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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
THIRD SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

Course Code: EC207

Course Name: LOGIC CIRCUIT DESIGN (EC, AE)

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks

Marks

- 1 a) Convert the following numbers to the base indicated: (6)
 - i) $(1542)_8$ to base 10 ii) 52.35_{10} to base 2
 - iii) $(AD.4)_H$ to base 8 iv) $(1456.125)_{10}$ to base 16
- b) Using K map design a 3 bit Binary to Gray code converter. (9)
- 2 a) Perform the following binary arithmetic using 1's complement and 2's complement. (8)
 - i) $76.75 - 146.625$ ii) $77.5 - 34.25$
- b) Implement the following Boolean function using 8:1 Multiplexer. (7)

$$F(A, B, C, D) = \bar{A}\bar{B}\bar{C} + B\bar{C}\bar{D} + \bar{A}CD + AC\bar{D}$$
- 3 a) Design a combinational circuit to compare two 2-bit numbers $A(A_1A_0)$ and $B(B_1B_0)$ and generate outputs $f1 = A > B$, $f2 = A = B$ and $f3 = A < B$. (10)
- b) How is the Hamming code word generated? The message "1001001" is coded in the 7-bit even parity Hamming code, which is transmitted through a noisy channel. Decode the message, assuming that at most a single error occurred in each code word. (5)

PART B

Answer any two full questions, each carries 15 marks

- 4 a) Draw the circuit diagram of CMOS NOR gate and explain the working with truth table. (5)
- b) Realize the following: (10)
 - i) T flip-flop using SR flip-flop ii) JK flip-flop using D flip-flop
- 5 a) Implement the following functions using PLA. (7)

$$F_1 = \sum_m (3, 5, 7)$$

$$F_2 = \sum_m (4, 5, 7)$$
- b) Realize a T flip-flop using NAND gates and explain the operation with truth table, excitation table and characteristic equation. (5)
- c) What is race around condition? How it is avoided? (3)
- 6 a) Design a MOD-6 synchronous counter using JK flip-flop. When the counter enters an unused state, the counter has to start counting from 0. Draw the timing diagram and complete logic diagram. (10)
- b) Define the terms noise margin, propagation delay and power dissipation of logic families. Compare TTL and CMOS logic families showing the values of above mentioned terms. (5)

PART C*Answer any two full questions, each carries 20 marks*

- 7 a) With the logic diagram explain the working of a four bit bi-directional Serial in (10)
Serial out (SISO) shift register with mode control.
- b) Reduce the following state table using equivalence class state reduction technique. (10)

Present state	Next state and output			
	X=0		X=1	
S0	S0	0	S1	0
S1	S4	0	S2	0
S2	S7	0	S1	0
S3	S2	1	S6	0
S4	S6	0	S5	0
S5	S5	1	S4	1
S6	S1	1	S6	0
S7	S3	0	S8	0
S8	S8	1	S7	1

- 8 (20)

Obtain the state diagram for a sequence detector to detect the sequence 1010, generate the state table, transition table, excitation table and implement using D flip flop. When the sequence is detected output $z = 1$, overlapping of sequence is permitted.

- 9 a) Draw the logic diagram of a 4-bit ring counter and explain the working with (8)
timing diagram.
- b) Reduce the following state table using implication chart technique. (7)

Present state	Next state and output			
	X=0		X=1	
S0	S4	0	S2	0
S1	S2	0	S0	0
S2	S1	0	S6	0
S3	S6	0	S0	0
S4	S5	1	S1	0
S5	S4	0	S3	0
S6	S3	0	S6	0

- c) (5)
Differentiate Moore and Mealy models with examples.
