RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

B.A./B.SC. FIRST SEMESTER EXAMINATION, DECEMBER 2013

FIRST YEAR

Date : 14/12/2013 — **Computer Science (Honours)**

Time : 11am – 3pm — Paper : I — Full Marks : 75

(Use separate answer book for each group)

Group – A

Answer **any one** of the following: [1×5]

1. a) What will be the base 32 equivalent of the number $(10110011100011110000)_2$?
   b) Find the number of prime implicants & essential prime implicants present for the boolean function $F = ABD' + AB'C + B'CD'$

2. a) Suppose the largest n-bit binary number requires 'd' digits in decimal. Then prove that the relation between 'n' & 'd' is approximately $d>n\log_{10}2$. [3]
   b) Write the equivalent predicate formula or expression for the following:
   "Silver and Gold are precious things". [2]

Answer **any two** of the following: [2×10]

3. a) "Self complementary codes can be both weighted and non-weighted" – comment on it. [3]
   b) Prove that the function f(A, B) = A'B' is a functionally complete function. [3]
   c) Find the value of N in the following expression:
   $(345)_6 + (632)_7 + (487)_9 = (N)_5$ [4]

4. a) Minimize the following function using K-map method $F(w, x, y, z) = \Sigma m(1, 2, 4, 7, 11, 12, 15)$ [6]
   b) Show that the dual of the exclusive-oR is equal to its complement. [2]
   c) Find the number of 1s in the binary representation of 31×4096+7×16+3. [2]

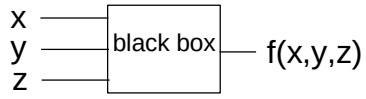
5. a) Show that $(P \to (Q \vee R)) \equiv ((P \to Q) \vee (P \to R))$ [3]
   b) Prove that the following propositional formula is "satisfiable but not valid" $(P \to (Q \vee R)) \to ((P \wedge Q) \to R)$ [3]
   c) Write the first order predicate calculus statement equivalent to the following: [2+2]
      i) Some Dolphins are intelligent
      ii) Some questions in all question paper are easy to answer.

6. a) Explain the use of Hamming codes in error correction with an example. [3]
   b) Draw a flow-chart to calculate the gcd of two numbers. [3]
   c) What do you mean by OCR? How does OMR differ from it? [3]
   d) Give an example of modern keyboard used in real life. [1]

Group – B

Answer **any five** of the following: [5×10]

7. a) The black box in the following figure consists of a minimum complexity circuit that used only AND, OR and NOT gates:



The function (x,y,z) = 1 whenever x, y are different and 0 otherwise. Derive the equation for 'f' that leads to correct design for the minimum complexity circuit. [4]

b) Discuss the working principle of DMA controller using a block diagram. [5]

c) What do you mean by positive and negative logic? [1]

8. a) Design a 4×16 decoder using necessary 2×4 decoders. [3]

b) State differences between combinational and sequential circuit. [2]

c) What is the indeterminate state in RS flip-flop? How is it resolved? [5]

9. a) Design 3-bits synchronous binary up counter using JK flip-flop and basic gates. [5]

b) Draw and explain logic diagram of serial-in parallel-out shift register. [3]

c) What is the use of Master-Slave Flip-Flop? [2]

10. a) What do you mean by general purpose register-give examples? [3]

b) Take the following expression:

$a = b * c + 2;$

explain how the above expression can be expressed by one address instruction. [4]

c) Differentiate between control flow and data flow architecture. [3]

11. a) Express $(39.25)_{10}$ in 32 bit IEEE-754 floating point format. [3]

b) Using Booth's algorithm perform -3×7. Show intermediate steps. [2]

c) What is overflow and underflow in computer architecture? [2]

12. a) Explain working mechanism of micro-programmed control unit. [5]

b) Differentiate between RISC & CISC architecture. [3]

c) What is Associative memory? [2]

13. a) Give the difference between Memory Mapped I/O & I/O Mapped I/O. [2]

b) Explain associative mapping of cache memory with a suitable example. [5]

c) Explain tri-state buffer. [3]

14. a) What is the role of sampling in A/D conversion? [3]

b) Differentiate between SRAM & DRAM. [3]

c) Write short note on various bus arbitration methods. [4]