1.What is the decimal equivalent of the binary number 1011?

A) 8

B) 11

C) 13

D) 15

Answer: C) 13

Explanation: The binary number 1011 can be converted to decimal by multiplying each digit by its corresponding power of 2 and summing the results: (1 * 2^3) + (0 * 2^2) + (1 * 2^1) + (1 * 2^0) = 8 + 0 + 2 + 1 = 13.

2.Which of the following is not a valid base for number representation?

A) Binary

B) Decimal

C) Octal

D) Hexadecimal

Answer: B) Decimal

Explanation: Decimal is the most common base for human use, representing numbers using digits 0 through 9. Binary, octal, and hexadecimal are also valid bases commonly used in computer science.

3.What is the binary representation of the decimal number 25?

A) 11001

B) 11010

C) 11100

D) 11101

Answer: D) 11101

Explanation: To convert 25 to binary, repeatedly divide the number by 2 and record the

remainders from right to left: 25 ÷ 2 = 12 remainder 1, 12 ÷ 2 = 6 remainder 0, 6 ÷ 2 = 3 remainder 0, 3 ÷ 2 = 1 remainder 1, 1 ÷ 2 = 0 remainder 1. Reading the remainders from bottom to top gives 11001.

4.Which logic gate produces a true output only when all inputs are true?
A) OR gate
B) XOR gate
C) AND gate
D) NOT gate
Answer: C) AND gate
Explanation: An AND gate produces a true output only when all of its inputs are true.

5.What is the Boolean expression for the OR gate?
A) A + B
B) A * B
C) A’ + B’
D) A’ * B’
Answer: A) A + B
Explanation: The Boolean expression for an OR gate is A + B, where ‘+’ represents logical OR.

6.In Boolean algebra, what is the identity element for the AND operation?
A) 0
B) 1
C) True
D) False
Answer: B) 1

Explanation: In Boolean algebra, the identity element for the AND operation is 1, because any input ANDed with 1 results in the original input.

7.Which Boolean function represents the logical operation NOT A?
A) A’
B) A + B
C) A * B
D) A’ + B’
Answer: A) A’
Explanation: A’ represents the logical negation (NOT) of A.

8.What is the simplified expression for the Boolean function F(A, B, C) = A’BC + AB’C + ABC’?
A) AB + AC + BC
B) A + B + C
C) A’B’C’ + ABC
D) A’B’C + AB’C + ABC
Answer: A) AB + AC + BC
Explanation: Applying Boolean algebra rules and simplification techniques, the expression simplifies to AB + AC + BC.

9.Which of the following is a valid Boolean expression for the XOR gate?
A) A + B
B) A * B
C) A’ + B’
D) A’ * B’ + AB
Answer: D) A’ * B’ + AB
Explanation: The XOR gate’s Boolean expression is A’ * B’ + AB, representing the output as

true when exactly one of the inputs is true.

10.How many inputs and outputs does a NAND gate have?
A) 1 input, 1 output
B) 2 inputs, 1 output
C) 1 input, 2 outputs
D) 2 inputs, 2 outputs
Answer: B) 2 inputs, 1 output
Explanation: A NAND gate has two inputs and one output. It produces the negation of the AND operation.

11.What is the output of an AND gate if both inputs are 0?
A) 0
B) 1
C) Undefined
D) 2
Answer: A) 0
Explanation: An AND gate outputs 0 when any input is 0.

12.Which of the following represents the complement of the number 110011 in binary?
A) 110011
B) 001100
C) 110100
D) 001101
Answer: B) 001100
Explanation: The complement of a binary number is obtained by flipping each bit.

13.How many bits are required to represent 16 unique values in binary?

A) 2

B) 3

C) 4

D) 5

Answer: C) 4

Explanation: To represent 16 unique values, we need 4 bits because 2^4 = 16.

14.Which of the following is the correct full form of SOP in Boolean algebra?

A) Sum of Products

B) Sum of Parts

C) Sum of Positives

D) Sum of Points

Answer: A) Sum of Products

Explanation: SOP stands for Sum of Products, a standard form used in Boolean algebra.

15.What method is used to simplify Boolean expressions using a graphical representation?

A) Truth tables

B) Karnaugh maps

C) De Morgan’s theorem

D) Quine-McCluskey algorithm

Answer: B) Karnaugh maps

Explanation: Karnaugh maps are graphical tools used to simplify Boolean expressions.

16.Which logic gate’s output is the complement of the AND operation?

A) OR gate

B) XOR gate

C) NAND gate
D) NOR gate
Answer: C) NAND gate
Explanation: The output of a NAND gate is the complement of the AND operation.

17.What is the simplified form of the Boolean expression F(A, B, C) = (A + B)(A’ + C)?
A) AB’ + AC
B) AB + BC
C) A’ + C
D) AB’ + BC
Answer: A) AB’ + AC
Explanation: Apply Boolean algebra rules and simplification techniques to obtain the simplified form.

18.How many possible combinations of inputs are there for a circuit with 3 inputs?
A) 2
B) 4
C) 6
D) 8
Answer: D) 8
Explanation: For each input, there are 2 possibilities (0 or 1), so the total combinations are 2^3 = 8.

19.Which logic gate produces a true output if and only if exactly one input is true?
A) OR gate
B) XOR gate
C) NAND gate

D) NOR gate

Answer: B) XOR gate

Explanation: The XOR gate produces a true output if and only if exactly one input is true.

20.Which of the following represents the full form of the acronym POS in Boolean algebra?

A) Product of Sums

B) Positive Operand Set

C) Principal Operand Simplification

D) Product of Segments

Answer: A) Product of Sums

Explanation: POS stands for Product of Sums, another standard form used in Boolean algebra.

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