

Roll No.

(01/23-II)

14372

B. A./B. Sc. EXAMINATION

(For Batch 2021 & Onwards)

(First Semester)

DIGITAL ELECTRONICS

CS-12

Time : Three Hours *Maximum Marks :* $\left\{ \begin{array}{l} \text{B.Sc. : 40} \\ \text{B. A. : 20} \end{array} \right.$

Note : Q. No. 1 is compulsory. Attempt *Five* questions in all, selecting *one* question from each Unit in addition to compulsory Q. No. 1. All questions carry equal marks. (B.Sc. 08 marks and B.A. : 04 marks)

Compulsory Question

1. (i) What is the difference between positional and non-positional number system ?

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P.T.O.

- (ii) What is Gray Code ?
- (iii) Prove $a + \bar{a}b = a + b$ using Venn diagram.
- (iv) What are Canonical and Standard forms of Boolean functions ?
- (v) What is analysis procedure for combinational circuits ?
- (vi) Explain XNOR gate.
- (vii) Draw the Truth Table for 8421 to cyclic code convertor.
- (viii) What is Comparator ?

Unit I

- 2. (a) Solve the following :
 - (i) $(110101.1101)_2 = (?)_{16} = (?)_8$
 - (ii) $(3FA.8)_{16} = (?)_{10} = (?)_2$
 - (iii) $(623.77)_8 = (?)_{10} = (?)_{16}$
 - (iv) $(952)_{10} = (?)_8 = (?)_2$
- (b) Perform the following using both 1's and 2's complement systems :
 - (i) 99-25
 - (ii) 24-46

- 3. (a) Explain fixed point representation and normalized floating point representation of numbers by using example.
- (b) Encode each of the 10 decimal digits by means of the following weighted binary codes :
 - (i) 8 4 -2 -1
 - (ii) 2 4 2 1
 - (iii) 5 2 1 1
 - (iv) 5 4 -2 -1

Unit II

- 4. Simplify the following Boolean function by K-map :
 - (a) $F(A, B, C, D) = \sum(5, 6, 7, 8, 9)$
 $+ \sum d(10, 11, 12, 13, 14, 15)$
 where d denotes don't care condition.
 - (i) In SOP form
 - (ii) In POS form.

$$(b) F(A, B, C, D) = \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}\bar{C}D + \bar{A}\bar{B}C\bar{D} + \bar{A}\bar{B}CD + \bar{A}B\bar{C}\bar{D} + \bar{A}B\bar{C}D + \bar{A}BC\bar{D} + \bar{A}BCD$$

5. (a) Simplify the following Boolean function by K-map :

$$F(A, B, C, D) = \Pi(4, 5, 6, 14, 15)$$

- (i) In SOP form
(ii) In POS form.
- (b) Prove the following theorems using postulates of Boolean algebra :
- (i) $a + (\bar{a}.b) = a + b$
(ii) $XY + XZ + YZ = XY + XZ$

Unit III

6. (a) Implement the following Boolean function using NAND gates only :

$$F = A(BC + D) + \bar{C}D$$

- (b) Explain NAND and NOR gates as Universal gates.

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7. (a) Implement the Boolean function :

$$F = B(A + CD) + \bar{B}C$$

- (i) Using NAND only
(ii) Using NOR only
- (b) Show that a positive-logic AND gate is a negative-logic OR gate and vice-versa.

Unit IV

What is Full Adder ? Draw the logic diagram of full adder using NAND gates only. Also design Full Adder using Half Adder and Logic Gates.

Explain and draw logic diagram of BCD to 7-segment decoder.

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