RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

B.A./B.Sc. FIRST SEMESTER EXAMINATION, JANUARY 2015

FIRST YEAR

Date : 07/01/2015 — **COMPUTER SCIENCE (General)**

Time : 11 am – 1 pm — **Paper :** I — Full Marks : 50

[Use a separate Answer Book for each group]

Group – A

Answer <u>either Q.No. 1 or 2</u> : [1×5]

1. a) Given a string of ASCII characters whose bit patters have been converted into hexadecimal for compactness:
   4A EF 68 6E 20 C4 EF E5
   of the 8 bits in each pair of the digits, the left most is a parity bit. The remaining bits are the ASCII code.
   i) Convert to bit form and decode the ASCII
   ii) Determine the parity used : even or odd (only write) [4]
   b) Calculate : $(1001)_2 \times (11)_2$. [1]

2. a) Give the difference between weighted and Non-Weighted Codes with example. [4]
   b) For 5-bit original data, what will be the minimum number of parity bits— (i) For single bit error detection? (ii) For single bit error detection and correction? [1]

Answer <u>any two</u> questions from <u>Q.No. 3 – 6</u>: [2×10]

3. a) What are the unused bit combinations for Excess-3 code? Give reasons. [3]
   b) Write a short note on Hamming Code. [3]
   c) Determine the base of the numbers in the following operations: (i) 14/2 = 5, (ii) 132 – 25 = 104. [4]

4. a) Find the value of 7's complement and 8's complement of the octal number 537, show the necessary steps. [2]
   b) Minimize the following function using boolean algebra : [3]
   $f = a'bc + ca + a'bc' + ab'c + c'a + abc$
   c) Give the significance of Gray Code with example. [2]
   d) Express the boolean function $F = a + b'c$ in canonical form as the product of maxterms (using Boolean algebra). [3]

5. a) Prove that $\overline{a + b} = \bar{a} \cdot \bar{b}$, without using truth table. [2]
   b) i) Using 1's complement find the value of $(1001)_2 - (11101)_2 = ?$
   ii) Using 2's complement find the value of $(1101)_2 - (1001)_2 = ?$ [2+2]
   c) The state of a 12-bits register is 100010010111. What is it's content if it represents
   i) Three decimal digits in the Excess-3 code?
   ii) Three decimal digits in the 8 4 –2 –1 code? [4]

6. a) What do you mean by Minterm and Maxterm explain with example. [2]
   b) Draw the logic circuit of the following boolean expressions with only NAND gate
   i) $x\bar{y} + xy + \bar{x}y$
   ii) $A\bar{B}C + AB\bar{C} + \overline{ABC}$ [2+2]
   c) Simplify the following boolean function: $F(A, B, C, D) = \sum(0, 2, 3, 5, 7, 8, 10, 11, 14, 15)$ [4]

Group – B

Answer either Q.No. 7 or 8 : [1×5]

7. a) Differentiate between synchronous counter and asynchronous counter. Among them which one is faster and why? [2+2]
   b) Differentiate between encoder and priority encoder. [1]

8. a) Explain how a flip flop can act as a memory device with example. [2]
   b) Differentiate between excitation table and truth table. [2]
   c) Differentiate between Combinational Circuit and Sequential Circuit. [1]

Answer any two questions from Q.No. 9 – 12: [2×10]

9. a) How can a D flip flop be operated in toggle mode without using any external input? [2]
   b) Design a synchronous counter using negative edge triggered J-K flip flop which will count the following states : 1,2,5,6. [4]
   c) Design a full adder using basic gates with its truth table. [4]

10. a) Explain briefly the applications of a comparator. [2·5]
    b) Convert a SR flip flop to a D flip flop. [3·5]
    c) What will be the content of a 8-bit SISO shift left register after application of 7 clock pulses if its initial content is 01110101 and serially alternative 0's and 1's are applied through the input for shift left? Do it stepwise. [4]

11. a) What do you mean by parallel loading in register? [2]
    b) Write down the working principle of Multiplexer and Demultiplexer. [1·5+1·5]
    c) Design a 4-bit magnitude comparator showing its truth table and logic diagram. [3·5]
    d) Write down the working principle of a decoder. [1·5]

12. a) What is a code converter? Design a gray-to-binary code convertor. [1+3]
    b) What is the advantage of using master slave flip flop? [2]
    c) Explain the difference between level triggered flip flop and edge triggered flip flop using suitable diagram. [2]
    d) Differentiate between bidirectional shift register and universal shift register. [2]

———— × ————