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**PRESIDENCY UNIVERSITY  
BENGALURU**

**SCHOOL OF ENGINEERING**

**MID TERM EXAMINATION**

**Winter Semester:** 2021 - 22

**Course Code:** ECE 2006

**Course Name:** DIGITAL ELECTRONICS

**Program & Sem:** BTECH ECE & 2<sup>ND</sup> SEM

**Date:** 14/May/2022

**Time:** 10:00 AM – 11:30 AM

**Max Marks:** 50

**Weightage:** 25%

**Instructions:**

- (i) Read the all questions carefully and answer accordingly.
- (ii) Draw diagrams wherever necessary.
- (iii) Use of non-programmable scientific calculator is permitted.

**Part A [Memory Recall Questions]**

**Answer all the Questions. Each question carries TWO marks.**

**(10Qx 2M= 20M)**

1. A logic gate is a device that acts as a building block for digital circuits. They perform basic logical functions that are fundamental to digital circuits. How many entries will be in the truth table of a 4-input NAND gate?

- a.6                      b. 8                      c. 32                      d.16                      (C.O.No.1) [Knowledge]

2. A binary number is a number expressed in the base-2 numeral system or binary numeral system, a method of mathematical expression which uses only two symbols: typically "0" and "1". What is the addition of the binary number  $101001 + 010011 = ?$

- a. 111100              b.000111              c. 101110              d. 010100              (C.O.No.1) [Knowledge]

3. Boolean Algebra is used to analyze and simplify the digital (logic) circuits. It uses only the binary numbers i.e. 0 and 1. Simplify  $Y = AB' + (A' + B)C$

- a)  $AB' + C$               b)  $AB + AC$               c)  $A'B + AC'$               d)  $AB + A$               (C.O.No.1) [Knowledge]

4. An arithmetic circuit is a set of gates with a separate set of inputs for each number that has to be processed. What are the arithmetic gate?

- a) NAND and NOR              b) AND and NAND              c) X-OR and X-NOR              d) None of the above

(C.O.No.1) [Knowledge]

5. The implementation of Boolean functions by using logic gates involves connecting output of one logic gate to the input of another gate. Logic Gates are the basic building blocks of digital electronic circuits. The number of basic gates required to implement the expression  $F = x'y'z$  is \_\_\_\_\_. Also mention the IC numbers. (C.O.No.1) [Knowledge]

6. There are four main types of number systems - Binary, decimal, hexadecimal and octal. The hexadecimal equivalent of given binary system  $(1010100011)_2$  is \_\_\_\_\_. (C.O.No.1) [Knowledge]

7. NAND and NOR are universal gates, prove that NAND is a universal gate by implementing AND gate. (C.O.No.1) [Knowledge]

8. A truth table represents a table having all combinations of inputs and their corresponding result. In two input NAND gate one of the input goes to low level, then the output is \_\_\_\_\_

- (a) Low                      b) High                      c) Intermediate                      d) None of the above

(C.O.No.1) [Knowledge]

9. Boole's algebra predated the modern developments in abstract algebra and mathematical logic. Choose from the following options. The Boolean algebraic function  $AB+AC=$ \_\_\_\_\_

- a)  $AB+BC+AC$     b)  $AB'C+A'B'C'+A'BC$     c)  $ABC+A'B'C'+B'C$     d)  $ABC+A'B'C'+B'C$

(C.O.No.1) [Knowledge]

10. A minterm is the product of N distinct literals where each literal occurs exactly once. A maxterm is the sum of N distinct literals where each literal occurs exactly once. Min term representation for 111 is \_\_\_\_\_ and Max term representation for 111 is \_\_\_\_\_. (C.O.No.1) [Knowledge]

### Part B [Thought Provoking Questions]

Answer all the Questions. Each question carries 10 marks.

(2Q x 10M= 20M)

11. A digital system is to be designed in which the month of the year is given as input is four bit form. The month January is represented as '0000', February '0001' and so on. The output of the system should be '1' corresponding to the input of the month containing 31 days or otherwise it is '0'. Consider the excess numbers in the input beyond '1011' as don't care conditions for system of four variables (A, B, C, D). Consider Y as the output. Write the truth table and obtain the equation for Y in the standard SOP form. Perform K map. (C.O.No.2) [Application]

12. Mr. Jame wants to perform addition of three one-bit binary numbers and implement it on the trainer kit. To do this implementation Jame needs a truth table with simplified circuits, Guide Jame to construct the circuit with basic gates and also universal gate. (C.O.No.2) [Application]

### Part C [Problem Solving Questions]

Answer the following Question. Each question carries TEN mark.

(1Qx10M=10M)

13. In simplification of the Boolean expression, the laws and rules of the Boolean algebra play an important role.

- (i) Simplify  $Y=ABC+AB'C+ABC'$ . Also draw the logic circuit diagram. (5marks)

(C.O.No.1) [Comprehension]

- (ii) Obtain the canonical form for the following

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

(3marks)

b)  $AB'+AC'$

(2marks)

(C.O.No.1) [Comprehension]



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**Date:** 14/May/2022

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**Max Marks:** 50

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**Instructions:**

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**Part A [Memory Recall Questions]**

**Answer all the Questions. Each question carries TWO marks.**

**(10Qx 2M= 20M)**

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- a)  $AB' + C$               b)  $AB + AC$               c)  $A'B + AC'$               d)  $AB + A$               (C.O.No.1) [Knowledge]

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- b) NAND and NOR              b) AND and NAND              c) X-OR and X-NOR              d) None of the above

(C.O.No.1) [Knowledge]

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- (a) Low                      b) High                      c) Intermediate                      d) None of the above

(C.O.No.1) [Knowledge]

9. Boole's algebra predated the modern developments in abstract algebra and mathematical logic. Choose from the following options. The Boolean algebraic function  $AB+AC=$ \_\_\_\_\_

- b)  $AB+BC+AC$     b)  $AB'C+A'B'C'+A'BC$     c)  $ABC+A'B'C'+B'C$     d)  $ABC+A'B'C'+B'C$

(C.O.No.1) [Knowledge]

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Answer all the Questions. Each question carries 10 marks.

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### Part C [Problem Solving Questions]

Answer the following Question. Each question carries TEN mark.

(1Qx10M=10M)

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- (iii) Simplify  $Y=ABC+AB'C+ABC'$ . Also draw the logic circuit diagram. (5marks)

(C.O.No.1) [Comprehension]

- (iv) Obtain the canonical form for the following

c)  $(A+B'+C)(B'+C+D')(A+B'+C'+D)$

(3marks)

d)  $AB'+AC'$

(2marks)

(C.O.No.1) [Comprehension]



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**SCHOOL OF ENGINEERING**

**END TERM EXAMINATION**

**Winter Semester:** 2021 - 22

**Course Code:** ECE 2006

**Course Name:** Digital Electronics

**Program & Sem:** B.Tech (ECE) & II Semester

**Date:** 7<sup>th</sup> July 2022

**Time:** 01.00 PM to 04.00 PM

**Max Marks:** 100

**Weightage:** 50%

**Instructions:**

(i) Read the all questions carefully and answer accordingly.

(ii) Scientific calculators are allowed. **Programmable calculators are not allowed**

**Part A [Memory Recall Questions]**

**Answer all the Questions. Each question carries TWO marks.**

**(15Qx2M= 30M)**

- Q.NO.1** Boolean function  $AB=BA$ , is also known as (C.O.No.1) [Knowledge]  
 (a) Idempotent law (b) De Morgan's Theorem (c) Identity law (d) Commutative law
- Q.NO.2** The minterm representation for 111 is \_\_\_\_\_ (C.O.No.1) [Knowledge]  
 (a)  $a'+b'+c'$  (b)  $abc$  (c)  $a'b'c'$  (d) none
- Q.NO.3** The Maxterm representation for 101 is (C.O.No.1) [Knowledge]  
 (a)  $a'+b+c'$  (b)  $abc$  (c)  $a'b'c'$  (d) none
- Q.NO.4.** NAND & NOR GATES are called as \_\_\_\_\_ (C.O.No.1) [Knowledge]  
 (a) Basic gates (b) Both A & B (c) Universal gate (d) Special gates
- Q.NO.5** In Boolean algebra,  $A+A'B$  is equal to (C.O.No.1) [Knowledge]  
 (a)  $A+B$  (b)  $A$  (c)  $B$  (d) 0
- Q.NO.6** The equality  $A' + B' + C' = (A \cdot B \cdot C)'$  is known as \_\_\_\_\_ (C.O.No.1) [Knowledge]  
 (a) De Morgan's Theorem (b) Commutative Law (c) Both A & B (d) None of the above
- Q.NO.7** Consider a TWO input logic gate, if both the inputs is zero, then the corresponding output of the gate is zero, and for the rest of the input conditions, the output goes high. Match the logic function with the given logic gate. (C.O.No.1) [Knowledge]  
 (a) AND GATE (b) XOR GATE (c) OR GATE (d) NAND GATE
- Q.NO.8** In a two input NAND gate one of the input is low, then output is (C.O.No.1) [Knowledge]  
 (a) Low (b) High (c) Intermediate (d) None of the above
- Q.NO.9** There are 16 input combinations in a digital system, how many minimum variables are Required to frame a Boolean Function? (C.O.No.2) [Knowledge]  
 (a) 2 (b) 4 (c) 6 (d) 8
- Q.NO.10** How many unique symbols are in Hexadecimal number system (C.O.No.1) [Knowledge]

(a) 6

(b) 14

(c) 16

(d) 8

- Q.NO.11** Which one of the following is not a sequential circuit (C.O.No.1) [Knowledge]  
(a) Flip flop (b) latch (c) register (d) multiplexer
- Q.NO.12** Which input of JK Flip flop will produce Toggle mode (C.O.No.3) [Knowledge]  
(a) J= 1, K= 0 (b) J= 1, K= 1 (c) J= 0, K= 0 (d) J= 0, K= 1
- Q.NO.13** Which one of the following can be used to shift the data bits (C.O.No.3) [Knowledge]  
(a) Flip flop (b) latch (c) register (d) multiplexer
- Q.NO.14** How many flip-flop is required to store 1 bit of information (C.O.No.3) [Knowledge]  
(a) 1 (b) 2 (c) 3 (d) 4
- Q.NO.15** The IC no. of two input Nand Gate and OR gate is (C.O.No.1) [Knowledge]  
(a) 7400 and 7404 (b) 7432 and 7404 (c) 7400 and 7432 (d) 7400 and 7404

### Part B [Thought Provoking Questions]

**Answer all the Questions. Each question carries TEN marks.**

**(4Qx10M=40M)**

- Q.NO.16** In electronics, a multiplexer (or mux; spelled sometimes) also known as a data selector, is a device that selects between several analog or digital input signals and forwards the selected input to a single output line. (C.O.No.2) [Comprehension]  
(a) Implement a Multiplexer which has two select lines and write down its truth table.  
(b) If the input given to the above MUX is  $I_3 I_2 I_1 I_0 = 1010$ , what will be the output if  $S_1 S_0 = 01$ ?
- Q.NO.17** To obtain minimized Boolean expression from Boolean function, K-Map is one of the methods. In the given condition, obtain min-terms in the Sum-of-Products form for  $F_1(x, y, z) = xy + yz + xyz$  and Product of sum form for  $F_2(a, b, c) = (a+b). (b+c)$  (C.O.No.1) [Comprehension]
- Q.NO.18** Suppose you want to design a combinational circuit named as "A" but what you have is another combinational circuit named as "B". The operation of "A" is to accept 3 inputs and produce 2 outputs and perform the addition operation. Combinational circuit "B" performs the reverse operation of encoder and it has 2 inputs and 4 outputs. (C.O.No.2) [Comprehension]  
(a) Identify A and B and write down the truth table of "B"  
(c) Implement  $f(x, y) = \sum m(1, 3)$  using "B".
- Q.NO 19.** Suppose you have designed one JK flip flop which is a 1-bit memory bi-stable device having two inputs and two outputs. Now, which input combination you will apply when you want the output to toggle with each clock. Support your answer using suitable truth table and circuit diagram. Also write down the excitation table for JK flip flop (C.O.No.3) [Comprehension]

### Part C [Problem Solving Questions]

**Answer both the questions. Each question carries FIFTEEN marks.**

**(2Qx15M=30M)**

- Q.NO.20** Mr. Santosh wants to develop a circuit to count the no. of clocks. Suppose he wants to do 2 bit up counting which requires flip-flop based circuit. How will you help Mr. Santosh to design a 2 bit synchronous up counter? Draw the truth table and excitation table. (C.O.No.3) [Application]
- Q.NO.21.** Implement the Boolean function using  $8 \times 1$  MUX which is having 3 select lines  
 $f(x, y) = \sum m(0, 1, 2, 3, 4, 10, 11, 14, 15)$  (C.O.No.2) [Application]