Short Questions

Q 1: What is Boolean Algebra?

Ans: **Boolean Algebra:**

In 1847, a British Mathematician, George Boole, introduced the algebra of binary numbers. This is known as Boolean algebra.

Q 2: What is Proposition?

Ans: **Proposition:**

The statements that return result true or false are called propositions. Sentence "What is your name"? is not a proposition because its answer is n in the form of yes (true) or no (false) form. On the other hand the sentence "Are you Male?" is a proposition because its answer is in the form of Yes No.

Q 3: What are Boolean Constants?

Ans: **Boolean Constants:**

The quantities that may not change their values are called constants. The two binary values 0 and 1 are called Boolean constants. These values may be used in Boolean expressions. If B = {0, 1} then 0 and 1 are the Boolean constants.

Q 4: What are Boolean Variables?

Ans: **Boolean Variables:**

The variables used in Boolean algebra are called Boolean variables, Boolean variable may have value 0 or 1 and it is denoted by single letter silt as V, 'y', 'a', 'b' etc.

Q 5: What is AND Operation?

Ans: **AND Operation:**

The process to perform logical multiplication of two binary variables o numbers in Boolean algebra is called AND Operation. The AND operator is used for AND Operation. This operator is represented by a symbol • (Dot)u by absence of any symbol.

Q 6: What is OR Operation?

Ans: **OR Operation:**

The process to perform logical addition of two binary variables or numbers in Boolean algebra is called OR operation. The OR operator is used for 01 operation. This operator is represented by a symbol + sign.

Q 7: What is NOT Operation?

Ans: **NOT Operation:**

The process to take the complement of a binary variable or number is called logical NOT operation. In this operation, the prime or bar sign is placed over the variables such as:

X or X

Q 8: What is Truth Table?

Ans: **Truth Table:**

A table that represents the output from different combinations of input variables is called truth table.

Q 9: What is Boolean Expression?

Ans: **Boolean Expression:**

An expression formed with binary variables, constants, Boolean operators as well as parentheses is known as Boolean Expression. It is a logical statement, which gives result either true or false.

Q 10: What is Identity Element?

Ans: **Identity Element:**

There is an identity element T with respect to AND (.) and an identity element '0' with respect to OR such that for 'x':

a) $x + 0 = x$

b) $x \cdot 1 = x$

Q 11: What is Distributive law?

Ans: **Distributive Law:**

The OR (+) operation is distributive over AND (.) and AND (.) operation is distributive over OR (+) operation. Suppose x, y and z are members of set B then according to distributive laws.

(a) $x \cdot (y + z) = x \cdot y + x \cdot z$

(b) $x + (y \cdot z) = (x + y) \cdot (x + z)$

Q 12: What is Duality Principle?

Ans: **Duality Principle:**

If the binary operators (such as '+' and '.') and identity elements (such as 1 and 0) of one part of axiom is interchanged then other part of axiom is automatically obtained. This is an important property of Boolean algebra. This property is called the duality principle.

Q 13: What is De-Morgan's Law?

Ans: **DE-MORGAN'S LAW:**

The complement of addition of two numbers is equal to the product of their complements. Similarly the complement of product of two numbers is equal to the sum of their complements.

If 'x' and 'y' are two Boolean variables then according to De Morgan's law.

(a) $x + y = x \cdot y$

(b) $x \cdot y = x + y$

Q 14: What is Boolean function?

Ans: **Boolean Function:**

A Boolean function is an expression formed with binary variables, Boolean operators, parenthesis and an equal sign. The Boolean variables may be equal to either 0 or 1. The value returned by Boolean function is also equal to either 0 or l.

Q 15: What is Literal?

Ans: **Literal:**

Suppose two variables 'x' and 'y' are used in a Boolean function. Each variable may appear in the function in two forms, i.e. it may appear in the complement form or without complement form. Each of these forms is called a literal. Each literal represents one input to the Boolean function.

Q 16: What is Minterm?

Ans: **Minterm:**

If a product of Boolean variables is 1, it is known as Minterm. It is also known as standard product.

Q 17: What is Maxterm?

Ans: **Maxterm:**

If the sum of Boolean variables is 0, it is known as Maxterm. It is also known as standard sum.

Q 18: What is Karnaugh Map?

Ans: **Karnaugh Map:**

Karnaugh Map is also referred to as K-map. It provides an efficient way to solve/simplify Boolean functions. It is a tool used to transform a truth table of expression into a simplified logic circuit.

Q 19: What is Axiom?

Ans: **Axiom:**

Boolean algebra consists of certain basic postulates and theorems that are used in the simplification of Boolean expressions for designing electronic circuits. These basic postulates are called axioms.

Q 20: What are the advantages of Karnaugh Map?

Ans: **Advantages:**

Some advantages of this method of simplification are given below

(i) This method is very easy to follow

(ii) This is a systematic process. It always leads to a single minimal solution

Disadvantages:

A disadvantage of this system is that it is not scalable. This means that this system works very well for less variables but becomes complex for higher number of variables.

Q 21: What are the disadvantages of using Boolean Algebraic laws?

Ans: **Disadvantages of using Boolean Algebraic Laws:**

Following are some disadvantages of using Boolean algebraic laws for simplification of Boolean expressions.

(i) It is difficult to write a computer program that can use these laws to simplify a given Boolean function.

(ii) This process may not give the best-simplified function.

(iii) A Boolean function is needed for this process to work. But in most engineering applications we do not have the actual Boolean function and only have the truth table of the required function.