

Professional Course Examination, Odd 2021
(First Semester)
BACHELOR OF COMPUTER APPLICATIONS
Digital Computer Fundamentals (Revised)
Full Marks: 75
Time: 3 Hours

The figures in the margin indicate full marks for the questions

(PART : A – OBJECTIVE)
(Marks : 25)

SECTION – I
(Marks : 15)

1. Choose the correct answer:

(1x10=10)

- a) The 1's complement of the binary number 1001010.110
 - i) 1101010.110
 - ii) 1010101.101
 - iii) 0110111.001
 - iv) 0110101.001

- b) The 10's complement for $(547)_{10}$ is
 - i) 453
 - ii) 435
 - iii) 463
 - iv) 456

- c) The operator precedence for evaluating Boolean expression is
 - i) OR, AND, parenthesis, NOT
 - ii) AND, NOT, parenthesis, OR
 - iii) NOT, parentheses, AND, OR
 - iv) Parentheses, NOT, AND, OR

- d) The universal gate is
 - i) NAND gate
 - ii) OR gate
 - iii) EX-OR gate
 - iv) NOT gate

- e) The output of AND gate is 1, if
 - i) All inputs are 0
 - ii) All inputs are 1
 - iii) At least one input is 0
 - iv) At least one input is 1

- f) In Boolean Algebra the bar sign (-) indicates
- AND operation
 - OR operation
 - NOT operation
 - None of the above
- g) A combinational circuit that selects binary information from one of many input lines and directs it to a single output line is
- Decoder
 - Multiplexer
 - Adder
 - Subtractor
- h) A combinational circuit that converts binary information from n input lines to a maximum of 2^n unique output lines is
- Decoder
 - Multiplexer
 - Adder
 - Subtractor
- i) In which counter does the flip-flop output transition serves as a source for triggering other flip-flop?
- Ripple counter
 - Shift counter
 - Binary counter
 - Up-down counter
- j) The counters in which the clock pulses are applied to the CP inputs of all flip-flops are called
- Synchronous counters
 - All counters
 - Asynchronous counters
 - Syndicate counters

2. State whether the flowing statements are True (T) or False (F): (1x5=5)
- Decimal number $(61)_{10}$ to its binary number equivalent is $(111101)_2$
 - The AND gate is an electronic circuit that gives a high output only if all inputs are low.
 - A half adder can add two bits.
 - In a synchronous binary counter, the flip-flop in the lowest order position is complemented with every pulse.
 - The BCD equivalent for 14 is 0001 0100.

SECTION – II
(Marks : 10)

3. Answer the following questions: (2x5=10)
- i) What are alphanumeric codes?
- OR
- ii) What are binary numbers?

- b) i) Write any two properties of Boolean algebra. (6)
 OR
 ii) State Duality Principle (4)
- c) i) Write the truth table of the function: $F = xy + xy' + y'z$ (4)
 OR
 ii) Briefly explain half adder. (5)
- d) i) What is demultiplexer? (4)
 OR
 ii) What is multiplexer? (5)
- e) i) What is a register? (4)
 OR
 ii) What is flip flop? (5)

(PART : B – DESCRIPTIVE)
(Marks : 50)

4. a) Draw the block diagrams of a digital computer and explain its units. (6)
 b) Convert $(32)_{10}$ to binary, octal and hexadecimal. (4)
 OR
 c) Obtain the r's and (r-1)'s complements of the following numbers: (5)
 i) $(0000001)_2$
 ii) $(90090)_{10}$
 d) Convert 11010111.110 to decimal, octal and hexadecimal (5)
5. a) Define Boolean algebra by giving the six Huntington postulates. (6)
 b) Express the following function in a sum of minterms.
 $F(w,x,y,z) = y'z + wxy' + wxz' + w'x'z$ (4)
 OR
 c) Using Karnaugh's three variable mapping, simplify the Boolean function
 $F = x'yz + x'yz' + xy'z' + xy'z$ (5)
 d) Using Karnaugh mapping, obtain the simplified expression in product of sums(POS) for the following Boolean function:
 $F = x'z' + y'z' + yz' + xyz$ (5)
6. a) Write any five digital logic gates with graphic symbols and truth table. (5)
 b) Implement the Boolean function $F = xy + x'y' + y'z$ using AND, OR and NOT gates. (5)
 OR
 c) Write the steps for subtraction with r's complement method. Give examples. (4)
 d) Evaluate the following binary numbers: (6)
 i) $1111 \div 0011$
 ii) 1011×0101
 iii) $11010 + 10000$
7. a) What is a decoder? Design a 3-to-8 line decoder showing its truth tables. (5)

b) What is a multiplexer? Explain the block diagram, logic diagram and function table of a 4-to-1 multiplexer. (5)

OR

c) What are combinational circuits? Write the steps for designing one. (4)

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

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

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

OR

c) Explain the JK flip flop along with the suitable diagram and characteristic table. (5)

d) What is a shift register? Explain 4 bit ripple counter along with diagrams. (5)

*****BCA/1/CC/04*****