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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Third Semester B.Tech Degree Examination December 2021 (2019 scheme)

Course Code: ITT203

Course Name: DIGITAL SYSTEM DESIGN

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions. Each question carries 3 marks Marks

1 Convert (94.75)10 to binary, octal and hexadecimal (3)

2 Explain about Excess-3 code & Gray code (3)

3 State duality principle. Find the dual of the Boolean expression (3)

$$F(A,B,C)=(A+B'C)(A+C)$$

4 Realize the X-OR function using NOR logic (3)

5 Implement the function $F=\sum m(0, 2, 3, 5)$ using 8 to 1 Mux (3)

6 Design an even parity generator circuit for transmitting four bits of information (3)

7 Derive the characteristic table and characteristics equations of D, JK and T flip-flops (3)

8 Draw the circuit implementation of a positive edge triggered D flip-flop (3)

9 What is the different between a register and a counter? Give examples that clearly shows the difference between them (3)

10 Explain a Ring Counter. Draw the timing diagram of a 4-bit Ring Counter for 8 clock pulses. Assuming that the counter was initialized with 0110 at time T=0. (3)

PART B

Answer any one full question from each module. Each question carries 14 marks

Module 1

11 a) Perform subtraction using 1's & 2's complement method (8)

i) 11010 – 10111

ii) 100-11000

b) Represent the decimal numbers 453.8 and 628.6 in BCD. Calculate the sum using BCD arithmetic (6)

12 Express the signed decimal numbers (+12) and (-7) using 2's complement (14)

representation and enough digits to accommodate the numbers Then perform the binary multiplication on the them

Module 2

13 a) Simplify the Boolean function F (A, B, C, D) = $\sum m(0, 1, 2, 5, 8, 9, 10)$ into: (8)

(i) sum-of-products form and

(ii) product-of-sums form

b) Expand A+BC'+ABD'+ABCD to minterms and maxterms (6)

14 a) Simplify the following functions using Quine- McClusky method (8)

$$F(v,w,x,y,z) = \sum m(0,1,6,7,8,9,13,14,15)$$

b) Find all the prime implicants for the Boolean function (6)

$$F(w,x,y,z) = \Sigma(0,1,2,5,7,8,10,15)$$

Also, determine the essential prime implicants Give the simplified Boolean expression

Module 3

15 a) Explain a 4-bit carry look ahead adder with neat diagram (7)

b) Design a 4-bit code-converter to convert BCD to gray code (7)

16 Design a four-bit combinational circuit 2's complementer (The output generates the 2's complement of the input binary number) Implement the circuit using basic gates (14)

Module 4

17 a) Explain the working of D flip-flop with preset and clear input (8)

b) What you mean by asynchronous inputs and synchronous inputs in flip flop (6)

18 a) A synchronous sequential machine has a single control input X and the clock, and outputs A & B On consecutive rising edges of the clock, the code on A and B changes from 00 to 01 to 10 to 11 and repeats itself if X=1, if at any time, X=0, it holds to the present state Draw the state diagram and implement the circuit using T flip flop (10)

b) Differentiate between edge triggering and level triggering of flip flops Give an example of edge triggered and level triggered circuit (4)

Module 5

19 Show the difference between a synchronous counter and an asynchronous counter using the design of a BCD counter (14)

20 a) Explain a four-bit universal shift register (7)

b) Design a combinational circuit using a ROM. The circuit accepts a three-bit number and outputs a binary number equal to the square of the input number. (7)

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