) Reduce resistance in a circuit **Ans:(C)**
4	10	What does LED stand for? (a) Light Energy Device (b) Low Energy Display (c) Light Emitting Diode (d) Light Electron Display **Ans:(C)**
4	11	Which part of the relay creates a magnetic field to operate the switch? (a) Contact (b) Armature (c) Coil (d) Spring **Ans:(C)**
4	12	In LED interfacing, the longer leg of the LED is usually the: (a) Cathode (b) Anode (c) Base (d) Ground **Ans:(B)**
4	13	What is a solenoid? (a) A type of resistor (b) A magnetic coil that moves a plunger when energized (c) A digital switch (d) A type of capacitor **Ans:(B)**
4	14	What type of signal is typically used to drive a solenoid? (a) Analog signal (b) DC signal (c) AC signal (d) RF signal **Ans:(B)**
4	15	A solenoid converts: (a) Electrical energy to magnetic energy only (b) Electrical energy to mechanical motion (c) Magnetic energy to light (d) Mechanical energy to heat **Ans:(B)**

U.NO	Q NO	QUESTIONS
4	16	What is used to control the speed of a DC motor? (a) Transformer (b) Frequency generator (c) PWM (Pulse Width Modulation) (d) Encoder **Ans:(C)**
4	17	What does ADC stand for? (a) Advanced Digital Controller (b) Analog Digital Converter (c) Analog to Digital Converter (d) Amplified Data Converter **Ans:(C)**
4	18	What does DAC stand for? (a) Digital Analog Control (b) Data Analog Converter (c) Digital to Analog Converter (d) Digital Amplifier Converter **Ans:(C)**
4	19	What is the main purpose of an ADC? (a) Convert digital signals to analog (b) Store data in binary format (c) Convert analog signals to digital (d) Amplify analog signals **Ans:(C)**
4	20	What type of output does a DAC provide? (a) Digital only (b) Analog only (c) Binary (d) Clock signals **Ans:(B)**
4	21	Which of the following is a type of DAC? (a) R-2R Ladder (b) Flash (c) Differential Amplifier (d) Comparator **Ans:(A)**
4	22	What does SAR stand for in Successive Approximation ADC? (a) Sample and Reset (b) Successive Approximation Register (c) Signal Amplification Relay (d) Sequential Analog Response **Ans:(B)**
4	23	What is the main function of the comparator in a Successive Approximation ADC? (a) Generate clock signals (b) Compare input voltage with DAC output (c) Store digital output (d) Amplify analog input **Ans:(B)**
4	24	Which component converts the digital output back to analog for comparison in SAR ADC? (a) ADC (b) DAC (c) Comparator (d) Sample and hold circuit **Ans:(B)**
4	25	The conversion time in a SAR ADC is proportional to: (a) The number of bits (b) Input voltage magnitude (c) Frequency of input signal (d) Number of comparators **Ans:(A)**

U.NO	Q NO	QUESTIONS
4	26	Which of the following is true about SAR ADCs? (a) They are the fastest type of ADC (b) They use a single comparator and a DAC (c) They use multiple comparators simultaneously (d) They do not require a DAC **Ans:(B)**
4	27	What is the main feature of a dual slope ADC? (a) Uses two integrators (b) Measures the time taken to discharge a capacitor (c) Integrates the input signal over a fixed time interval (d) Uses flash conversion technique **Ans:(C)**
4	28	Which component is primarily used in dual slope ADC for integration? (a) Capacitor (b) Resistor (c) Inductor (d) Transformer **Ans:(A)**
4	29	What happens during the 'run-up' phase of a dual slope ADC? (a) The capacitor discharges through a reference voltage (b) The input voltage is integrated over a fixed period (c) The output is converted to digital (d) The capacitor is charged to full voltage **Ans:(B)**
4	30	During the 'run-down' phase, the capacitor: (a) Charges from the input voltage (b) Discharges through the reference voltage (c) Is disconnected from the circuit (d) Is replaced by a resistor **Ans:(B)**
4	31	The output of a dual slope ADC is proportional to: (a) The discharge time during run-down (b) The charge time during run-up (c) The frequency of the input signal (d) The amplitude of the reference voltage only **Ans:(A)**
4	32	The accuracy of a dual slope ADC depends mainly on: (a) The reference voltage stability (b) The number of comparators (c) The speed of the ADC (d) The number of bits only **Ans:(A)**
4	33	Which type of signal is suitable as an input for a dual slope ADC? (a) Only digital signals (b) Both AC and DC signals (c) Only high frequency signals (d) Only low voltage signals **Ans:(B)**
4	34	What is a Weighted Resistor D/A Converter? (a) A device that converts analog to digital signals (b) A type of amplifier (c) A circuit that uses resistors weighted in binary to generate analog output (d) A filter circuit **Ans:(C)**
4	35	What is the function of resistors in a Weighted Resistor DAC? (a) Filter the input (b) Control current direction (c) Provide binary-weighted currents or voltages (d) Store data **Ans:(C)**

U.NO	Q NO	QUESTIONS
4	36	What happens to the resistor value as you move from MSB to LSB in a Weighted Resistor DAC? (a) It increases linearly (b) It decreases exponentially (c) It stays constant (d) It follows a binary weighting **Ans:(D)**
4	37	The analog output of a weighted resistor DAC is proportional to: (a) The sum of all input voltages (b) The digital input bits weighted by resistors (c) The clock frequency (d) The reference voltage only **Ans:(B)**
4	38	A 4-bit Weighted Resistor DAC uses resistors of: (a) Equal values (b) Powers of 2, like R, 2R, 4R, 8R (c) Decreasing by 1 each time (d) Increasing by 10 each time **Ans:(B)**
4	39	One disadvantage of a Weighted Resistor DAC is: (a) High speed (b) Low resolution (c) Requires precise resistor values (d) It can't work with digital signals **Ans:(C)**
4	40	The output of a Weighted Resistor DAC is typically: (a) AC (b) Analog voltage or current (c) Digital pulses (d) Clock signals **Ans:(B)**
4	41	In a 3-bit Weighted Resistor DAC, how many input bits are used? (a) 1 (b) 2 (c) 3 (d) 8 **Ans:(C)**
4	42	What is the role of the op-amp in a Weighted Resistor DAC? (a) It adds noise to the output (b) It holds the digital input (c) It converts the weighted currents to a voltage (d) It stores binary data **Ans:(C)**
4	43	What would happen if the resistors are not precisely matched in a Weighted Resistor DAC? (a) The output becomes faster (b) There will be more accurate conversion (c) The DAC may produce incorrect or distorted output (d) It will function better at higher frequencies **Ans:(C)**
4	44	What resistor values are used in an R-2R ladder DAC? (a) All equal resistors (b) R and 2R only (c) 1k and 10k (d) R, 2R, and 3R **Ans:(B)**
4	45	The R-2R ladder DAC converts: (a) Analog signals to digital (b) Digital signals to analog (c) Frequency to voltage (d) Voltage to current **Ans:(B)**

U.NO	Q NO	QUESTIONS
4	46	What is the role of the op-amp in an R-2R ladder DAC? (a) Inverts the output (b) Acts as a buffer and summing amplifier (c) Converts AC to DC (d) Stores digital data **Ans:(B)**
4	47	In an R-2R DAC, each bit in the digital input contributes to the output: (a) Equally (b) Linearly (c) Proportionally based on its position (MSB to LSB) (d) Randomly **Ans:(C)**
4	48	A TTL gate output is connected to a CMOS gate input through a pull-up resistor to 5 V. The purpose of the resistor is to: (a) Increase the voltage of logic HIGH to meet CMOS VIH (b) Limit current when input is HIGH (c) Reduce propagation delay (d) Pull input LOW when output is floating **Ans:(A)**
4	49	Which ADC type is best suited for high-accuracy, low-speed applications such as digital multimeters? (a) Flash ADC (b) Successive approximation ADC (c) Dual-slope ADC (d) Parallel comparator ADC **Ans:(C)**
4	50	An R-2R ladder DAC uses only two resistor values: (a) R and 2R (b) R and R/2 (c) 2R and 4R (d) R and 3R **Ans:(A)**
4	51	What is the primary purpose of a transistor driver when interfacing a solenoid with a microcontroller? (a) To increase the logic voltage (b) To provide the required current to the solenoid (c) To reduce the solenoid resistance (d) To convert AC to DC **Ans:(To provide the required current to the solenoid) A microcontroller GPIO pin typically cannot supply the relatively high current required by a solenoid. A transistor driver allows the microcontroller to control the solenoid while supplying the required load current from an appropriate power source.**
4	52	Which component is commonly connected across a relay coil to protect a transistor from the coil's back EMF? (a) Zener diode (b) Flyback diode (c) LED (d) Capacitor **Ans:(Flyback diode) When the relay coil is switched OFF, its collapsing magnetic field produces a high reverse voltage. A flyback diode provides a safe path for this current and protects the switching transistor.**
4	53	In a Successive Approximation Register (SAR) ADC, what is the main function of the SAR? (a) Amplify the analog input (b) Generate and test digital codes successively (c) Integrate the input voltage over time (d) Convert digital data into analog form **Ans:(Generate and test digital codes successively) The SAR generates trial digital codes, compares the corresponding DAC output with the input voltage, and successively determines each bit from MSB to LSB.**
4	54	Which feature distinguishes a dual-slope ADC from a SAR ADC? (a) It uses no comparator (b) It uses integration over a fixed time period

(c) It requires a relay for conversion (d) It produces only a 1-bit output

Ans:(It uses integration over a fixed time period) A dual-slope ADC first integrates the unknown input for a fixed period and then integrates an opposite-polarity reference until the integrator returns to zero. The measured time determines the digital output.

4 55 In a binary weighted-register DAC, how is the contribution of each digital bit determined?

(a) All bits contribute equally (b) Higher-order bits contribute larger analog values

(c) Only the LSB contributes (d) The contribution is independent of bit position

Ans:(Higher-order bits contribute larger analog values) In a binary weighted DAC, each bit is assigned a binary weight. The MSB has the largest contribution, while successive lower-order bits contribute approximately half the value of the preceding bit.

U.NO	Q NO	QUESTIONS
5	1	Which of the following is a volatile memory? (a) ROM (b) RAM (c) Flash memory (d) Hard disk **Ans:(B)**
5	2	What does ROM stand for? (a) Read On Memory (b) Read Only Memory (c) Random Only Memory (d) Run On Memory **Ans:(B)**
5	3	Which memory loses its contents when power is turned off? (a) Non-volatile memory (b) Volatile memory (c) Permanent memory (d) Optical memory **Ans:(B)**
5	4	Which type of RAM is faster? (a) DRAM (b) SRAM (c) PROM (d) EPROM **Ans:(B)**
5	5	Which memory can be electrically erased and reprogrammed? (a) EEPROM (b) ROM (c) DRAM (d) SRAM **Ans:(A)**
5	6	Which of the following is non-volatile memory? (a) SRAM (b) DRAM (c) ROM (d) Cache **Ans:(C)**
5	7	Which memory is used for temporary data storage in a computer system? (a) RAM (b) ROM (c) Hard disk (d) CD-ROM **Ans:(A)**
5	8	Cache memory is used to: (a) Store permanent data (b) Increase processing speed (c) Backup files (d) Store music **Ans:(B)**
5	9	The smallest unit of memory is: (a) Byte (b) Bit (c) Word (d) Nibble **Ans:(B)**
5	10	Which memory type is commonly used for BIOS storage? (a) EEPROM (b) SRAM (c) DRAM (d) Cache **Ans:(A)**

U.NO	Q NO	QUESTIONS
5	11	What happens during a memory read operation? (a) Data is written to memory (b) Data is transferred from memory to CPU (c) Address lines are cleared (d) Memory contents are erased **Ans:(B)**
5	12	What happens during a memory write operation? (a) Data is transferred from CPU to memory (b) Data is transferred from memory to CPU (c) Memory is refreshed (d) Address lines are disabled **Ans:(A)**
5	13	What is memory access time? (a) Time to execute an instruction (b) Time to locate a file on a disk (c) Time between a request for data and its delivery (d) Time to refresh the screen **Ans:(C)**
5	14	Which factor usually makes memory faster? (a) Higher capacity (b) Lower access time (c) More address lines (d) Larger word length **Ans:(B)**
5	15	Which lines are used to select a memory location? (a) Data lines (b) Control lines (c) Address lines (d) Status lines **Ans:(C)**
5	16	During a read operation, which control signal is activated? (a) Write Enable (WE) (b) Read Enable (RE) (c) Chip Disable (CD) (d) Reset **Ans:(B)**
5	17	ROM stands for: (a) Read Only Memory (b) Random Only Memory (c) Read On Memory (d) Run On Memory **Ans:(A)**
5	18	Which of the following is a characteristic of ROM? (a) Volatile (b) Non-volatile (c) Requires constant refreshing (d) Loses data when power is off **Ans:(B)**
5	19	Which type of ROM is programmed during manufacturing and cannot be changed later? (a) PROM (b) EPROM (c) Mask ROM (d) EEPROM **Ans:(C)**
5	20	PROM stands for: (a) Programmable Read Only Memory (b) Permanent Read On Memory (c) Primary Read Only Memory (d) Programmed Random Memory **Ans:(A)**

U.NO	Q NO	QUESTIONS
5	21	Which type of ROM can be erased by exposing it to UV light? (a) PROM (b) EPROM (c) EEPROM (d) Mask ROM **Ans:(B)**
5	22	Which type of ROM can be erased and reprogrammed electrically? (a) PROM (b) EPROM (c) EEPROM (d) Mask ROM **Ans:(C)**
5	23	Which ROM type is widely used for storing firmware in modern computers? (a) Mask ROM (b) EPROM (c) EEPROM / Flash ROM (d) PROM **Ans:(C)**
5	24	What is the main disadvantage of Flash ROM? (a) Data cannot be changed (b) Limited number of write/erase cycles (c) Needs constant power (d) Very slow read speed **Ans:(B)**
5	25	Which of the following is not a type of ROM? (a) PROM (b) EPROM (c) EEPROM (d) SRAM **Ans:(D)**
5	26	Which of the following is a volatile memory? (a) DRAM (b) SRAM (c) Both A and B (d) ROM **Ans:(C)**
5	27	DRAM needs to be: (a) Erased with UV light (b) Refreshed periodically (c) Written once only (d) Reprogrammed electrically **Ans:(B)**
5	28	SRAM is: (a) Slower than DRAM (b) Faster than DRAM (c) Same speed as DRAM (d) Non-volatile **Ans:(B)**
5	29	Which type of RAM uses flip-flops to store data? (a) DRAM (b) SRAM (c) ROM (d) Flash **Ans:(B)**
5	30	Which type of RAM stores data using capacitors? (a) DRAM (b) SRAM (c) PROM (d) EEPROM **Ans:(A)**

U.NO	Q NO	QUESTIONS
5	31	In sequential access memory, data is: (a) Accessed in any order (b) Accessed in a fixed sequence (c) Accessed by key matching (d) Accessed via index table **Ans:(B)**
5	32	In random access memory, data can be: (a) Accessed only in sequence (b) Accessed directly from any location (c) Accessed only once (d) Accessed after a delay **Ans:(B)**
5	33	Direct access memory allows: (a) Only sequential data reading (b) Access to blocks of data directly (c) Key-based search (d) CPU-only access **Ans:(B)**
5	34	Which is an example of direct access storage? (a) Magnetic disk (b) Tape drive (c) ROM chip (d) Cache memory **Ans:(A)**
5	35	A pen drive is also known as: (a) USB flash drive (b) Hard disk (c) Optical disk (d) Magnetic tape **Ans:(A)**
5	36	Which type of memory is used in pen drives? (a) DRAM (b) SRAM (c) Flash memory (d) Mask ROM **Ans:(C)**
5	37	SD card stands for: (a) Secure Disk (b) Secure Digital (c) Standard Disk (d) Storage Device **Ans:(B)**
5	38	SSDs are generally _____ than traditional hard drives. (a) Slower (b) Faster (c) Same speed (d) Less reliable **Ans:(B)**
5	39	An SSD stands for: (a) Solid-State Disk (b) Secure Storage Device (c) System Storage Disk (d) Small Storage Drive **Ans:(A)**
5	40	PLD stands for: (a) Programmable Logic Device (b) Permanent Logic Device (c) Programmed Logical Data (d) Parallel Logic Device **Ans:(A)**

U.NO	Q NO	QUESTIONS
5	41	Which of the following is a type of PLD? (a) PROM (b) PLA (c) PAL (d) All of the above **Ans:(D)**
5	42	The main goal of memory management is to: (a) Increase CPU speed (b) Manage allocation and deallocation of memory (c) Store permanent files (d) Control I/O devices **Ans:(B)**
5	43	Which type of memory is directly accessible by the CPU? (a) Secondary storage (b) Main memory (c) Virtual memory (d) Cache only **Ans:(B)**
5	44	The main difference between Flash ROM and NVRAM is: (a) Both are volatile (b) One is volatile, one is not (c) Use in graphics (d) Cost per GB **Ans:(B)**
5	45	NVRAM is typically used in: (a) BIOS settings storage (b) USB drives (c) SSD storage cells (d) Graphic cards **Ans:(A)**
5	46	Which is more flexible for prototyping? (a) Fixed logic (b) Programmable logic (c) Equal flexibility (d) **Ans:(B)**
5	47	Which can be reprogrammed after manufacturing multiple times? (a) Fixed logic (b) Programmable logic (c) EEPROM (d) Flash memory **Ans:(B)**
5	48	Fixed logic devices are: (a) Configurable after manufacturing (b) Hardwired at fabrication (c) Software programmable (d) Reprogrammable multiple times **Ans:(B)**
5	49	Programmable logic devices are: (a) Manufactured for a single function (b) Configurable by the user (c) Only used for memory storage (d) Cannot be updated **Ans:(B)**
5	50	Which memory is closest to the CPU? (a) Cache memory (b) Secondary storage (c) Main memory (d) Registers **Ans:(D)**

U.NO	Q NO	QUESTIONS
5	51	Which logic device is programmed by the user after manufacturing? (a) Fixed logic device (b) Programmable logic device (c) Hardwired gate (d) Transistor **Ans:(Programmable logic device) A PLD can be configured by the user after manufacture.**
5	52	Which programmable device is typically used to implement combinational logic using programmable AND and OR arrays? (a) PLA (b) RAM (c) ROM (d) Counter **Ans:(PLA) A PLA contains programmable AND and OR arrays for implementing logic functions.**
5	53	Which memory retains data even when power is removed? (a) SRAM (b) DRAM (c) ROM (d) Cache **Ans:(ROM) ROM is non-volatile and retains stored data without power.**
5	54	Which memory requires periodic refreshing? (a) SRAM (b) DRAM (c) ROM (d) Flash **Ans:(DRAM) DRAM stores data in capacitors that must be periodically refreshed.**
5	55	Which storage medium uses semiconductor memory cells and has no moving parts? (a) Hard disk drive (b) Optical disk (c) Solid-state drive (d) Magnetic tape **Ans:(Solid-state drive) An SSD stores data in semiconductor flash memory and has no moving mechanical parts.**

PART B

UNIT	PART	Q.NO	QUESTION
1	B	1	Draw the logic circuit for the Boolean expression Y = A·B + C.
1	B	2	Realize the OR gate using only NAND gates.
1	B	3	Represent the decimal number 125 in BCD and explain its advantage over pure binary.
1	B	4	Perform 10011 – 1101 using 1's complement subtraction.
1	B	5	Convert the decimal number 255 into hexadecimal and binary
1	B	6	Draw the circuit of a 2-input XOR gate using only NAND gates.
1	B	7	Show how the decimal number 93 is represented in 8-4-2-1 BCD code.
1	B	8	Illustrate the truth table of a 3-input OR gate.
1	B	9	Realize an NAND gate using only NOR gates.
1	B	10	Subtract 110010 – 100111 using 2's complement method and show all steps.
1	B	11	Explain the conversion of a decimal number to binary and illustrate it with a suitable example.
2	B	1	Use a 3-variable K-map to simplify F(A, B, C) = A'B + ABC.
2	B	2	Simplify F(A, B, C) = Σ(3, 5, 6) using a K-map.
2	B	3	Solve using K-map: F(A, B, C) = Σ(1, 4, 6, 7).
2	B	4	Compare half-adder and full-adder in three points.
2	B	5	Explain how a 2-bit comparator can be used to compare two binary numbers.
2	B	6	Draw the circuit diagram of a Full Adder and give its truth table
2	B	7	Draw the circuit diagram of a Full Subtractor and give its truth table
2	B	8	Explain the working of a 1X4 Demultiplexer.
2	B	9	What is the purpose of a priority encoder?
2	B	10	Derive the difference and borrow expressions for a half-subtractor.
2	B	11	Explain the working of a full adder and derive its Sum and Carry expressions using Boolean algebra.
3	B	1	State the drawback of an SR flip-flop.
3	B	2	Compare SR, JK, and D flip-flops in any two points.
3	B	3	State the advantage of a JK flip-flop over an SR flip-flop.
3	B	4	Differentiate between level triggering and edge triggering.
3	B	5	Show how a JK flip-flop can be used as a T flip-flop.
3	B	6	Explain the operation of a serial-in parallel-out (SIPO) register.
3	B	7	Compare asynchronous and synchronous counters.
3	B	8	Draw the logic diagram of a 4-bit ripple counter.
3	B	9	Explain how a synchronous counter eliminates propagation delay.
3	B	10	Explain the working of a 3-bit synchronous down counter.
3	B	11	Explain the working of JK and D flip-flops and compare their characteristics.

UNIT	PART	Q.NO	QUESTION
4	B	1	Differentiate between active and passive sensors.
4	B	2	Draw the circuit of successive approximation A/D converter
4	B	3	Define CMOS and state its voltage levels.
4	B	4	Compare TTL and CMOS logic families in two points.
4	B	5	State the role of a current limiting resistor in interfacing an LED.
4	B	6	Explain how a DC motor can be interfaced with TTL logic.
4	B	7	Explain how a solenoid can be driven using a digital output.
4	B	8	Explain the working principle of a successive approximation A/D converter.
4	B	9	Compare successive approximation and dual slope A/D converters.
4	B	10	Compare weighted resistor and R-2R ladder D/A converters.
4	B	11	Explain the memory hierarchy and discuss the role of cache, main memory, and secondary storage.
5	B	1	What is meant by memory read operation?
5	B	2	What are address lines in memory?
5	B	3	Differentiate between memory capacity and word length.
5	B	4	Differentiate between ROM and RAM
5	B	5	State the characteristic of EPROM.
5	B	6	Differentiate between volatile and non-volatile memory.
5	B	7	Define sequential memory access with one example.
5	B	8	Define memory hierarchy.
5	B	9	Differentiate between Flash ROM and NVRAM
5	B	10	Differentiate between fixed logic devices and programmable logic devices.
5	B	11	Explain the architecture and operation of a Programmable Logic Array (PLA).

PART C

UNIT	PART	Q.NO	QUESTION
1	C	1	Convert and interpret the given decimal number 148 into its equivalent Binary, Octal, and Hexadecimal representations.
1	C	2	Explain and illustrate the working principles of AND, OR, NOT, and EX-OR gates using their symbols and truth tables.
1	C	3	Differentiate and demonstrate the concepts of ASCII and Unicode, supporting your explanation with suitable examples.
1	C	4	Design and demonstrate the realization of AND, OR, and NOT gates using only NAND gates.
1	C	5	Construct and justify any four logic gates using only NOR gates.
1	C	6	Analyze different number representations and evaluate the suitability of signed-magnitude, 1’s complement, and 2’s complement for signed arithmetic.
2	C	1	Simplify and validate the Boolean expression Y = AB'C + A'BC + AB'C' + A'B'C + A'B'C' using a Karnaugh Map, and draw the corresponding logic diagram for the output.
2	C	2	Explain and evaluate, with a suitable logic diagram, the working of a Full Adder circuit.
2	C	3	Illustrate and explain, with a suitable logic diagram, the working of a Full Subtracter circuit.
2	C	4	Describe and compare the working principles of a Multiplexer and Demultiplexer circuit, supported by appropriate diagrams.
2	C	5	Design and explain the logic diagram of a single-bit comparator, illustrating its operation with suitable examples.
2	C	6	Design and analyze a combinational circuit for a specified Boolean function using suitable logic gates, and verify its operation using a truth table.
3	C	1	Explain and assess the logic diagram of a JK flip-flop and its functional behavior.
3	C	2	Demonstrate and explain the operation of a Parallel-In Serial-Out (PISO) shift register, using a suitable example.
3	C	3	Illustrate and explain, with a logic diagram, the operation of an Asynchronous Up Counter.
3	C	4	Summarize and explain the operation of a 4-bit synchronous down counter.
3	C	5	Demonstrate and verify the functionality of a decade counter using a logic diagram and truth table.
3	C	6	Analyze a sequential circuit using flip-flops and explain how its state changes with respect to the clock signal.

UNIT	PART	Q.NO	QUESTION
4	C	1	Explain and apply the concept of solenoid interfacing, supported by a suitable diagram.
4	C	2	Describe and explain the working of a Successive Approximation Analog-to-Digital Converter (ADC) with a neat diagram.
4	C	3	Explain and interpret the operation of a Dual Slope ADC, using an appropriate diagram.
4	C	4	Explain and justify the working of a binary weighted resistor Digital-to-Analog Converter (DAC) with a diagram.
4	C	5	Explain and illustrate the operation of an R–2R ladder type DAC with a suitable diagram.
5	C	1	Compare and evaluate Flash ROM and NVRAM based on their characteristics and applications.
5	C	2	Explain and interpret the operation of a Pen Drive and SD Card.
5	C	3	Differentiate and contrast Fixed Logic and Programmable Logic.
5	C	4	Explain and illustrate, with a suitable diagram, the architecture of a Programmable Logic Array (PLA).
5	C	5	Explain and integrate the concepts of memory accessing, memory hierarchy, and memory management, highlighting their interrelationships.

ANALYTICAL TYPE

1 A manufacturing plant is designing a digital temperature-monitoring system. A sensor provides temperature information to a digital controller. The controller processes the data, displays the status using LEDs, stores critical readings in memory, and controls a cooling motor through a relay. A PLA is used to implement some control logic.

a) The controller receives the binary value 101101. What is its hexadecimal equivalent?

b) The system must select one of four sensor signals for processing. Which combinational circuit should be used?

c) The temperature status must be temporarily stored and shifted serially to another circuit. Which register is suitable?

d) The analog temperature sensor output must be converted into a digital value with successive bit decisions. Which ADC is appropriate?

e) The controller must retain stored data even when power is removed, and the memory should be electrically erasable. Which memory is suitable?

2 An automated water tank uses a level sensor connected to a digital controller. Based on the sensed level, the controller operates a pump through a relay, indicates the level using LEDs, stores operating parameters, and uses programmable logic for control decisions.

a) The controller receives the BCD-coded decimal digit 9. What is its BCD representation?

b) The controller must compare the present water level with a preset digital level. Which combinational circuit performs this operation?

c) The pump-control circuit must count completed filling cycles from 0 to 9. Which counter is appropriate?

d) The water-level sensor produces an analog voltage, and accurate conversion is required by measuring the input over an integration period. Which ADC should be selected?

e) The control logic must be implemented using programmable AND and OR arrays. Which PLD is appropriate?

3 A security system uses a keypad to enter an access code. The digital controller processes the code, selects information from multiple inputs, stores temporary data, drives an electronic locking solenoid, and saves authorized user information in non-volatile memory.

a) The access controller receives binary 11010110. What is its hexadecimal representation?

b) Several input signals are connected to the controller, but only one must be selected based on select lines. Which circuit should be used?

c) The entered password bits need to be converted from serial input into multiple parallel outputs. Which register is required?

d) The controller activates a solenoid that requires considerably more current than a CMOS output can provide. What interface device should be used as the switching driver?

e) Authorized access data must remain stored after power failure and must be electrically reprogrammable. Which memory is suitable?

4 A digital energy meter measures an electrical quantity using a sensor. The analog signal is converted to digital form, processed using combinational and sequential circuits, displayed through LEDs, and stored for later retrieval. The design uses programmable logic to implement the control section.

a) During subtraction, the processor needs to represent a negative binary number. Which complement method is most commonly used in digital systems?

b) The meter needs to perform binary addition of two measured values. Which basic combinational circuit should be used for adding two bits with carry?

c) The meter must count incoming measurement pulses synchronously using a common clock. Which type of counter is preferred?

d) The measured analog signal must be converted using a DAC whose resistor values are based on binary weights. Which DAC is being used?

e) The stored meter readings must be transferred to a computer using a removable flash-based storage device. Which device is suitable?

5 A hospital monitoring system continuously receives signals from sensors, converts analog measurements into digital data, processes them using digital logic, displays alarms using LEDs, activates a warning device through a relay, and stores patient readings for later analysis.

a) An alarm output must be HIGH only when both the abnormal-temperature signal and abnormal-heart-rate signal are HIGH. Which logic gate is required?

b) The system must encode several alarm inputs and generate the binary code corresponding to the highest-priority alarm. Which circuit should be used?

c) The controller needs to store several bits temporarily and shift them one position for serial transmission. Which circuit is appropriate?

d) The analog sensor signal must be converted to digital form by successively testing the bits from MSB to LSB. Which ADC is used?

e) The monitoring system requires fast read/write access to temporary measurement data while the system is operating. Which memory is appropriate?