2022(New)

Time : 3 hours

Full Marks : 70

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Answer from both the Sections as directed.

Section – A

Answer any **four** questions of the following :

1. What are various logic gates ? Give the representation, algebraic expression along with truth table for all of them.   10

2. State and prove De Morgan's Law.

   Apply De Morgan's law on the expressions :

   (a) ((A' + B + C + D)' + (AB'C'D)')'

   (b) (A + B')(C' + D)   10

EX – 75/2   (Turn over)

3. What are registers ? Explain the function of shift register. 10

4. What are sequential circuits ? Explain the function of T-flip flop. 10

5. Construct a full adder using two half adders. Implement the circuit using NAND gate. 10

6. State the rules of constructing a K-map. Simplify the following Boolean function using K-map $F(A, B, C, D) = 1, 3, 7, 11, 15$ with don't care conditions $d(A, B, C, D) = (0, 2, 5)$. 10

7. What is multiplexer ? Construct an 8-to-1 multiplexer. What is use of a multiplexer ? 10

8. Perform following operations :

 (a) Convert $(444)_{10}$ to its BCD equivalent. 2

 (b) $(1000) - (1010)$ using 2's complement system. 3

 (c) $1101 - 1001$ using 1's complement system. 3

 (d) Convert $(101.01)_2 = ()_{10}$. 2

Section – B

Answer **all** questions of the following :

$10 \times 3 = 30$

9. What are minterm and maxterm ?

10. What are counters ?

11. Using 2's complement method, perform $(52)_{10} - (18)_{10}$.

12. What is a half adder ?

13. What is meant by a decoder ?

14. What is a memory data register ?

15. What are signed binary numbers ?

16. Find the 1's and 2's complement of the following numbers :

   (a) 10100010

   (b) 00000000

17. State and prove Distributive Law.

18. What is a latch ?

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2021

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Full Marks : 70

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Answer from both the Sections as directed.

Section – A

Answer any **four** questions of the following :

10×4 = 40

1. Two numbers A and B in hexadecimal are given :

   A = 1436D

   B = DDAD

   (i) Find the decimal equivalent of A and B.

   (ii) Find the binary of A and B.

   (iii) Subtract B from A in hexadecimal.

OP – 81/2

2. Draw and explain the circuit diagram of decimal adder. Find the sum of numbers 0101 and 1001. Show the steps clearly.

3. Using K-map, simplify the SOP functions and realize it using logic gates.

$F_{(ABCD)} = \Sigma 4, 5, 7, 8, 9, 11, 12, 13, 15$ & $d = (0, 2, 10)$

4. What is the difference between Latch and Flip-Flop ? Explain briefly the working of JK flip-flop.

5. Implement :

(a) AND and OR using NAND

(b) AND, OR and NOT using NOR

6. Define shift registers. What are the types of shift registers ? Explain briefly.

7. Perform the following expressions :

(a) Find the minterm of expression – A'B'C' + A'B'C + A'BC + ABC'

(b) Find the maxterm of the expression –

$(A+B+C')\ (A+B'+C')\ (A'+B'+C)$

(c) Subtract 11001100-1000000 using 2s complement

8. Define full adder. Show how to implement full adder using two half adders. Draw the circuit diagram and explain.

Section – B

Answer all questions of the following : $3 \times 10 = 30$

9. What is a state table ?

10. Draw the digital logic circuit for expression $(AB + CD)\ (AD)$.

11. Define counters.

12. What are basic gates ?

13. What is overflow ?

14. Which combinational circuit is known as data selector and why ?

15. Prove using Boolean Theorem (A+C) (A+D) (B+C) (B+D) = AB + CD.

16. Explain XOR and XNOR gate with truth table and their Boolean expression.

17. What do you mean by don't care condition in K-Map ?

18. Explain briefly signed binary number representatin.

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2019

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The figures in the margin indicate full marks.

Answer from both the Sections as directed.

Section – A

Answer any four questions :   10×4 = 40

1. What are Logic Gates ? Explain clearly why NAND and NOR Gates are termed as Universal gates.

2. What is a Synchronous Counter ? Explain the difference between performance of asynchronous and synchronous counter.

3. What are 1's and 2's complement in binary number system ? Subtract $(1101)_2$ from $(11010)_2$

using 2's complement and 1's complement methods.

4. What are basic laws of Boolean algebra ? Prove $x + xy = x + y$ using Laws of Boolean algebra.

5. What is Flip Flop ? Explain the working of J-K flip flop.

6. What is meant by a Decoder ? Draw the logic diagram and truth table of 3 – to – 8 docoder.

7. The four variable function f is given as $f(A, B, C, D) = \Sigma m(0, 1, 2, 4, 5, 7, 11, 15)$. Using K-Map minimize the function in SOP form.

8. What is a Full Adder ? Describe, in detail, the working of a full adder clearly explaining truth table and simplified logic diagram.

Section – B

All questions are compulsory : 3×10 = 30

9. Simplify using Boolean algebra :
   A'B + ABC' + ABC

10. What is a ripple counter ?

11. Sate Demorgan's Law

12. Find 1's complement 2's complement of $(32)_{10}$

13. What is the use of don't care condition in K-Map ?

14. Convert the given expression in canonical POS from, $Y = (A + B) (B + C) (A + C)$.

15. Explain minterm and maxterm in Boolean algebra.

16. What is the difference between Canonical form and Standard form ?

17. What is a data register ?

18. Convert $(214.32)_{10}$ to binary.

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