Odd Semester, 2020

(Held in March, 2021)

COMPUTER APPLICATION

(Honours)

(BCA–102)

(Digital Computer Fundamentals)

Marks : 75

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **five** questions, taking **one** from each Unit

UNIT—I

1. *(a)* Convert the following into the specified bases : 2×4=8

(i) $(19{\cdot}75)_{10}$ to Binary

(ii) $(FD42)_{16}$ to Decimal

(iii) $(100100101)_2$ to Octal

(iv) $(1163)_8$ to Binary

UNIT—II

3. *(a)* Simplify the Boolean equations : 2×3=6

(i) $Y(A, B, D) = (A' + B)(A + B + D)D'$

(ii) $Y(A, B, C) = (A + C)(A' + B)$

(iii) $Y(A, B, C) = ABC + A'B + ABC'$

(b) Convert the following Boolean function into standard SOP and express it in *n*-terms of minterms : 3×2=6

(i) $Y(A, B, C) = AB + AC' + BC$

(ii) $Y(A, B, C) = AB + ABC' + B'$

(c) With the help of logic gate diagram, explain 2-input X-NOR gate and give its truth table. 3

4. *(a)* Simplify the following 3-variable expressions using Boolean algebra : 3×2=6

(i) $Y(A, B, C) = \Sigma m(0, 1, 2, 3, 4, 5, 6, 7)$

(ii) $Y(A, B, C) = \prod M(1, 3, 5, 7)$

(b) For the following functions, construct a truth table and draw the logic diagram : 2×3=6

(i) $Y(A, B, C) = (A \oplus B)C'$

(ii) $Y(A, B, C) = ((A \oplus B)'(B + C'))'$

(iii) $Y(A, B) = (AB)' + B'$

(c) Find the complement of
$BD' + A'BC' + XYZ$ 3

UNIT—III

5. (a) Represent the following Boolean function by Karnaugh map : 4

$Y(A, B, C, D) = ABC + B'CD + BD$

(b) Simplify the following Boolean equations using K-map : 3+3=6

(i) $Y(A, B, C, D) = \prod M(1, 2, 5, 6, 8, 9, 15)$

(ii) $Y(A, B, C, D) = \Sigma m(1, 4, 6, 9, 10, 11, 14, 15)$

(c) Discuss 3-to-8-line decoder with proper logic diagram. 5

6. (a) Simplify the following four-variable Boolean function using Quine-McCluskey method : 6

$Y(A, B, C, D) = \Sigma m(2, 4, 5, 9, 12, 13)$

(b) Explain how the operations of a decoder can be inversed to get n-output lines for 2^n input lines. 4

(c) Implement Half Adder for two binary inputs and two binary outputs. 5

UNIT—IV

7. *(a)* What are sequential circuits? How does they differ from combinational circuits? Explain. 3+2=5

(b) What are flip-flops? Discuss basic RS flip-flop using NAND gates. 1+5=6

(c) Explain triggering of flip-flops. How can they be sampled? 2+2=4

8. *(a)* How can you get rid of the indeterminate states in clocked-RS flip-flop? Discuss. 4+4=8

(b) What are the different types of sequential circuits? Discuss how they differ. 4+3=7

UNIT—V

9. *(a)* Design a 3-bit synchronous binary counter using a T-flip-flop. 7

(b) How can you serially transfer information from register *A* to register *B*? Justify your answer with a proper example. 4+4=8

10. *(a)* Compare and contrast between synchronous and asynchronous counters. 4

(b) What is a register? Draw the logic diagram of a 4-bit register using any flip-flop. 2+3=5

(c) Design a 4-bit Binary Ripple Counter using *J-K* flip-flop with proper count sequence table and a logic diagram. 6

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