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Narula Institute of Technology
An Autonomous Institute under MAKAUT
2023
END SEMESTER EXAMINATION - ODD 2023
IT303 - ANALOG AND DIGITAL ELECTRONICS

TIME ALLOTTED: 3Hours

FULL MARKS: 70

Instructions to the candidate:

Figures to the right indicate full marks.

Draw neat sketches and diagram wherever is necessary.

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

Group A

(Multiple Choice Type Questions)

Answer any ten from the following, choosing the correct alternative of each question: 10×1=10

1. Which of the following flip-flops is free from race around problem? (1) CO1 BL2
 - a) T flip-flop
 - b) SR flip-flop
 - c) Master-Slave Flip-flop
 - d) None of the Mentioned

2. Which of the following expressions is in the sum-of-products form? (1) CO2 BL1
 - a) $(A + B)(C + D)$
 - b) $(AB)(CD)$
 - c) $AB(CD)$
 - d) $AB + CD$

3. If both inputs of an S-R flip-flop are low, what will happen when the clock goes HIGH? (1) CO3 BL2
 - a) An invalid state will exist
 - b) No change will occur in the output
 - c) The output will toggle.
 - d) The output will reset.

4. The maximum efficiency of a Class A amplifier is around (1) CO4 BL3
 - a) 75%
 - b) 50%
 - c) 25 %
 - d) 90%

5. 12. In an 8 -bit Johnson counter sequence, how many states orbit patterns are possible? (1) CO1 BL5
 - a) 240
 - b) 228

- c) 232
- d) 220

6. 5. Which of these sets of logic gates are known as universal gates? (1) CO4 BL3

- a) XOR, NAND, OR
- b) OR, NOT, XOR
- c) NOR, NAND, XNOR
- d) NOR, NAND

7. 3. Which of the following statement about a common base transistor is true? (1) CO3 BL2

- a) Very low input impedance
- b) Very low output Impedance
- c) Current gain is greater than unity
- d) Voltage gain is very low

8. 4. The following hexadecimal number (1E.43)₁₆ is equivalent to (1) CO3 BL3

- a) (36.506)₈
- b) (36.206)₈
- c) (35.506)₈
- d) (35.206)₈

9. 8. Which logic unit is the fastest of all the logic families? (1) CO3 BL3

- a) DTL
- b) TTL
- c) ECL
- d) CMOS

10. The race around condition does not occur in flip- flop (1) CO2 BL2

- a) Master Slave J-K
- b) T
- c) D
- d) S-R

11. In a binary ladder (R-2R), D/A converter, the input resistance for each input is (1) CO2 BL2

- a) R
- b) 2R
- c) 3R
- d) 0

12. Determine the values of A, B, C, and D that make the sum term $A'+B+C'+D$ equal to zero. (1) CO2 BL2

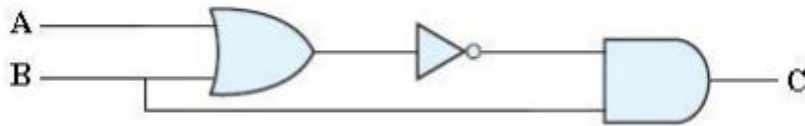
- a) A = 1, B = 0, C = 0, D = 0
- b) A = 1, B = 0, C = 1, D = 0
- c) A = 0, B = 1, C = 0, D = 0
- d) A = 1, B = 0, C = 1, D = 1

Group B
(Short Answer Type Questions)
(Answer any three of the following) 3x5=15

13. Explain Universal Gate with example? Implement a XOR gate using any Universal Gate. Write down the difference between Combinational Circuit and Sequential Circuit. (5) CO2 BL3

14. Answer the following (5)

a) Write the Boolean expression for the output of the system shown in figure. (2) CO3 BL4



b) Implement the following Boolean function with NAND – NAND logic $F = \sum(0, 1, 3, 5)$ (3) CO3 BL5

15. Answer the following (5)

a) Discuss the behavior of a diode when it is in reverse bias. explain breakdown. (2) CO3 BL3

b) Explain the role of the depletion region, the flow of minority carriers, and the resulting current-voltage characteristics. (3) CO2 BL3

16. Answer the following (5)

a) What is the difference between latch and flip flop? (2) CO2 BL4

b) Differentiate Synchronous and Asynchronous counters. draw 3-bit ripple counter. (3) CO3 BL3

17. What is the difference between Half Subtractor and Full subtractor? (5) CO2 BL3

Design a Full subtractor circuit using 2 half-subtractor circuit.

Group C
(Long Answer Type Questions)
(Answer any three of the following) 3x15=45

18. Answer all the Questions (15)

a) Convert decimal to octal- $(18.01)_{10} = (?)_8$ (5) CO2 BL2
 Convert binary to decimal – $(1001.001)_2 = (?)_{10}$

b) Explain De-Morgan's laws for simplification of Boolean expression. (5) CO2 BL2

If $A\bar{B} + \bar{A}B = C$, show that $A\bar{C} + \bar{A}C = B$

c) Simplify the following expression using K Map for the 4 variables A, B, C, and D. (5) CO2 BL3

$Y = m_1 + m_3 + m_5 + m_7 + m_8 + m_9 + m_{12} + m_{13}$

19. Answer all the Questions (15)
- a) Design a Full Adder circuit using a 3 to 8 Decoder (5) CO2 BL4
 - b) Why Multiplexer is also known as Data Selector? (5) CO2 BL4
Design a 16 X 1 Multiplexer using five 4 X 1 Multiplexer.
 - c) Implement the following Boolean function (5) CO2 BL4
 $F(A,B,C,D) = m(0,1,3,4,8,9,15)$ using a 8 : 1 Multiplexer
20. Answer all the Questions (15)
- a) Draw the internal diagram of a 555-timer circuit. (5) CO4 BL4
 - b) Design an monostable multivibrator using the 555 timer circuit (5) CO4 BL4
 - c) What do mean by amplifier. Explain the operation of class A amplifier with proper diagram. (5) CO3 BL4
21. Answer all the Questions (15)
- a) Briefly explain the fundamental purpose of a Digital-to-Analog Converter (DAC) in electronic systems. Compare and contrast the working principles of weighted resistor DAC and R-2R ladder DAC architectures. (7) CO4 BL6
 - b) Discuss the key advantages of CMOS logic, including low power consumption and high noise immunity. Provide examples of real-world applications where CMOS technology is commonly used. compared with respect to ECL family. (8) CO3 BL5
22. Write short notes on any three of the following (15)
- a) Successive approximation ADC (5) CO4 BL4
 - b) Comparator circuit (5) CO3 BL4
 - c) Excitation table for S-R flip flop (5) CO3 BL4
 - d) Operation Master Slave flip flop (5) CO4 BL4
 - e) Barkhausen criterion for oscillation (5) CO2 BL2