ROLL NO. _____

Code: DE58/DC58/DE108/DC108 **Subject: LOGIC DESIGN**

DipIETE – ET/CS (Current & New Scheme)

Time: 3 Hours **June 2019** **Max. Marks: 100**

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 Choose the correct or the best alternative in the following: (2×10)

a. Which of the following number systems is not a positional number system?
(A) Roman **(B)** Decimal
(C) Hexadecimal **(D)** Binary

b. The following code(s) is (are) not a BCD code
(A) Gray code **(B)** XS-3 code
(C) 8421 code **(D)** All of these

c. How many NOR gates are required to obtain AND operation?
(A) 2 **(B)** 3
(C) 4 **(D)** 5

d. Which of the following gates cannot be used as an inverter?
(A) NAND **(B)** NOR
(C) AND **(D)** X-NOR

e. An 8-square is called
(A) A pair **(B)** A quad
(C) A cube **(D)** An octet

f. A multiplexer is also known as
(A) A data accumulator **(B)** A data restorer
(C) A data selector **(D)** A data distributor

g. A flip-flop can store
(A) One bit of data **(B)** Two bits of data
(C) Three bits of data **(D)** Any number of bits of data

h. The toggle mode for a J-K flip-flop is
(A) J=0, K=0 **(B)** J=1, K=1
(C) J=0, K=1 **(D)** J=1, K=0

i. The characteristics equation of a D flip-flop is
(A) $Q_{n+1} = D$ **(B)** $Q_{n+1} = Q_n$
(C) $Q_{n+1} = 1$ **(D)** $Q_{n+1} = D+Q_n$

j. A sequential circuit with ten states will have _____ flip-flops
(A) 10 **(B)** 5
(C) 3 **(D)** 4

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2 a. Explain the operation of digital computer with block diagram **(8)**

b. Perform the following conversions: **(4+4)**
(i) $(378.98)_{10}$ to Octal (ii) $(2598.675)_{10}$ to Hexadecimal

Q.3 a. Draw the logic circuit for the Boolean expression F = X'Y' + XY + X'Y **(4)**

b. Write the truth table for Exclusive OR gate with logic diagram. **(3)**

c. Simplify the following expressions and implement them with NAND gate circuits.
F = AB' + ABD + ABD' + A'C'D' + A'BC' **(9)**

Q.4 a. Distinguish between combinational and sequential logic circuits. **(8)**

b. Draw the circuit diagram of master-slave JK Flip -Flop and explain its Operation with the help of truth table. **(8)**

Q.5 a. Design a combinational circuit that accepts a 3-bit BCD number and generates an output binary number equal to the square of the input number. **(8)**

b. Explain the working of BCD adder with logic diagram. **(8)**

Q.6 a. Explain in details the operation of MOD-6 Johnson counter, with logic diagram and state diagram. **(8)**

b. Design a MOD-10 Asynchronous counter using Flip-Flops. **(8)**

Q.7 a. Design a 4 x 1 Multiplexer, and list any four of its applications. **(8)**

b. Design a 4-bit Gray-to-Binary Code converter. **(8)**

Q.8 a. Design a MOD-3 Synchronous Counter and draw its logic diagram. **(8)**

b. Draw the logic diagram for 4-bit Serial Input and Serial Output Shift Register and explain its working with timing waveform. **(8)**

Q.9 a. Define the following terms with respect to memory devices: **(8)**
(i) Access time (ii) Address (iii) Read only memory (iv) Volatile memory

b. What is RAM? What are its various types and explain each type.? **(8)**