BCA/1/CC/04 **Student's Copy**

Professional Course Examination, November/December 2019

(1st Semester)

BACHELOR OF COMPUTER APPLICATIONS

(Digital Computer Fundamentals)

(Revised)

Full Marks : 75

Time : 3 hours

(PART : A—OBJECTIVE)

(*Marks* : 25)

The figures in the margin indicate full marks for the questions

SECTION—A

(*Marks* : 15)

Tick (✓) the correct answer in the brackets provided : 1×10=10

1. The 1's complement of the binary number 1010101·010 is

(a) 0101010·110 ( )

(b) 0101010·100 ( )

(c) 0101010·111 ( )

(d) 0101010·101 ( )

2. Binary code for decimal digit requires

(a) 1 bit ( )

(b) 2 bits ( )

(c) 3 bits ( )

(d) 4 bits ( )

3. Which of the following states the associative law?

(a) $x \quad x \quad x$ ( )

(b) $x \quad y \quad y \quad x$ ( )

(c) $x \quad (y \quad z) \quad (x \quad y) \quad z$ ( )

(d) $(xy) \quad x \quad y$ ( )

4. The operator precedence for evaluating Boolean expressions is

(a) OR, AND, parentheses, NOT ( )

(b) AND, NOT, parentheses, OR ( )

(c) NOT, parentheses, AND, OR ( )

(d) parentheses, NOT, AND, OR ( )

5. The algebraic expression for the exclusive-NOR operation is

(a) $F \quad xy \quad x\,y$ ( )

(b) $F \quad xy \quad x\,y$ ( )

(c) $F \quad (x \quad y)$ ( )

(d) $F \quad x \quad y$ ( )

6. The output of OR gate is 1, if

(a) all inputs are 1 ( )

(b) all inputs are 0 ( )

(c) at least one input is 1 ( )

(d) at least one input is 0 ( )

7. A combinational circuit that selects binary information from one of many input lines and directs it to a single output line is

(a) decoder ( )

(b) multiplexer ( )

(c) adder ( )

(d) subtractor ( )

8. A combinational circuit that converts binary information from *n* input lines to a maximum of 2^n unique output lines is

(a) decoder ( )

(b) multiplexer ( )

(c) adder ( )

(d) subtractor ( )

9. A sequential circuit that goes through a prescribed sequence of states upon the application of input pulses is called

(a) register ( )

(b) counter ( )

(c) flip-flop ( )

(d) multiplexer ( )

10. The counters in which the clock pulses are applied to the CP inputs of all flip-flops are called

(a) synchronous counters ( )

(b) all counters ( )

(c) asynchronous counters ( )

(d) syndicate counters ( )

Indicate whether the following statements are *True (T)* or *False (F)* by putting a Tick (✓) mark in the brackets provided : 1×5=5

11. The BCD equivalent for 14 is 0001 0100.

(T / F)

12. A product of sums is a Boolean expression containing OR terms, called sum terms.

(T / F)

13. A buffer inverts the input.

(T / F)

14. A half-adder can add two bits.

(T / F)

15. In a synchronous binary counter, the flip-flop in the lowest-order position is complemented with every pulse.

(T / F)

SECTION—B

(*Marks* : 10)

Answer the following questions : 2×5=10

16. What are alphanumeric codes?

17. Write the truth table of the function :

$F \quad xy \quad xy \quad y\,z$

18. Evaluate $(753)_{10} \quad (864)_{10}$ using 10's and 9's complement subtraction.

19. Distinguish between sequential and combinational circuits.

20. What is a register?

(PART : B—DESCRIPTIVE)

(*Marks* : 50)

The figures in the margin indicate full marks for the questions

1. *(a)* Draw the block diagram of a digital computer and explain its units. 6

(b) Obtain the *r*'s and (*r* 1)'s complement of the following numbers : 4

(i) $(0000001)_2$

(ii) $(90090)_{10}$

OR

(c) Convert the following numbers from the given base to the bases indicated : 5+5=10

(i) Decimal 225·225 to binary, octal and hexadecimal

(ii) Binary 11010111·110 to decimal, octal and hexadecimal

2. *(a)* Define Boolean algebra by giving the six Huntington postulates. 6

(b) Express the following function in a sum of minterms : 4

$F(w, x, y, z)$ $y\,z$ wxy wxz $w\,x\,z$

OR

(c) Define two-valued Boolean algebra. Show that the Huntington postulates are valid for the two-valued Boolean algebra. 5

(d) Using Karnaugh mapping, obtain the simplified expression in sum of products for the following Boolean function : 5

F $x\,z$ $y\,z$ yz xyz

3. *(a)* Write the steps for subtraction with *r*'s complement method. Give example. 4

(b) Evaluate the following binary numbers : 2×3=6

(i) 1111 0011

(ii) 1011 0101

(iii) 11010 10000

OR

(c) Write the graphic symbol and truth table for the following : 6

(i) OR

(ii) NAND

(iii) XOR

(d) Implement the Boolean function F xy $x\,y$ $y\,z$ using AND, OR and NOT gates. 4

4. *(a)* Write the steps for designing a combinational circuit. 4

(b) What is a full-adder? Write the Boolean expression, truth table and logic diagram implementation for a full-adder. 6

OR

(c) Write and explain the circuit diagram and truth table of a 3-to-8 line decoder. 5

(d) Write and explain the block diagram, logic diagram and function table of a 4-to-1 line multiplexer. 5

5. *(a)* What is *R–S* flip-flop? Write the logic diagram, characteristic table and graphic symbol of a clocked *R–S* flip-flop. 5

(b) What is a shift register? Write and explain the working of a 4-bit ripple counter. 5

OR

(c) What is *D* flip-flop? Write the logic diagram, characteristic table and graphic symbol of a clocked *D* flip-flop. 6

(d) What is a BCD counter? Write and explain the working of a shift register constructed using *D* flip-flop. 4

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