QP Code: RM22BTECH155 | Reg. No | | | | | | | | | | | AY 22

GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Fourth Semester Regular) Examinations, May – 2024

21BECPC24001 - Digital Electronics

(ECE)

Time: 3 Hours | Maximum: 70 Marks

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

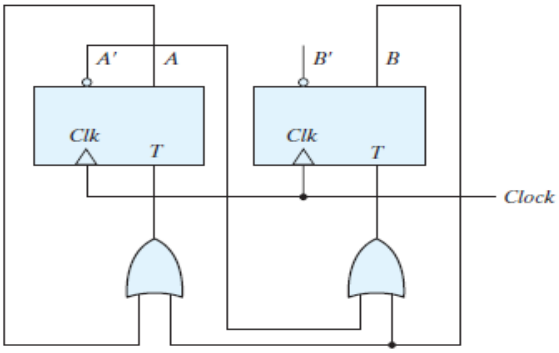
PART – A **(2 × 5 = 10 Marks)**

		CO #	Blooms Level
Q.1.	Answer ***ALL*** questions.		
a.	Find the radix of the number system where 24 + 17 = 40.	CO1	K1
b.	Show that the dual of the exclusive-OR is equal to its complement.	CO1	K1
c.	Convert the following expression into a standard product of sums. $Y = A(A + B + C)$	CO2	K2
d.	Write a characteristic equation and excitation table for the *T* flip-flop.	CO3	K1
e.	How many 16K × 1 RAMs are required to obtain a memory with a word capacity of 64K? The word length is eight bits.	CO4	K3

PART – B **(15 × 4 = 60 Marks)**

		Marks	CO #	Blooms Level
	Answer ***ALL*** questions.			
2.a.	Carry out the following additions: (i) (+13, -11) using 1's complement notation. (ii) (-15, +9) using 2's complement notation.	8	CO1	K3
b.	Simplify the following Boolean functions to a minimum number of literals. (i) $x(x' + y)$ (ii) $xy + x'z + yz$	7	CO1	K3
	(OR)			
c.	Construct logic circuit using AND, OR, and NOT gate for the following Boolean function: (i) $Y = (A + B)(A' + B')$ (ii) $Y = (A + B)(C' + D')(A' + C)$	8	CO2	K3
d.	In a tabular form, write the "2421" code and "Excess-3" code of decimal digit "0 to 9". What are the special properties of these codes?	7	CO1	K2
3.a.	Simplify the following Boolean function using a four-variable K-map: $F(A, B, C, D) = \sum(0, 1, 3, 4, 5, 7, 9, 11, 15)$ and then, realize the simplified functions using logic gates.	10	CO2	K3
b.	Reduce the Boolean expression $A + B[AC + (B + \overline{C})D]$	5	CO1	K3
	(OR)			
c.	What is a full adder circuit? Draw its truth table. Design a full adder circuit using two half adder circuits and an 'OR' gate.	10	CO2	K3
d.	Implement the following Boolean function with a multiplexer. $F(A, B, C, D) = \sum(1, 3, 4, 11, 12, 13, 14, 15)$	5	CO2	K3
4.a.	A magnitude comparator is a combinational circuit that compares two numbers *A* and *B*, and determines their relative magnitudes. The outcome of	8	CO2	K3

	the comparison is specified by three binary variables that indicate whether $A > B$, $A = B$ or $A < B$. Determine the algorithm to implement this comparator and draw a 2-bit magnitude comparator using the combinational circuit.			
b.	Construct the 3 × 8 decoder using 2 × 4 decoders.	7	CO2	K3
	(OR)			
c.	What is the race-around condition? How is it eliminated in a master-slave *JK* flip-flop?	8	CO3	K2
d.	Explain how a *J-K* can be constructed using *D* flip-flop.	7	CO3	K3
5.a.	Design of a synchronous Mod-6 counter using *JK* flip-flops.	10	CO3	K3
b.	What is a shift register? Explain the principle of a 4-bit serial-in, parallel-out, shift register.	5	CO3	K2
	(OR)			
c.	Derive the state table and the state diagram of the sequential circuit shown in the figure.	10	CO3	K3



d.	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.	5	CO4	K3

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