2015

(1st Semester)

BACHELOR OF COMPUTER APPLICATION

Paper No. : BCA–104

(New Course)

(Digital Computer Fundamentals)

Full Marks : 75

Time : 3 hours

(PART : B—DESCRIPTIVE)

(*Marks* : 50)

The figures in the margin indicate full marks for the questions

1. *(a)* Describe the digital computer with a block diagram. 4

(b) Convert the following numbers from the given base to the bases indicated : 6

(i) $(71 \cdot 6875)_{10}$ to binary, octal, and hexadecimal

(ii) $(254 \cdot 87)_8$ to decimal, binary, and hexadecimal

Or

(c) Explain any five digital logic gates with names, graphic symbols and truth tables. 5

(d) Perform the subtraction of the following numbers using r's complement : 5

(i) $(23750 - 768921)_{10}$

(ii) $(10111 - 110001)_2$

2. (a) Simplify the Boolean function $F = xy + x'z + yz$ to a minimum number of literals. 4

(b) Express the Boolean function $F = x + y'z$ in a sum of minterms form. 6

Or

(c) Find the complements of $F = A(B'C' + BC)$. 4

(d) Express the Boolean function $F = AB + A'C$ to a product of maxterms form. 6

3. (a) Simplify the Boolean function $F(w, x, y, z) = \Sigma(0, 1, 2, 5, 8, 9, 10)$ in *(i)* sum of products, and *(ii)* product of sums. Draw the logical diagram for each function. 5

(b) Explain full subtractor by showing its truth table and implementing using logic gates. 5

Or

(c) Explain full adder by showing its truth table and implementing using logic gates. 5

(d) What is a decoder? Design a 3-to-8 line decoder showing its truth table. 5

4. (a) Explain the working of clock RS flip-flop with logical diagram and characteristic table. 6

(b) Explain a shift register with block diagram. 4

Or

(c) Explain the working of clock T flip-flop with logical diagram and characteristic table. 4

(d) Describe a master-slave JK flip-flop with logic diagram. 6

5. (a) Explain briefly the basic symbols for register-transfer logic. 5

(b) Explain macrooperations and micro-operations with an example each. 5

Or

(c) Explain briefly the basic arithmetic microoperations in detail. 5

(d) Explain logic microoperations and shift microoperations with an example each. 5

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BACHELOR OF COMPUTER APPLICATION

Paper No. : BCA-104

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(PART : A—OBJECTIVE)

(*Marks* : 25)

The figures in the margin indicate full marks for the questions

SECTION—I

(*Marks* : 15)

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

1. In information transfer from one register to another, the statement $A \leftarrow B$ denotes

   (a) the transfer of the contents of register B into register A ( )

   (b) a replacement of the contents of register A by the contents of register B ( )

   (c) the contents of the source register B do not change after the transfer ( )

   (d) All of the above ( )

2. To implement arithmetic microoperation of the statement $F \leftarrow A + B$, we require

   (a) one register ( )

   (b) two registers ( )

   (c) three registers ( )

   (d) four registers ( )

3. A group of flip-flops sensitive to pulse duration is usually called

   (a) a clock pulse ( )

   (b) a latch ( )

   (c) programmable logic array ( )

   (d) encoder ( )

4. The T flip-flop is a single version of

   (a) JK flip-flop ( )

   (b) RS flip-flop ( )

   (c) D flip-flop ( )

   (d) None of the above ( )

5. A decoder converts binary information from n input lines to a maximum of

   (a) 2^n output lines ( )

   (b) 2^n unique output lines ( )

   (c) $2^n + 1$ unique output lines ( )

   (d) $2^n - 1$ unique output lines ( )

6. The circuit that checks the parity in the receiver is called

   (a) a parity checker ( )

   (b) a parity generator ( )

   (c) a parity bit ( )

   (d) an error-detection code ( )

7. If the dual of an algebraic expression is desired, we simply

   (a) interchange OR operator and AND operator ( )

   (b) replace 1's by 0's and 0's by 1's ( )

   (c) Both *(a)* and *(b)* ( )

   (d) None of the above ( )

8. Boolean functions expressed as a sum of minterms or product of maxterms are called

   (a) standard products ( )

   (b) standard sums ( )

   (c) Both *(a)* and *(b)* ( )

   (d) canonical form ( )

9. What is the minimum number of two-input NAND gates used to perform the function of two input OR gate?

   (a) One NAND gate ( )

   (b) Two NAND gates ( )

   (c) Three NAND gates ( )

   (d) Four NAND gates ( )

10. The code which changes by only one bit as it proceeds from one number to the next is

    (a) decimal code ( )

    (b) reflected code ( )

    (c) alphanumeric code ( )

    (d) error-detection code ( )

II. Tick (✓) whether the following statements are *True* (*T*) or *False* (*F*) : 1×5=5

1. A buffer circuit is used merely for power amplification.

(*T* / *F*)

2. Each combination of the variables in a truth table is called a maxterm.

(*T* / *F*)

3. The operations performed on the data stored in registers are called macrooperations.

(*T* / *F*)

4. The size of multiplexer is specified by the number of 2^n of its data inputs and the single output.

(*T* / *F*)

5. A binary counter with a reverse count is called a binary-down counter.

(*T* / *F*)

SECTION—II

(*Marks* : 10)

III. Answer the following questions : 2×5=10

1. What is an instruction code? Write the three instruction code formats.

2. What do you mean by overflow?

3. Explain a demultiplexer.

4. What are the universal gates? Why are they called so?

5. Explain a half adder in detail.

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