SE / ETRX / III (REV) 24/5/2012
Digital System Design GN-5294

Con. 3892-12.

(3 Hours) [Total Marks : 100]

N.B. : (1) Question No. 1 is **compulsory** and solve any **four** from remaining **six** questions.
(2) In **all** attempt **five** questions.
(3) **Figures** to the **right** indicate **full** marks.
(4) Assume **data** if **necessary** and **justify** the **same**.

1. Answer the following :—
   (a) Construct Hamming code for BCD 0110. Use even parity. 5
   (b) Explain the term 'metastability', its causes and effects. 5
   (c) Define the following terms :— 5
       (i) Fan out   (iv) Propagation delay
       (ii) Noise margin   (v) Figure of merit.
       iii) Fan in active pull up
   (d) Implement X-NOR operation using only minimum number of NAND gates. 5

2. (a) Implement the following expression using IC 74138, 3:8 active low decoder and 10
       additional gates.
       $F(A,B,C,D) = \prod M \{ 0, 6, 7, 8, 12, 13, 14, 15 \}$
   (b) Find reduced SOP form using K-maps, and implement using universal gates :— 10
       (i) $f(A, B, C, D) = \Sigma m \{ 2, 3, 6, 7, 8, 9, 12, 13 \} + d(4, 10, 14)$
       (ii) $f(A, B, C, D) = \prod M \{ 0, 6, 7, 8, 12, 13, 14, 15 \}$

3. (a) Simplify the following using Quine Mc-Clusky method. 10
       $f(A, B, C, D, E) = \Sigma m \{ 0, 1, 9, 15, 24, 29, 30 \} + d(3, 11, 31)$
   (b) Implement the following using single IC 74151 and some gates. 10
       (i) $f1 = \Sigma m \{ 1, 2, 4, 7, 10, 13, 14 \}$
       (ii) $f2 = \Sigma m \{ 1, 4, 5, 7, 8, 12, 13, 15 \}$

4. (a) Determine whether any static 0 or static 1 hazards exist in the following Boolean 10
       expression. Identify where the hazards are and what must be done to avoid them.
       $f(A,B,C,D) = \Sigma m \{ 5, 7, 8, 9, 10, 11, 13, 15 \}$
   (b) Explain and draw asynchronous counter for the following :— 10
       -4- 5-6-7-8-9-10-11-12-13-14-15-

5. (a) Design and explain one digit BCD adder using IC 7483 and NAND gates. 10
   (b) Write short notes on : 10
       (i) ALU   (ii) programmable logic unit

6. (a) Construct twisted ring counter using IC 74194 and draw the output wave-form. 10
   (b) Draw and explain a 9 bit even parity checker using IC 74180. 10

7. (a) Implement binary to BCD converter using universal gates. 10
   (b) Explain the following :— 10
       (i) Self complementing codes, with example.
       (ii) The term 'noise margin' and its value for TTL and CMOS families.