Sem-III (M) Regular 16/12/13
Comp Dept

COMP 3-5 (RC)

S.E. (Comp.) (Semester – III) (RC) Examination, Nov./Dec. 2013
LOGIC DESIGN

Duration : 3 Hours | Total Marks : 100

Instructions : *1) Answer **five full** questions, by selecting atleast **one** question from **each** module.*
*2) Diagram **must** be drawn neat and clear with pencil **only**.*
*3) Assume data **if necessary**.*

MODULE – I

1. a) What is a digital system ? What are its advantages over analog system ? 4
   b) Perform the following operations : 4
      i) $(679.6 + 536.8)_{10}$ using BCD addition
      ii) $(753 - 864)_{10}$ using 9's complement method.
   c) Detect and correct errors if any in the following even parity Hamming code word 0101101. 4
   d) Minimize and draw the circuit for $f(A, B, C, D) = \sum_m(0, 1, 3, 5, 7, 8, 9, 11, 15)$ using Q-M method. 8

2. a) Prove the following using Boolean Algebraic Theorems 6
      i) $(A + B)\left(\overline{A}\,\overline{C} + C\right)\left(\overline{\overline{B} + AC}\right) = \overline{A}B$
      ii) $\overline{A \oplus B} = A \oplus \overline{B} = \overline{A} \oplus B$.
   b) Implement $Y = \overline{AB} + A + \left(\overline{B + C}\right)$ using minimum number of NAND gates only (only 2 inputs). 4
   c) Obtain the minimal POS expression for Π_M (0, 1, 2, 4, 5, 6, 9, 11, 12, 13, 14, 15) using K-map. 6
   d) What are self complementing codes ? Explain two self complementing codes with help of example. 4

P.T.O.

MODULE – II

3. a) Describe the operations of the following combinational circuits : 8
   i) magnitude comparator
   ii) octal to binary encoder.

   b) Design a full adder with two half adders and one OR gate. Show the truth tables and circuit diagrams. 6

   c) A circuit receives a BCD code as input. Design a minimal circuit to detect the decimal numbers 0, 1, 2, 3, 8, 9. 6

4. a) Explain the following : 6
   i) How does level triggered flip flop differ from edge triggered flip flop ?
   ii) How does SR flip flop differ from JK flip flop in its basic operation ?

   b) With the help of a neat logic diagram schematic symbol, truth table, present state, next state table, state diagram and excitation table. Explain the working of a J – K flip flop. 8

   c) Bring out the differences between combinational and sequential circuits. What is 'T' and 'D' in T and D flip flop ? 6

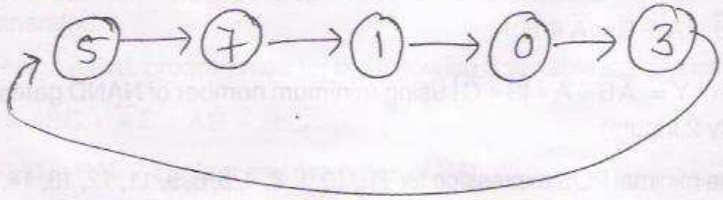
MODULE – III

5. a) Explain the working of a 4 bit bidirectional shift register with mode control signal. Also discuss its constructional features. 8

   b) Design and implement an octal synchronous down counter using either D or T flip flops. For this mod N counter what is N ? 8

   c) Explain the working of 4 bit SIPO shift register. 4

6. a) What are synchronous counter ? Design a synchronous counter that goes through the following states, using SR flip flops. 8



   b) With the help of neat diagram and a wave form, explain the working of mod-4 ripple counter. How would you convert it to a Mod-8 counter ? 6

   c) The content of a 4 bit shift register is initially 1101. The register is shifted 6 times to the right with serial input being 101101. What is the content of the register after each shift ? 4

   d) List some applications of counters. 2

MODULE – IV

7. a) Reduce the number of states in the following state table and draw the reduced state diagram. 8

Present State	Input x	Next State	O/P Z
a	0	f	0
	1	b	0
b	0	d	0
	1	c	0
c	0	f	0
	1	e	0
d	0	g	1
	1	a	0
e	0	d	0
	1	c	0
f	0	f	1
	1	b	1
g	0	g	0
	1	h	1
h	0	g	1
	1	a	0

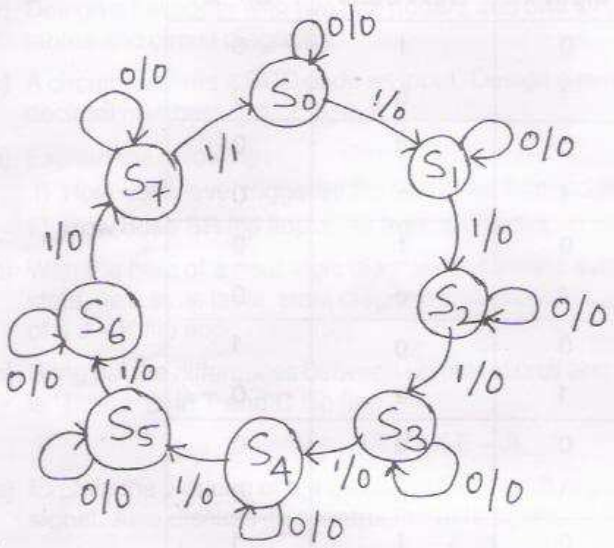
b) Design a synchronous counter for the following diagram using T-flip flops. 8

State	Assignment
S_0	000
S_1	001
S_2	011
S_3	010
S_4	110

S_5 111

S_6 101

S_7 100



c) How is FPLA architecture different from the PAL ? 4

8. a) Design a 2 input 2 output synchronous sequential circuit which produces an output z = 1, whenever any of the following input sequences 1100, 1010 or 1001 occurs. The circuit resets to its initial state after a 1 output has been generated. 10

b) Design a PAL programmed for the following 3 variable logic function 6

$X = ABC + \overline{A}C + A\overline{B} + \overline{B}\,\overline{C}$.

c) What is PAL ? Explain any two types of PAL. 4