Chapter 8

Digital Electronics

One mark questions (Knowledge):

1. What is a digital signal?
2. Define the radix or base of a number system.
3. What is the base of binary number system?
4. What is a bit?
5. What is a nibble?
6. What is a byte?
7. What is a word?
8. Expand MSB?
9. Expand LSB?
10. What is a positive logic?
11. What is a negative logic?
12. What is the purpose of 1's and 2's complement of a binary number system?
13. What is a logic gate?
14. What is a basic gate?
15. Name any one basic gate?
16. What is an OR gate?
17. What is an AND gate?
18. Write the truth table of an OR gate.
19. Write the truth table of an AND gate.
20. Write the circuit symbol of NOT gate.
21. Write the truth table of NOT gate.
22. Write the Boolean expression of NAND gate.
23. Write the Boolean expression of two inputs NAND gate.
24. Write the Boolean expression of two inputs NOR gate.
25. Write the circuit symbol of NAND gate.
26. Write the truth table of a NAND gate.
27. Write the truth table of a NOR gate.
28. Write the logic symbol of NOR gate.
29. Mention any one type of pulse generator.
30. Write the expression for frequency of astable multivibrator.

One mark questions (Understanding):

1. Give the size of 1k Byte memory.
2. How many distinct symbols are there in base 2number system?
3. How many distinct symbols are there in base 16 number system?
4. How is 2's complement of a binary number obtained?
5. How do you represent a logic diagram using basic gates for the Boolean expression,

$$Y = \overline{A} + \overline{B}?$$

One mark questions (Application):

1. Convert 85_{10} to binary number. Ans: 1010101_2
2. Convert 1001_2 into decimal number. Ans: 9_{10}
3. Convert $5DC_{16}$ into binary number. Ans: $0101\ 1101\ 1100_2$
4. Obtain the decimal equivalent of the binary number101_2. Ans: 5_{10}
5. Convert the given hexadecimal number $AD2_{16}$ to binary number.
   Ans.: $1010\ 1101\ 0010_2$
6. Convert the number 11111000_2 to hexadecimal number. Ans: $F8_{16}$
7. Convert the given number $(238)_{10}$ to hexadecimal number. Ans: EE_{16}
8. Obtain the 1's complement of the binary number 110011. Ans: 001100_2
9. Find the 2's complement of the binary number 10101011. Ans: 01010101_2
10. Add 110111_2 and 1101_2. Ans: 1000100_2
11. Perform binary division 10010_2 by 11_2. Ans: 110_2
12. Perform the binary addition for the numbers 110001 and 100001. Ans: 1010010_2
13. Subtract $111100_2 - 11100_2$. Ans: 100000_2
14. Perform binary multiplication 1011_2 and 110_2. Ans: 1000010_2
15. Prove that AB+A = A.
16. Prove that AB+A$\overline{B}$ = A.
17. Simplify the expression Y = ($\overline{A}$+B) (A+B) (A+1) using Boolean laws. Ans: Y = B

Two marks questions (Knowledge):

1. Distinguish between the digital and analog signals.
2. Write the circuit diagram of a transistor NOT gate.
3. Represent the truth table of NAND gate.
4. Write circuit diagram of DTL NAND gate.

Two marks questions (Understanding):

1. How is a bit represented? Give an example.
2. How is a nibble represented? Give an example.
3. How is a byte represented? Give an example.
4. How do you represent the Boolean expression and truth table of NOR-gate?
5. Why is NAND gates called as DTL circuit? Write its logic circuit.
6. Which gates are called Universal gates? Why they are called so?

Two marks questions (Application):

1. Draw the timing diagram of OR gate.
2. Draw the timing diagram of AND gate.
3. Draw the timing diagram of NOT gate.
4. Draw the timing diagram of NAND gate.
5. Draw the timing diagram of NOR gate.
6. Find the Binary equivalent of $(DADA)_{16}$? Ans: $1101\ 1010\ 1101\ 1010_2$
7. Obtain the decimal equivalent and hexadecimal equivalent of the binary number $(111101)_2$.
   Ans: Decimal Number=61_{10} Hexadecimal Number = $3D_{16}$
8. Convert $(AD)_{16}$ into binary and then to decimal system.
   Ans: Binary Number = $1010\ 1101_2$ Decimal Number = 173_{10}
9. Convert the given hexadecimal number $(DAC)_{16}$ to binary number and then to decimal number.

Ans: Binary = 1101 1010 1100_2 Decimal = 3500_{10}

10. Convert the given number $(87)_{10}$ to hexadecimal number and then to binary number.
    Ans: Hexadecimal Number = 57_{16} Binary Number = 0101 0111_2
11. Obtain the 1's and 2's complement of the binary number 101010101_2.
    Ans: 1's complement = 010101010_2 2's complement = 010101011_2
12. Prove that $\bar{A}B+A = A+B$.
13. Prove that $A+ BC = (A+B)(A+C)$.
14. Prove that $A(A+B) = A$.
15. Prove that $AB + BC + \bar{B}C = AB + C$
16. Simplify the Boolean expression $Y = A + \bar{A}B + AB$. Ans: $Y = \bar{A} + B$

Three marks questions (Knowledge):

1. State and prove De-Morgan's Theorems.
2. State and prove De-Morgan's Theorem with the truth table and logic circuit.
3. Draw the circuit and truth table of two input diode OR gate.
4. Draw the circuit and truth table of two input diode AND gate.
5. Draw the circuit and the truth table of transistor NOT gate.

Three marks questions (Understanding):

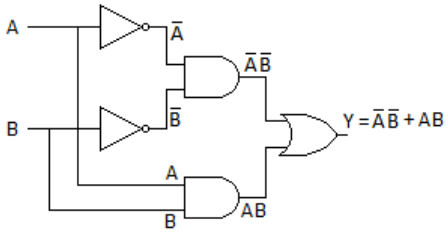
1. Prove that $A+BC = (A+B)(A+C)$.
2. Prove that $A + \bar{A}B = A + B$.
3. With the circuit diagram write the truth table of DTL NAND gate.
4. With the circuit diagram write the truth table of DTL NOR gate.
5. Briefly explain the circuit diagram of Monostable Pulse Generator.
6. Briefly explain the circuit diagram of Astable Multivibrator.

Five marks questions (Application):

1. Subtract 27_{10} from 56_{10} using 1's complement. Ans: 11101_2
2. Subtract 28_{10} from 78_{10} using 1's complement. Ans: 0110010_2
3. Subtract 34_{10} from 65_{10} using 2's complement. Ans: 0011111_2
4. Subtract 10000_2 from 111110_2using 2's complement. Ans: 101110_2
5. Simplify the following expression, a) $Y = (\overline{A + B})(\bar{A}+\bar{C})(\bar{B}+C)$ b) $Y = (A+\bar{B}C)(A\bar{B}+C)$
   Ans: a) $Y = \bar{A}\bar{B}$ b) $Y = A\bar{B} + AC + \bar{B}C$
6. Simplify the following Boolean expression and draw the logic diagram for the simplified expression,

$$Y = \overline{\bar{A}B + A\bar{B}}$$

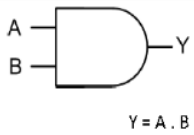
Ans: a) $Y = \bar{A}\bar{B} + AB$



7. Simplify the given Boolean expression and draw the logic circuit for the simplified answer.

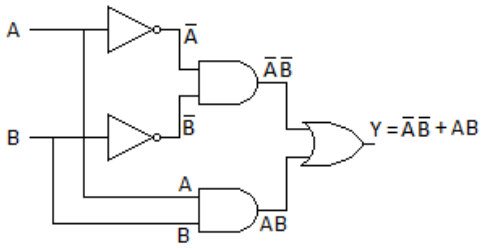
$Y = AB + ABC + AB\bar{C}$.

Ans: $Y = A.B$



8. Simplify the given Boolean expression and draw the logic circuit for the simplified answer Y = $\overline{A\bar{B} + \bar{A}B}$.

Ans: Y = $\bar{A}\bar{B} + AB$



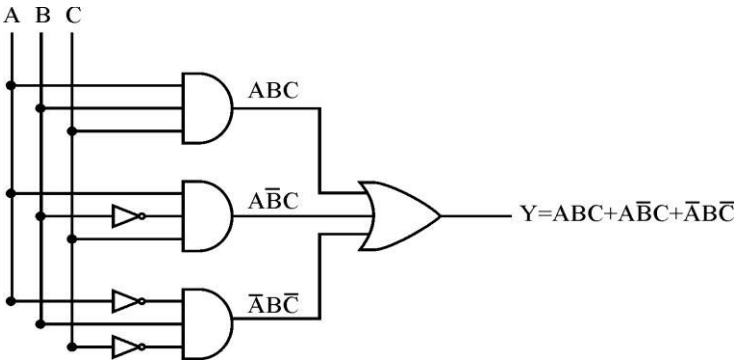
9. Simplify the Boolean expression Y =$AB + A(\overline{B + C})$. Ans: Y = AB + $A\bar{C}$

10. Simplify the given Boolean expression using De-Morgans' theorem, $Y = \overline{(\overline{A\bar{B}}.A)}.\overline{(\overline{A\bar{B}}.B)}$.

Ans: Y = $A\bar{B}$+$\bar{A}B$

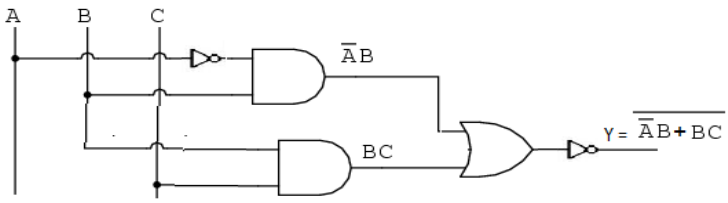
11. Draw the logic circuit for the given Boolean expression, $Y = A\bar{B}C + ABC + \bar{A}B\bar{C}$

Ans:



12. Draw the logic circuit for the given Boolean expression, $Y = \overline{\bar{A}B + BC}$.

Ans:



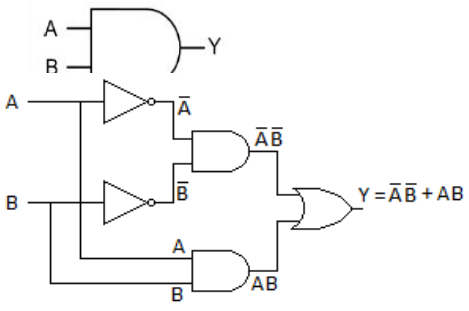
13. Simplify the Boolean expression and draw the logic circuit for the simplified answer.

a) $Y = AB + ABC + AB\bar{C}$

b) Y = $\overline{A\bar{B} + \bar{A}B}$

Ans: a) Y = A.B

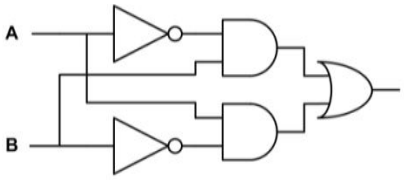
b) Y =$\bar{A}\bar{B} + AB$



14. Simplify the Boolean expression Y=$\overline{\overline{A\overline{B}} + \overline{ABC} + A\,(B + A\overline{B})}$.

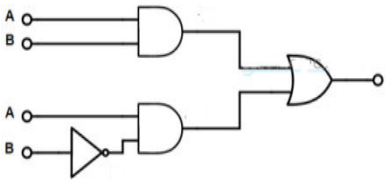
Ans: Y = 0

15. a) Find the Boolean expression for the following logic circuit,



Ans: Y = $A\overline{B}+\overline{A}B$

b) Find the Boolean expression for the given logic circuit.



Ans: Y = AB + $A\overline{B}$

Five marks questions (Understanding):

1. State and prove De-Morgans' theorems.
2. Explain transistor NOT gate.
3. Explain two input diode OR gate.
4. Explain two inputs AND gate.
5. Explain two inputs NOR gate.
6. Explain two input NAND gate.
7. Explain the Astable multivibrator using IC 555.
8. Explain the monostable multivibrator using IC-555.

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