Professional Course Examination, November 2018

(1st Semester)

BACHELOR OF COMPUTER APPLICATIONS

Course : BCA–104

(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 9's complement of $(636)_{10}$ is

(a) 336 ( )

(b) 363 ( )

(c) 663 ( )

(d) 373 ( )

2. When an input electrical signal $A = 10100$ is applied to a NOT gate, its output signal is

(a) 01011 ( )

(b) 10001 ( )

(c) 10101 ( )

(d) 00101 ( )

3. Conversion of binary number 101101_2 to hexadecimal is

(a) 37_{16} ( )

(b) $2E_{16}$ ( )

(c) 27_{16} ( )

(d) $2D_{16}$ ( )

4. Flip-flop outputs are always

(a) the same ( )

(b) independent of each other ( )

(c) complimentary ( )

(d) same as inputs ( )

5. A half-adder adds _____ bits.

(a) 16 ( )

(b) 8 ( )

(c) 4 ( )

(d) 2 ( )

6. A demultiplexer is also known as

(a) data selector ( )

(b) data distributor ( )

(c) decoder ( )

(d) encoder ( )

7. A shift register can be used for

(a) parallel to serial conversion ( )

(b) serial to parallel conversion ( )

(c) digital delay line ( )

(d) All of the above ( )

8. Binary Coded Decimal (BCD) numbers express each digit as a

(a) byte ( )

(b) bit ( )

(c) nibble ( )

(d) None of the above ( )

9. Multiplication of 111_2 by 101_2 is

(a) 110011_2 ( )

(b) 100011_2 ( )

(c) 111100_2 ( )

(d) 000101_2 ( )

10. A combinational logic circuit that selects one of several digit inputs and forwards the selected input into a single line is

(a) multiplexer ( )

(b) decoder ( )

(c) encoder ( )

(d) demultiplexer ( )

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

1. A decoder is used to change a BCD number into an equivalent decimal number.

(*T* / *F*)

2. The hexadecimal number system is widely used in analyzing and programming microprocessor.

(*T* / *F*)

3. The *D* flip-flop is a modification of *R-S* flip-flop.

(*T* / *F*)

4. A BCD counter is a decade counter.

(*T* / *F*)

5. An OR gate output is low only if all the inputs are high.

(*T* / *F*)

SECTION—B

(*Marks* : 10)

Answer the following questions : 2×5=

1. Differentiate between register and counter.

2. Simplify $(C + D')(C + D)$.

3. Explain overflow.

4. From the given expression, draw the logic symbol and truth table :

$$\text{Exp} = A + B' \cdot C' + D$$

5. What is encoder?

(PART : B—DESCRIPTIVE)

(*Marks* : 50)

The figures in the margin indicate full marks for the questions

1. *(a)* Convert the following : 6

(i) $(17)_{10} = (?)_2$

(ii) $(101011)_2 = (?)_{10}$

(iii) $(7013)_8 = (?)_{10}$

(b) Explain the r's compliment and $(r-1)$'s compliment. What is the 10's compliment of $(0{\cdot}3267)_{10}$? 4

OR

(c) Write the block diagram of a digital computer and explain its unit. 6

(d) Convert $(1001011001011011011)_2$ to octal and hexadecimal numbers. 4

2. *(a)* Explain any five digital logic gates with names, graphic symbols and truth table. 5

(b) Simplify the following expression, using four variable K-map in sum of product form : 5

$$f(A, B, C, D) = \Sigma(0, 2, 3, 5, 6, 7, 8, 10, 11, 14, 15)$$

OR

(c) Draw the logic circuit for $Y = ABC + ABC'$. Simplify the equation with Boolean algebra and draw the simplified logic circuit. 6

(d) Express the Boolean function $F = x + yz$ in a sum of minterm form. 4

3. *(a)* What is multiplexer? Write the logic and draw the block diagram of a 4-to-1 line multiplexer. 6

(b) Explain half-adder by showing its truth table and implementation using logic gates. 4

OR

(c) What is decoder? Design a 3-to-8 line decoder showing its truth table. 6

(d) Explain demultiplexer with suitable diagram. 4

4. *(a)* Explain the working of *J-K* flip-flop giving its logic diagram and its characteristics table. 6

(b) Explain shift register with block diagram. 4

OR

(c) Explain the working of *R-S* flip-flop giving its logic diagram and its characteristics table. 6

(d) Differentiate between asynchronous counter and synchronous counter. 4

5. *(a)* Explain the following : 6

(i) Arithmetic micro operation

(ii) Logic micro operation

(iii) Shift micro operation

(b) Differentiate between bus transfer and memory transfer. 4

OR

(c) Explain macro operation and micro operation with diagram. 6

(d) Differentiate between fixed point binary data and floating point data. 4