RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

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

FIRST YEAR

Date : 05/01/2015 **COMPUTER SCIENCE (Honours)**

Time : 11 am – 2 pm **Paper :** I Full Marks : 75

[Use a separate Answer Book for each group]

Group – A

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

1. Explain the following terms with example:
   (i) Self-complementary Code, (ii) Unweighted Code, (iii) Assembly Language [1·5+1·5+2]

2. Explain the following terms with example :
   (i) Parity Bit, (ii) Excess Code, (iii) Algorithm [1·5+1·5+2]

***Answer <u>any two</u> questions from <u>Q.No. 3 – 5</u>*:** [2×10]

3. a) Draw a flowchart to check whether a number is a prime number or not. [2]
   b) The solution to the quadratic equation $x^2 - 11x + 21 = 0$ is x = 3 and x = 5. What is the base of the numbers? [2]
   c) Given the 8-bit data word 01011011, generate the composite word for the Hamming Code that corrects single error and detects double errors. [4]
   d) Using the 2's Complement arithmetic find the value of $(1110100)_2 - (1010011)_2$. [2]

4. a) Represent the unsigned decimal numbers 739 and 645 in Gray Code with proper steps of conversion [2]
   b) Using diminished Radix complement rule evaluate 5's complement and 6's complement of $(432)_6$. [1]
   c) Express the boolean function F = ab + a´c in canonical form as the product of maxterm (using boolean algebra). [3]
   d) Minimize the boolean function f given below by Quine-Mcclusky method using decimal notation. [4]
   $f(a,b,c,d) = \bar{a}\bar{b}\bar{c}\bar{d} + \bar{a}b\bar{c}\bar{d} + \bar{a}bc\bar{d} + \bar{a}bcd + a\bar{b}\bar{c}\bar{d} + a\bar{b}c\bar{d} + ab\bar{c}\bar{d} + abc\bar{d} + abcd$

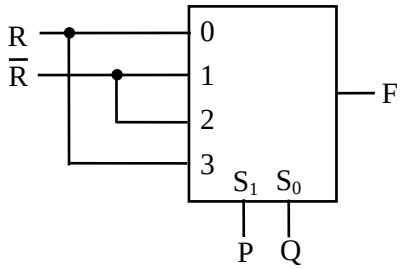
5. a) Evaluate the negation of each of the following statements: [3]
      i) If it is raining, then the game is cancelled.
      ii) He swims if and only if the water is warm.
      iii) For all real numbers , if x > 3 then $x^2 > 9$.
   b) Convert the following number with proper base. [3]
      i) $(437)_8 = (?)_{16}$
      ii) $(11011011)_2 = (?)_8$
      iii) $(739)_{10} = (?)_{16}$
   c) Show that s is a valid conclusion from the premises $p \Rightarrow q$, $p \Rightarrow r$, $\sim(q \wedge r)$ and $(s \vee p)$. [4]

Group – B

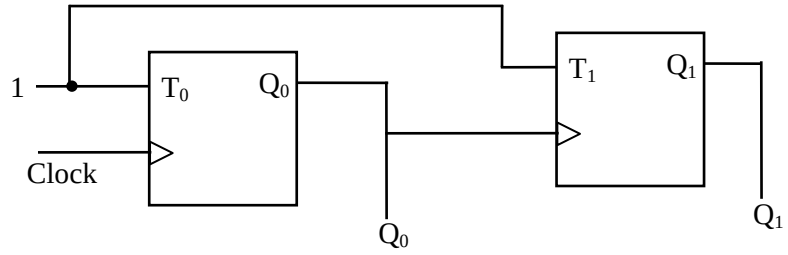
***Answer <u>any five</u> questions from <u>Q.No. 6 – 12</u>*:** [5×10]

6. a) Draw the logic diagram of a BCD adder showing its truth table. [4]
   b) Implement the following logic function using a 8 : 1 multiplexer $F(A,B,C,D) = \Pi(0,3,4,9,11,14)$. [3]
   c) What is asynchronous input in flip-flop? Why is it used? [2+1]

7. a) Derive the simplified boolean expression for the output F of the multiplexer shown below: [2·5]



b) Determine the next four values of Q_1Q_0 in the following sequential circuit shown below, if initial value of Q_1Q_0 is 00. [2·5]



c) Draw the logic diagram of a 1-bit magnitude comparator and explain its operation. [3]

d) What is the advantage of using synchronous counter? [2]

8. a) Draw logic diagram of a 4-bit PISO register and explain its operation. [4]

b) Explain the workings of Master-Slave R-S Flip-Flop. [3]

c) Let $\oplus$ denote the exclusive OR operation. Let '1' and '0' denote binary constants. Consider the following boolean expression for F over two boolean variables P and Q and find the equivalent expression for F.

$$F(P,Q) = \big((1 \oplus P) \oplus (P \oplus Q)\big) \oplus \big((P \oplus Q) \oplus (Q \oplus O)\big)$$

Do it stepwise. [3]

9. a) Give the difference between Compute Organization and Computer Architecture. [1·5]

b) Differentiate between Dataflow and Control flow architecture. [2·5]

c) Differentiate between temporal locality of reference and spatial locality of reference. [2]

d) A 4-way set associative cache memory unit with a capacity of 16KB is built using a block size of 8 words. The word length is 32 bits. The size of main memory is 4 GB. Find the number of bits required for TAG field. [4]

10. a) Represent $(-17)_{10}$ in 16 bit 2's complement representation. [2·5]

b) Give the difference between SRAM and DRAM. [2·5]

c) Explain the structure of a hard disk and explain the parameters upon which the disk access time depends. [2·5]

d) Give the difference between Indexed Addressing mode and Indirect Addressing mode with Proper example. [2·5]

11. a) Using a suitable diagram explain the match logic of associative memory. [4]

b) What is the advantage of vertical microinstruction over horizontal microinstruction? [2]

c) Convert $(-39 \cdot 52)_{10}$ into 32 bit IEEE floating point format. [2]

d) Write a short note on Micro-programmed controlled Control Unit. [2]

12. a) An 8-bit DAC has a step size of 0·05 V. Find full scale output, percentage resolution and output voltage for an input of 00101010. [3]

b) Differentiate between RISC and CISC. [2]

c) What is the advantage of 2's complement representation over 1's complement representation. [2]

d) Using restoring division perform: $(1100)_{10} / (100)_{10}$. [3]

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