Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

Subject code: X21102 **Subject Name: Digital Logic Design**

Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	(i)	$(2AC5.D)_{16} = (\quad)_{10} = (\quad)_{8} = (\quad)_{2}$	**03**
		(ii)	$(432)_5=(\quad)_7$ $(8620)_{10}=(\quad)_{BCD}$	**03**
		(iii)	Determine the value of b if $(33)_{10}=(201)_b$	**01**
	(b)	(i)	Add and multiply following numbers in the given base without converting to decimal: $(1230)_4$ and $(23)_4$	**03**
		(ii)	Using 2's complement perform $(11010)_2-(10000)_2$	**02**
		(iii)	Obtain 9's and 10's complement of $(13579)_{10}$	**02**
Q.2	**(a)**	(i)	Demonstrate the validity of De Morgan's theorems by means of truth tables for three variables.	**03**
		(ii)	What is duality principle? Show that the dual of the Exclusive-OR is equal to its complement.	**02**
		(iii)	Define the parameters power dissipation, propagation delay, noise margin and fan-out for IC digital logic families.	**02**
	(b)	(i)	Find the complement of the following Boolean function and reduce it to a minimum number of literals: F(A,B,C,D)=(BC'+A'D)(AB'+CD')	**03**
		(ii)	What is difference between canonical form and standard form? Simplify the following Boolean function using Karnaugh map: F (A, B, C, D) = ABD + A'C'D' + A'B + A'CD' + AB'D'.	**04**
			OR	
	(b)		What do you mean by the gray code? Simplify Boolean function F (A, B, C, D) = Σm(0, 2, 3, 6, 7, 8, 10, 12, 13) using tabulation method.	**07**
Q.3	**(a)**		Design a combinational circuit whose input is a four bit number and whose output is 2's complement of the input number.	**07**
	(b)	(i)	Obtain all basic operations using only NAND gates. Also Implement Exclusive-OR gate using only four NAND gates.	**07**
		(ii)	Construct Boolean function F= A (B+CD) +BC' using only NOR gates.	
			OR	
Q.3	**(a)**		Explain Full adder in brief. Design a 4-bit BCD adder using two 4-bit binary adders.	**07**
	(b)	(i)	Explain 4-bit magnitude comparator.	**05**
		(ii)	Construct 4×16 decoder using 3×8 decoders. Use block diagram construction.	**02**

Q.4	**(a)**		Draw the schematic diagram of encoder and explain the working of Multiplexer in brief. Implement given function $F(A,B,C,D)= \Sigma m (0,1,3,4,7,10,12,14)$ using 8:1 Multiplexer.	**07**
	(b)		Differentiate edge and level triggering of flip-flops. What is race around condition in flip flops? How can we remove it?	**07**
			OR	
Q.4	**(a)**		Define the terms State & State table with respect to sequential circuit. Design a counter with the following binary sequence: 0,1,3,7,6,4 & repeat. Use T flip-flops.	**07**
	(b)	(i)	What is universal shift register? Explain Shift Registers in brief.	**05**
		(ii)	Differentiate Combinational logic and sequential logic circuits.	**02**
Q.5	**(a)**		Differentiate ripple counters and synchronous counters. Design a 4-bit binary ripple counter.	**07**
	(b)		Classify the types of microoperations most often encountered in digital systems and explain interregister-transfer microoperations in brief.	**07**
			OR	
Q.5	**(a)**	(i)	Explain Status Register.	**05**
		(ii)	Give differences between fixed-point data and floating point data.	**02**
	(b)		What is the difference between hard-wired control and microprogram control? What are the advantages and disadvantages in each method?	**07**

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