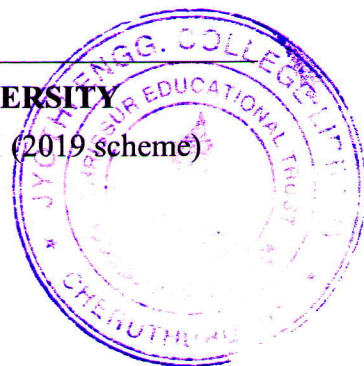


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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

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

**Course Code: CST203****Course Name: Logic System Design**

Max. Marks: 100

Duration: 3 Hours

PART A*Answer all questions. Each question carries 3 marks*

Marks

- 1 Do the following base conversions (3)
 - a) $(96DE)_{16}$ to octal
 - b) $(1011011000)_2$ to octal
- 2 Subtract -12 from 23 using 2's complement representation and 1's complement representation (3)
- 3 State and prove extended De Morgan's theorem (3)
- 4 Using Huntington's postulates prove that (3)
 - a) $x + x = x$
 - b) $x + 1 = 1$
- 5 Distinguish between decoder and demultiplexer (3)
- 6 Design a half adder circuit from its truth table (3)
- 7 Distinguish between T flip-flop and D flip-flop (3)
- 8 Explain race around problem. How can it be eliminated? (3)
- 9 Write the algorithm for addition of two binary numbers in 2's complement form (3)
- 10 What is programmable logic array? Where is it useful? (3)

PART B*Answer any one full question from each module. Each question carries 14 marks***Module 1**

- 11 a) Convert i) $(214)_{10}$ to binary, octal, BCD and hexadecimal (4)
 - ii) (128) to binary, octal, BCD and hexadecimal (4)
- b) Represent -219 and -114 in (6)
 - i) sign magnitude form ii) 1's complement form
 - iii) 2's complement form
- 12 a) Add 127 and 765 assuming the numbers are i) octal ii) BCD iii) hexadecimal (6)
- b) Subtract 157 from 615 assuming the numbers are i) octal ii) BCD (6)
 - iii) hexadecimal iv) 2's complement form (2)

Module 2

- 13 a) Define Boolean algebra. Give an example (8)
b) Show that any digital circuit can be implemented using universal gates (6)
- 14 a) Simplify the Boolean function $F(a,b,c,d) = \sum (0,1,2,5,7,8,9,10,11,13,15)$ using K map (7)
b) Verify your answer using tabulation method. (7)

Module 3

- 15 a) Explain parallel adder/subtractor circuit with a logic diagram (8)
b) Design a carry look ahead adder circuit for four bit binary addition (6)
- 16 a) Design a code converter circuit for converting binary number to BCD number (8)
b) Design a 4x2 encoder circuit (6)

Module 4

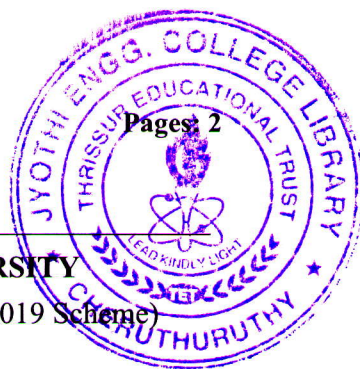
- 17 a) Explain 3 bit binary asynchronous counter with a logic diagram and timing sequence (8)
b) Explain asynchronous BCD counter (6)
- 18 a) Explain i) SR flip-flop ii) JK flip-flop iii) master-slave flip-flop with excitation table and characteristic equation (12)
b) Explain edge triggered flip-flop (2)

Module 5

- 19 a) Explain a ring counter with a logic diagram, timing sequence and state diagram (10)
b) Explain with a logic diagram a serial in parallel out shift register (4)
- 20 a) Illustrate the algorithm for addition and subtraction of two BCD numbers with an example (8)
b) Explain with an example how simple functions can be implemented using PLA (6)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Third Semester B.Tech Degree Examination December 2020 (2019 Scheme)

Course Code: CST203

Course Name: LOGIC SYSTEM DESIGN

Max. Marks: 100

Duration: 3 Hours

PART A*Answer all questions. Each question carries 3 marks*

Marks

- 1 Convert $(456.78)_{10}$ to a) binary b) octal and c) hexadecimal (3)
- 2 Write a) 1's complement and 2) 2's complement representations of (-126) (3)
- 3 State and prove De Morgan's Theorem (3)
- 4 Design a circuit using NAND gates for implementing EXCLUSIVE-OR function (3)
- 5 Design a half adder circuit using any universal gate. (3)
- 6 Draw the logic diagram of a 2×1 multiplexer circuit (3)
- 7 Derive the characteristic equation of a D flip flop from its excitation table. (3)
- 8 How is a sequential circuit different from a combinational circuit? Give an example for each circuit. (3)
- 9 Distinguish between a ring counter and Johnson counter (3)
- 10 When do you implement a combinational circuit using ROM and when do you implement a combinational circuit using PLA in preference to ROM. (3)

PART B*Answer any one full question from each module. Each question carries 14 marks***Module 1**

- 11 a) Convert i) $(13AF)_{16}$ to octal ii) $(10110101.101)_2$ to decimal (6)
- b) Add i) BCD numbers 1567 and 968 ii) octal numbers 2376 and 5677 (8)
- 12 a) Perform the following operations using 2's complement representation (10)
 - i) $(-34) + (+21)$ ii) $(+26) - (-12)$ iii) $(-33) + (-22)$ iv) $(+45) - (+32)$
- b) Convert i) (10011010) in 2's complement form to decimal (4)
- ii) (10111001) in 1's complement form to decimal

Module 2

- 13 a) Using K Map simplify the function (8)

$$F(w, x, y, z) = \sum (0, 1, 2, 3, 5, 7, 8, 9, 10, 13, 15)$$
- b) Express the above function in product of maxterms form. (6)

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- 14 a) Using tabulation method simplify the function (8)

$$F(w,x,y,z) = \sum (0,2,4,5,6,7,8,12,13,14,15)$$

- b) Express the following functions in a canonical form (6)

i) $F = D + BC'$ ii) $F = AB' + BC'$

Module 3

- 15 a) Design a full subtractor circuit. (6)

- b) Design a code converter for converting a BCD to excess-3 code. (8)

- 16 a) Explain BCD adder using a block diagram. (7)

- b) Design a 2 bit magnitude comparator. (7)

Module 4

- 17 a) With a logic diagram explain how a master slave flip flop overcomes race around problem. (7)

- b) Design a 2 bit synchronous counter. (7)

- 18 a) Draw the state diagram and logic diagram of a BCD ripple counter. (6)

- b) Design a 3 bit synchronous up-down counter. (8)

Module 5

- 19 a) Explain the working of a 3 stage Johnson ring counter with a block diagram (7)

- b) Explain the working of a 3 bit bidirectional shift register with parallel load. (7)

- 20 a) Illustrate the algorithm for addition and subtraction of two floating point numbers. (7)

- b) Illustrate the algorithm for addition and subtraction two binary numbers in sign magnitude form. (7)
