

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S3 (R, S) / S1 (PT) (S, FE) Examination December 2023 (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

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| 1 | Convert the decimal number 250.5 to base 7 and base 8. | (3) |
| 2 | Represent the decimal number 8623 in BCD, Excess-3 code and 2421 code. | (3) |
| 2 | Using the postulates and theorems of Boolean algebra, simplify the expression $(A+B)'(A'+B)'$ | (3) |
| 4 | A bank vault has three locks with a different key for each lock. Each key is owned by a different person. In order to open the door, at least two people must insert their keys into the assigned locks. The signal lines A, B and C are 1 if there is a key inserted into lock 1, 2 or 3 respectively. Write a minimized Boolean expression for the variable Z which is 1 iff the door should open. | (3) |
| 5 | A combinational circuit is defined by the following three functions.
$F_1 = x'y' + xyz'$ $F_2 = x' + y$ $F_3 = xy + x'y'$
Design the circuit with a decoder and external gates. | (3) |
| 6 | Design a combinational circuit to check for odd parity of four bits. | (3) |
| 7 | What are ripple counters? | (3) |
| 8 | Convert SR to T flipflop. | (3) |
| 9 | Convert $(17.5)_{10}$ to 32-bit single precision IEEE 754 binary floating point standard. | (3) |
| 10 | Find the modulus of 8-bit Ring, Johnson and Synchronous counter. | (3) |

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

- 11 a) Perform the following operations (6)
- i) $(367)_8 + (715)_8$ ii) $(56A.49)_{16} + (98B.5A)_{16}$ iii) $(1230)_4 + (23)_4$

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- b) Perform the following (8)
- i) BCD subtraction $(7235)_{10} - (346)_{10}$ in 10's complement method.
 - ii) Subtract $(9F2C)_{16}$ from $(A96B)_{16}$ in 15's complement method.
- 12 a) Perform the following operations using 2's complement representation (6)
- i) $(+12) - (+50)$ ii) $(+85) - (+43)$
- b) Convert the following numbers from the given base to the bases indicated. (8)
- i) Octal 623.77 to decimal, binary and hexadecimal.
 - ii) Hexadecimal 2AC5.D to decimal, octal and binary.
 - iii) Decimal number 85 to BCD and Excess-3 code.

Module 2

- 13 a) Implement $F(A, B, C) = \sum_m (0, 1, 5)$ using only NAND gates. (7)
- b) Simplify the Boolean expression $Y(A, B, C, D) = \prod_M (0, 1, 3, 5, 6, 7, 10, 14, 15)$ using K-map in Product of Sums form. (7)
- 14 a) Simplify $F(a, b, c, d) = \sum (1, 3, 4, 5, 9, 10, 11) + \sum_d (6, 8)$ using tabulation method. (10)
- b) Implement AND gate using only NOR gates. (4)

Module 3

- 15 a) Explain the operation of a 4-bit magnitude comparator circuit with a neat logic diagram. (10)
- b) Construct a full adder using two half adder circuits. (4)
- 16 a) Draw the circuit of a BCD adder and explain its working. (8)
- b) Implement $F(A, B, C, D) = \sum_m (0, 1, 3, 4, 8, 9, 15)$ using 8 x 1 MUX. (6)

Module 4

- 17 a) Design a synchronous counter with the following binary sequence 0, 1, 3, 7, 6, 4 and repeat. Use T flipflops. (10)

- b) The truth table of AB flipflop is given as (4)

A	B	Q_{n+1}
0	0	0
0	1	Q_n
1	0	Q_n'
1	1	1

Write the excitation table and characteristic equation of AB Flipflop.

- 18 a) Explain how a master slave flipflop eliminates race around condition. (7)
- b) Draw the logic diagram and timing diagram of a mod-5 ripple counter. (7)

Module 5

- 19 a) Draw a flowchart and explain the addition/subtraction of binary numbers in sign-magnitude form. (10)
- b) Draw the logic diagram of a 5-bit Johnson counter. (4)
- 20 a) Implement a 4-bit bidirectional shift register with parallel load. (8)
- b) Design a BCD to Excess -3 code converter using ROM. (6)