(T) Roll No. .....

PAPER ID—14530

B.C.A. EXAMINATION, 2023

(First Semester)

LOGICAL ORGANIZATION OF COMPUTER-I

Code : BCA-104

Time : 3 Hours *Maximum Marks : 80*

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory. All questions carry equal marks.

1. Explain the following briefly : **8×2=16**

(i) EBCDIC codes

(ii) Venn Diagrams

(iii) Combinational circuits

(iv) Self-complementing codes

(v) Half adder

(vi) Encoder circuits

(vii) XOR gate

(viii) Canonical form of Boolean Expressions.

Unit I

2. Solve the following number system conversions (Attempt any *four*) : **4×4=16**

(i) $(B2E)_{16} = (\ ?)_2$

(ii) $(5456)_8 = (\ ?)_{16}$

(iii) $(1110101101101)_2 = (\ ?)_{10}$

(iv) $(1527.362)_8 = (\ ?)_2$

(v) $(1046.25)_{10} = (\ ?)_{16}$

(vi) $(10110011100 11.00110)_8 = (?)_8$

3. Explain the following : 4×4=16

(i) Error detecting codes

(ii) Hamming codes

(iii) Floating point representation

(iv) Binary subtraction using 2's Complement method.

Unit II

4. (a) State and prove the following Boolean Algebra laws using examples : 4×2=8

(i) Distributive Law

(ii) De Morgan's Law

(b) Prove the following Boolean expressions using truth table : 4×2=8

(i) $AB + A'C + BC = AB + A'C$

(ii) $ABC + AB'C + ABC' + AB'C' = A$.

5. (a) Solve the following Boolean Expression using K-map : 6

$F(A, B, C, D) = \Sigma(0, 2, 3, 6, 7, 12, 13, 14) + \Sigma d(1, 4, 11, 15)$

(b) Simplify the following expression using Boolean Algebra laws and also draw a circuit diagram for the minimized expression : 5

$X'Y'Z + XY'Z' + XY'Z + XYZ' + XYZ$

(c) Explain SOP and POS forms of expression using example. 5

Unit III

6. What are logic gates ? Explain the types of Logic Gates with their truth table as well as diagrams. 16

7. (a) Define Universal gates. Prove that NAND and NOR gates are universal gates. 8

(b) Multilevel NAND and NOR Circuits. 4

(c) Explain Combinational circuits and their characteristics. 4

Unit IV

8. Design and implement following digital circuits :

   (a) BCD to 7 Segment Display 8

   (b) 5X32 decoder using 3X8 decoder. 8

9. (a) Design and implement a full adder circuit. 8

   (b) Define multiplexer circuits and its advantages. Also design a 4X1 MUX with block diagram and circuit. 8