QP Code: R264A007 | Reg. No | | | | | | | | | | | AY 23

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

B. Tech (Fourth Semester – Regular/Supplementary) Examinations, April 2026

23BECPC24001 - Digital System Design

(ECE)

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

Answer ALL Questions.

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

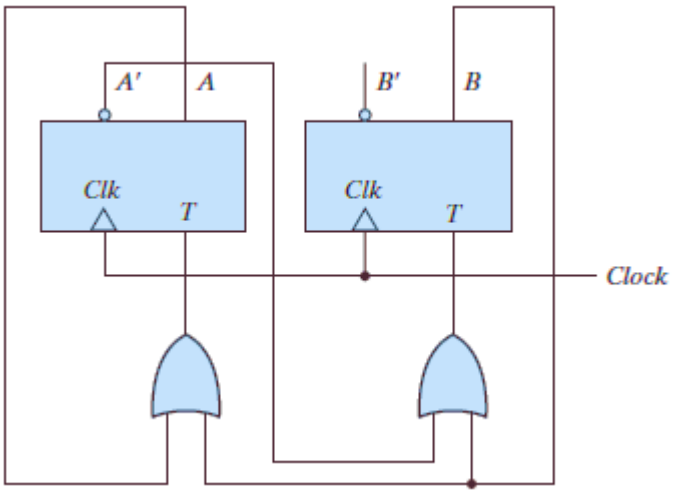
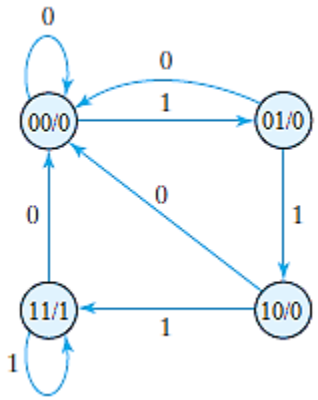
PART – A (Short Answer Questions) **(2 × 5 = 10 Marks)**

	Q.1. Answer ***ALL*** Questions.	CO#	BTL
a.	Convert $(634)_8$ 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.	CO3	K2
e.	Differentiate between static and dynamic RAM.	CO5	K2

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

	Answer ***ALL*** Questions.	Marks	CO#	BTL
2. a.	Carry out the following additions: (i) (+13, -11) using 1's complement notation. (ii) (-15, +9) using 2's complement notation.	6	CO1	K3
b.	Simplify the following Boolean functions to a minimum number of literals. (i) $x(x' + y)$ (ii) $xy + x'z + yz$ (OR)	4	CO2	K3
c.	Express -3.75 as a floating point number using IEEE single precision.	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	K4
3.a.	Simplify the following Boolean function using a four-variable K-map: $F(A, B, C, D) = \Sigma(0, 1, 3, 4, 5, 7, 9, 11, 15)$ and then, realize the simplified functions using logic gates.	6	CO2	K3
b.	Express the Boolean function $f = xy + x'z$ in a product of maxterms. (OR)	4	CO2	K3
c.	Implement the following Boolean function with NOR gates. $F = (AB' + A'B)(C + D')$	6	CO2	K4
d.	Reduce the Boolean expression $A + B[AC + (B + \overline{C})D]$	4	CO2	K3
4.a.	What is a full adder circuit '? Draw its truth table. Design a full adder circuit using two half adder circuits and an 'OR' gate.	6	CO3	K4
b.	Implement the Boolean function $F(x, y, z) = \sum(1, 2, 6, 7)$ with a multiplexer. (OR)	4	CO3	K4
c.	Design a combinational circuit which will convert a 4-bit binary number to a 4-bit Gray code.	6	CO3	K4
d.	Construct a 4-to-16-line decoder with two 3-to-8-line decoders with enable.	4	CO3	K4
5.a.	Design a counter with the following repeated binary sequence: 0, 1, 2, 4, 6.	6	CO5	K4

Use *D* flip-flops.

b.	Describe the construction and operation of a master-slave 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	CO5	K4
	(OR)			
c.	Design the sequential circuit specified by the state diagram of the figure using *D* flip-flops. 	6	CO4	K4
d.	A 3-input majority circuit produces the output as '1' when the number of 1's is more than the number of 0's at the input. Implement it using ROM.	4	CO5	K4

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