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(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FIRST SEMESTER EXAMINATION, DECEMBER 2017

FIRST YEAR (BATCH 2017-20)

Date : 15/12/2017 **COMPUTER SCIENCE (General)**

Time : 11.00 am – 1.00 pm Paper : I Full Marks : 50

[Use a separate Answer Book for <u>each Group</u>]

Group – A

Answer <u>any one</u> question from <u>Question Nos. 1 & 2</u> : [1×5]

1. a) Convert : $(BCD)_{16} = (?)_2 = (?)_8$. [2]
   b) Subtract $(1101)_2$ from $(1001)_2$ using 2's complement method. [3]

2. a) Find out the (r–1)'s complement of $(-750{\cdot}26)_8$. [3]
   b) Prove that $A + BC = (A + B)(A + C)$. [2]

Answer <u>any two</u> questions from <u>Question Nos. 3 to 6</u> : [2×10]

3. a) Multiply $(101{\cdot}01)_2$ by $(111{\cdot}10)_2$. [2]
   b) Add $(+F129{\cdot}A1)_{16}$ with $(1BCD{\cdot}5A)_{16}$ using $(r-1)$'s complement method. [3]
   c) Convert : $(578{\cdot}23)_{10} = (?)_{BCD}$. [1]
   d) Obtain the 9's complement of $(61)_{10}$ in the four coding schemes of 8421, 2421, $84\bar{2}\bar{1}$ and $XS-3$ binary coded decimal. [4]

4. a) $F(A,B,C) = \sum m(0,2,3,5)$ with (6,7) as don't cares. Realise the simplified function using only NOR gates. [3+3]
   b) Obtain Gray code of $(01101010)_2$. [2]
   c) ASCII codes of 'A' and 'a' are $(41)_{16}$ and $(61)_{16}$. Find out the binary code equivalent of 'Bad'. [2]

5. a) If $A\bar{B} + \bar{A}B = C$, show that $A\bar{C} + \bar{A}C = B$. [3]
   b) Add the following BCD numbers: 0111 and 1001. [2]
   c) Explain how the basic gates can be realised using NAND gates. [2]
   d) Simplify the following expression : $(A+B).(A+\bar{A}.\bar{B}).C + \bar{A}.B + A.B.C + \overline{A.(\bar{B}+\bar{C})}$. [3]

6. a) Write down the canonical POS expression for the function $F(A,B,C,D) = \Pi m(0,5,8,9,11,12,15)$. [2]
   b) If $F(A,B,C) = (A+B+\bar{C}).(\bar{A}+B+\bar{C}).(\bar{A}+B+C).(A+B+C)$, then find out the canonical SOP of F (A,B,C). [3]
   c) Find out the minimal SOP expression of $F(W,X,Y,Z) = \sum m(0,1,5,7,8,10,14,15)$. [3]
   d) "The Gray code is a unit-distance code" — Explain with an example. [2]

Group – B

Answer <u>any one</u> question from <u>Question Nos. 7 & 8</u> : [1×5]

7. Design a 4-bit up synchronous counter using JK flip-flops. [5]

8. a) Compare and contrast SRAM and DRAM. [3]
   b) What are the major difficulties of CISC architecture? [2]

Answer <u>any two</u> questions from <u>Question Nos. 9 to 12</u> : [2×10]

9. a) Briefly explain Von Neuman's architecture for the stored program concept. How does it differ from Harvard architecture? [5+2]
   b) What is the main difference between base and index register addressing mode? [2]
   c) Define interrupt vector table. [1]

10. a) Explain the roles of stack pointer and program counter during process execution. [3]
    b) Explain with examples the one-address, two-address and three address instructions. [3]
    c) Discuss instruction execution cycle with a suitable diagram. [4]

11. a) What are the differences among sequential, direct and random memory access mechanisms? [3]
    b) Design a parallel-in serial-out shift register. [4]
    c) What is the difference between spatial locality and temporal locality? [2]
    d) What is the difference between flip-flop and latch? [1]

12. a) Realise the Full adder circuit using Half adder circuit. [3]
    b) Design a 3×8 decoder circuit using four input NAND gates and NOT gates. [3]
    c) Explain how a 3×8 decoder circuit can be used a s 1×8 demultiplexer. [2]
    d) What are the advantages of JK flip-flop over SR flip-flop? [2]

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