QP Code: S253A026 Reg. No | | | | | | | | | | AY 23

Gandhi Institute of Engineering and Technology University, Odisha, Gunupur (GIET University)

B. Tech (Third Semester – Regular & Supplementary) Examinations, November 2025

23BCSES23001/23BCMES23001/23BCDES23001/23BVTPC23002 - Digital Electronics

(CSE, CSE(AIML), CSE(DS), EE(VLSI))

Time: 3 Hours **Maximum: 60 Marks**

Answer ALL Questions.

(The figures in the right hand margin indicate marks.)

PART – A (Short Answer Questions) (2 × 5 = 10 Marks)

Q.1. Answer ***ALL*** Questions.

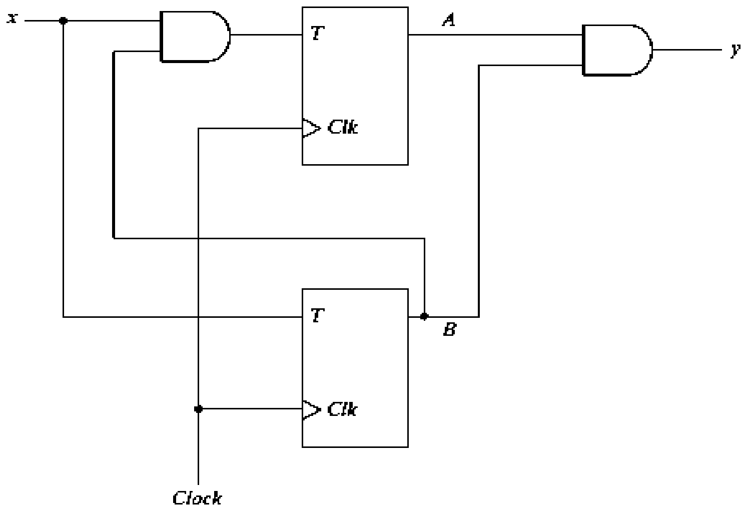
		CO#	BTL
a.	Convert $(712)_8$ to binary, hexadecimal, and decimal.	CO1	K3
b.	What is Gray code? Convert $(100110101)_2$ into Gray code.	CO2	K3
c.	State DeMorgan's theorem.	CO2	K1
d.	Write a characteristic equation and excitation table for the *D* flip-flop.	CO4	K2
e.	What are the differences between RAM and ROM?	CO6	K2

PART – B (Long Answer Questions) (10 × 5 = 50 Marks)

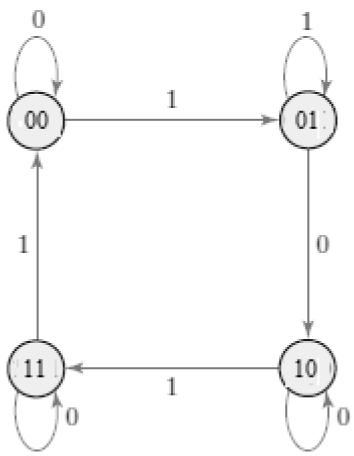
Answer ***ALL*** Questions.

		Marks	CO#	BTL
2. a.	Add the two numbers (-12, +7) using both 1's and 2's complement method.	6	CO1	K3
b.	Establish the following identities of Boolean algebra: (i) $A(A+B) = A$ (ii) $AB + \bar{A}C = (A+C)(\bar{A}+B)$	4	CO1	K3
	(OR)			
c.	Convert the decimal number 347.625 to a single-precision floating-point binary number.	6	CO1	K3
d.	Construct logic circuit using AND, OR, and NOT gate for the following Boolean function: (i) $Y = (A+B)(A'+B')$ (ii) $Y = (A+B)(C'+D')(A'+C)$	4	CO2	K3
3.a.	Simplify the following Boolean function using a four-variable K-map: $F(A, B, C, D) = \Sigma(4, 5, 6, 7, 12, 13, 14)$ and then, realize the simplified functions using logic gates.	6	CO2	K4
b.	Express the Boolean function as a sum of minterms: $F = A + B'C$ Now, convert the sum of minterms to another canonical form.	4	CO2	K3
	(OR)			
c.	Implement the following Boolean function with NOR gates. $F = (AB' + A'B)(C + D')$	6	CO2	K3
d.	Reduce the Boolean expression $A\left[B + \overline{C}\left(\overline{AB + A\overline{C}}\right)\right]$	4	CO2	K4
4.a.	Write the truth table and Boolean expression of a full adder. Draw its complete logic circuit.	6	CO3	K3
b.	Implement the Boolean function $F(A, B, C, D) = \sum(1, 3, 4, 11, 12, 13, 14, 15)$ with a multiplexer.	4	CO3	K3
	(OR)			
c.	Design a combinational circuit which will convert a 4-bit binary number to a	6	CO3	K3

	4-bit Gray code.			
d.	Construct the 3×8 decoder using 2×4 decoders.	4	CO3	K3
5.a.	Design a 3-bit synchronous binary counter.	6	CO5	K4
b.	Write short notes on Master slave *JK* flip-flop.	4	CO4	K2
	(OR)			
c.	With a neat logic diagram explain how a *T* flip-flop can be converted to a *D* flip-flop.	6	CO4	K4
d.	What is a shift register? Explain the principle of a 4-bit serial-in, serial-out, shift register.	4	CO5	K2
6.a.	Derive the state table and the state diagram of the sequential circuit shown in the figure.	6	CO4	K4



b.	Design a combinational circuit using a ROM. The circuit accepts a 3-bit binary number and generates an output binary number equal to the square of the input number.	4	CO6	K3
	(OR)			
c.	Design the sequential circuit specified by the state diagram of the figure using *JK* flip-flops.	6	CO4	K4



d.	Design a combinational circuit using a ROM that accepts 3-input and produces its 1's complement as output.	4	CO6	K3

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