DipIETE – ET/CS (NEW SCHEME) – Code: DE58 / DC58

Subject: LOGIC DESIGN

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

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.**
- **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. When two n-bit binary numbers are added, the sum will contain at the most

(A) n-bits **(B)** n+1 bits
(C) n+2 bits **(D)** n+n bits

b. The most suitable gate to check whether the number of ones in a digital word is even or odd is

(A) EX-OR **(B)** NAND
(C) NOR **(D)** AND, OR & NOT

c. The output of a gate is high if and only if all of its inputs are low. It is true for

(A) NAND **(B)** NOR
(C) EX-OR **(D)** EX-NOR

d. A multiplexer can be used as a

(A) Logic element **(B)** Flip-flop
(C) Counter **(D)** 7-Segment LED driver

e. In a combinational circuit the output at any instant of time depend

(A) Only on inputs present at that instant of time
(B) Only on past inputs
(C) Only on past outputs
(D) On past inputs as well present inputs

f. Shifting binary data to the left by one bit position using shift registers amounts to

(A) Division by 2 **(B)** Subtraction of 2
(C) Addition of 2 **(D)** Multiplications by 2

g. The maximum modulo number that can be obtained by a ripple counter using *Five* flip-flops is

(A) 32 **(B)** 16
(C) 15 **(D)** 5

h. Which of the following memories can be programmed by the user and then cannot be erased & reprogrammed?

(A) ROM **(B)** PROM
(C) EPROM **(D)** EEPROM

i. The binary equivalent of decimal number 0.0625 is

(A) 10011 **(B)** 0.10011
(C) 0.01101 **(D)** 0.0001

j. A switching function f(A B C D) =
can also be written as

(A) **(B)**

(C) **(D)**

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

Q.2 a. What are the advantages of digital techniques? Mention two limitations of digital technique. **(8)**

b. Perform the following conversions:
(i) $(0.3125)_{10}$ to Octal (ii) $(2374)_8$ to Decimal
(iii) $(B2F8)_{16}$ to Octal (iv) $(1011110101)_2$ to Hexadecimal **(8)**

Q.3 a. Realize AND, OR & INVERTER operations using universal gates. Also write the expressions at each gate outputs. **(8)**

b. Simplify the following equations using K-map and realize using gates. **(8)**
(i) (ii)

Q.4 a. Define the following:
(i) Propagation delay time (ii) Maximum clock frequency
(iii) Set-up time (iv) Hold time **(8)**

b. With the help of block diagram and waveforms explain how JK flip-flop can be used in frequency division and counting. **(8)**

Q.5 a. Explain parallel binary adder with the help of block diagram. **(8)**

b. What are the functions of an ALU? State the sequence of operations that occur in the ALU while performing arithmetic operations. **(5)**

c. Subtract $(3A8)_{16}$ from $(594)_{16}$. **(3)**

Q.6 a. Design a Mod-10 ripple counter that count from 0000 through 1001. **(8)**

b. Design a counter using JK flip-flop with the irregular binary count sequence shown in the state diagram **(8)**

Q.7 a. What is encoder? Design a decimal to BCD encoder using gates. **(8)**

b. Convert Gray code 1011 to Binary and show the realization for the same using EX-OR gates. **(5)**

c. Differentiate between Multiplexer and De-Multiplexer. Mention any two applications of Multiplexer. **(3)**

Q.8 a. With the help of block diagram and waveforms explain four bit ring counter. **(8)**

b. What is the difference between a counter and a shift register? Show the basic data movement in shift registers for the following operations:

(i) Serial in serial out (ii) Serial in parallel out
(iii) Parallel in serial out (iv) Parallel in parallel out
(v) Rotate left **(8)**

Q.9 a. Define the following:

(i) Static memory device (ii) Dynamic memory device
(iii) Volatile memory (iv) Auxiliary memory **(8)**

b. Explain memory operation with the help of memory. **(8)**