

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**THIRD SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019**

**Course Code: CS203**

**Course Name: SWITCHING THEORY AND LOGIC DESIGN**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer all questions, each carries 3 marks.*

Marks

- |   |   |     |
|---|---|-----|
| 1 | Represent decimal number $(5.75)_{10}$ in single precision floating point format.   | (3) |
| 2 | Simplify the Boolean function $F = AB' + AB + BC$ . Draw the circuit using basic gates. How many logic gates do you save by simplification? | (3) |
| 3 | Show the three different representations for a negative decimal number $N = -25$ in binary.   | (3) |
| 4 | Obtain the two canonical forms of the Boolean function $F(A,B,C) = A'B + BC' + BC + AB'C'$  | (3) |

**PART B**

*Answer any two full questions, each carries 9 marks.*

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|---|---|-----|
| 5 | a) Simplify the given Boolean function using Karnaugh Map and obtain the minimum Sum Of Products expression.<br>$F(WXYZ) = \Sigma(3,5,6,7) + d(10,11,12,13,14,15)$  | (5) |
|   | b) Verify or contradict the statement "NAND logic function is commutative but not associative" using truth table.   | (4) |
| 6 | a) Convert the following numbers to binary and perform subtraction both 2's complement and 1's complement.<br>1) Minuend $(3A)_{16}$ , subtrahend $(24)_{16}$<br>2) Minuend $(24)_{16}$ , subtrahend $(3A)_{16}$  | (5) |
|   | b) Obtain the simplified Product of Sums expression for the function $F(ABC) = \pi(0,2,3,5,7)$ using Karnaugh Map.  | (4) |
| 7 | a) A keyboard contains 26 uppercase letters and 10 decimal digits as keys. The keys are arranged as a two-dimensional matrix. Each key should be identified by a unique binary code. Propose a suitable coding scheme for the keyboard layout. And write the code for letter H.                     | (5) |
|   | b) A digital circuit has four inputs and one output. The output is equal to 1 when (1) all the inputs are equal to 1 or (2) none of the inputs are equal to 1 or (3) an odd number of inputs are equal to 1<br>a) obtain the truth table b) Find the simplified output function in sum of products. | (4) |

**PART C**

*Answer all questions, each carries 3 marks.*

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|----|---|-----|
| 8  | What is the function of a half subtractor circuit? Write the logic expression for the outputs. Draw the logic diagram of half subtractor. | (3) |
| 9  | What is the advantage of edge triggering over level triggering in flipflops?  | (3) |
| 10 | Draw the diagram of a JK latch using NOR gates. Explain the working of the latch when both J and K inputs are active simultaneously.      | (3) |
| 11 | Draw the schematic diagram of a 3-bit parallel adder. What is the drawback of this circuit?   | (3) |

**PART D**

*Answer any two full questions, each carries 9 marks.*

- 12 a) What is a multiplexer? Draw the internal diagram of a 4X1 multiplexer, clearly indicating the inputs and outputs. Explain the functionality using the function table (4)
- b) Draw the circuit of a master slave JK flipflop. With the help of a timing diagram explain its working. (5)
- 13 a) Implement the function  $F(A,B,C)=\Sigma(0,1,4,6)$  using a 4X1 multiplexer. (5)
- b) What is meant by excitation table of a flip flop? Obtain the excitation table of RS flipflop. (4)
- 14 a) Design a BCD to Excess-3 code convertor using a 4-bit parallel adder. (5)
- b) Draw the block diagram of a sequential circuit and differentiate synchronous and asynchronous sequential circuits. (4)

**PART E**

*Answer any four full questions, each carries 10 marks.*

- 15 With the help of timing diagram and logic diagram, explain the working of Serial In Serial Out shift register and Parallel In Serial Out shift register using an example. (10)
- 16 Draw the logic circuit of a BCD ripple Counter and explain its working with a timing diagram (10)
- 17 Show the internal architecture of a 8X4 ROM. Show the implementation of a full adder using ROM. (10)
- 18 What is meant by a PLA? Show the implementation of  $F1=AB'C+AC+BC$  and  $F2= AC +BC+B'C$  using a suitable PLA. (10)
- 19 Design a synchronous counter using T flipflops having states 000-001-011-101-110-111-000. (10)
- 20 What is meant by Hardware Description Languages? Give examples. Write the HDL code for a 4X1 multiplexer (10)

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