

DiplETE – ET/CS (NEW SCHEME) – Code: DE58 / DC58**Subject: LOGIC DESIGN****JUNE 2009****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. In a Digital Computer, binary subtraction is performed using

- (A) 1's complement (B) 2's complement
(C) 9's complement (D) 10's complement

b. The binary equivalent of octal number 347 is

- (A) 11100111 (B) 11011011
(C) 11100011 (D) 11000111

c. $\overline{A}B + \overline{A}C + BC$ is equivalent to

- (A) $AB+BC$ (B) AC
(C) $\overline{A}C + BC$ (D) $\overline{A}B + \overline{A}C$

d. The output of a gate is 1, if and only if odd number of inputs are at logical ones. It is true for

- (A) OR gate (B) NOR gate
(C) EX-OR gate (D) EX-NOR gate

e. In a sequential circuit, the output at any instant depends on

- (A) Present inputs (B) Previous outputs
(C) Previous inputs and present outputs (D) Previous outputs and present inputs

f. The Schmitt trigger circuit behaves as a

- (A) Square wave generator (B) Monostable Multivibrator
(C) Bistable Multivibrator (D) Free-running Multivibrator

g. A mask programmed ROM is

- (A) Programmed at the time of fabrication
(B) Programmed by the user
(C) Erasable and programmable

(D) Electrically Erasable.

h. In a counter circuit consisting of four JK flipflops, if all flipflops get triggered simultaneously, then it is a

- (A) Asynchronous circuit (B) Synchronous circuit
(C) Combinational circuit (D) May be combinational or sequential circuit

i. The output Expression of Exclusive-NOR gate is

- (A) $A\bar{B} + \bar{A}B$ (B) $AB + \bar{A}\bar{B}$
(C) $\bar{A}\bar{B} + A\bar{B}$ (D) None of the above

j. The minimum number of flipflops required for a synchronous decade counter is

- (A) 10 (B) 2
(C) 4 (D) 3

**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 (7)
- b. Perform the following conversions:
(i) $(237)_{16}$ to Octal (ii) $(375)_{10}$ to Hexa decimal (iii) $(11110000110)_2$ to Decimal (9)
- Q.3** a. State and prove the Demorgan's Theorems (8)
- b. Simplify the expressions and realise using basic gates
(i) $XY + XYZ + XY\bar{Z} + \bar{X}YZ$
(ii) Use K-map to simplify, $Y = \bar{C}(\bar{A}\bar{B}\bar{D} + D) + A\bar{B}C + \bar{D}$ (8)
- Q.4** a. Explain the operation of internal circuit of edge triggered JK flipflop with truth table. (8)
- b. With waveforms explain Serial data transfer of 4-bit Shift Register. (8)
- Q.5** a. Design one bit full adder circuit (8)
- b. Perform the following: (8)
(i) 2's complement subtraction: 120-55
(ii) BCD addition: 275+641
- Q.6** a. With truth table and block diagram. Explain synchronous Mod-16 counter. (8)
- b. Design Mod-12 asynchronous counter that counts binary sequence 0000 through 1011. Also draw the waveforms. (8)
- Q.7** a. What is multiplexer? Explain any two applications of multiplexers. (8)
- b. Define Magnitude comparator? Show how 74HC85 four bit Magnitude Comparator can be used to perform 8-bit comparison. (8)

- Q.8** a. Explain Mod-6 Johnson counter with block diagram and waveforms. **(8)**
- b. Show how to connect 74ALS174 as a Serial Shift register with data shifting on each PGT of clock pulse as follows:
 $D_5 \rightarrow D_4 \rightarrow D_3 \rightarrow D_2 \rightarrow D_1 \rightarrow D_0$. Name any four applications of shift registers. **(8)**
- Q.9** a. Define the following:
(i) Memory cell (ii) Byte (iii) Access time (iv) Address **(8)**
- b. With the help of NMOS cell, explain the operation of static RAM. Draw timing diagram for static RAM Read cycle. **(8)**