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DIGITAL ELECTRONICS

2 – Mark Questions & Answers

Unit –I

1. Define Digital Systems.

A system which processing discrete or digital signal is called as Digital System.

2. What is meant by bit?

A binary digit is called bit.

3. What is the best example of digital system?

Digital computer is the best example of a digital system.

4. Define Radix.

It specifies the number of symbols used for corresponding number system. .

5. Define Nibble and Byte.

- i). In binary number a group of four bits.
- ii). A group of 8 bits are called Byte.

6. List the number systems?

- i) Decimal Number system
- ii) Binary Number system
- iii) Octal Number system
- iv) Hexadecimal Number system

7. Define binary logic?

Binary logic consists of binary variables and logical operations. The variables are designated by the alphabets such as A, B, C, x, y, z, etc., with each variable having only two distinct values: 1 and 0. There are three basic logic operations: AND, OR, and NOT.

8. What is a Logic gate?

Logic gates are the basic elements that make up a digital system. The electronic gate is a circuit that is able to operate on a number of binary inputs in order to perform a particular logical function.

9. What are the basic digital logic gates?

The three basic logic gates are:

- 1. AND gate
- 2. OR gate
- 3. NOT gate

10. Which gates are called as the universal gates? What are its advantages?

The NAND and NOR gates are called as the universal gates. These gates are used to perform any type of logic application.

11. How to represent a positive and negative sign in computers?

Positive (+) sign by 0

Negative (-) sign by 1.

12. What are the applications of octal number system?

The applications of octal number system are:

- i. It is used for entering the binary data and displaying certain information's.
- ii. It is very important for the efficient use of microprocessors and other digital circuits.

13. Why is a hexadecimal number system called as an alpha numeric number system?

Hexadecimal number system has the base as 16 and therefore it requires 16 distinct symbols to represent the numbers. These are numerals 0 to 9 and alphabets A to F. Since both numeric digitals and alphabets are used to represent the digits in hexadecimal number system, it is also called as an alphanumeric number system.

14. Define Boolean algebra & Boolean Expression.

i). A system of algebra that operates on Boolean variables. The binary nature of Boolean algebra makes it useful for analysis, simplification and design of logic circuits.

15. What are basic properties of Boolean algebra?

The basic properties of Boolean algebra are commutative property, associative property and distributive property.

15. State the associative property of Boolean algebra.

The associative property of Boolean algebra states that the OR ing of several variables results in the same regardless of the grouping of the variables. The associative property is stated as follows:

$$\text{i). } A + (B + C) = (A + B) + C$$

$$\text{ii). } A (B C) = (A B) C$$

16. State the commutative property of Boolean algebra.

The commutative property states that the order in which the variables are OR ed makes no difference. The commutative property is:

$$\text{i). } A + B = B + A$$

$$\text{ii). } AB = BA$$

17. State the distributive property of Boolean algebra.

The distributive property states that AND ing several variables and OR ing the result with a single variable is equivalent to OR ing the single variable with each of the the several variables and then AND ing the sums. The distributive property is:

$$\text{i). } A+BC = (A+B) (A+C)$$

$$\text{ii). } A (B+C) = AB + AC$$

18. State De Morgan's theorem.

De Morgan suggested two theorems that form important part of Boolean algebra. They are,

1) The complement of a product is equal to the sum of the complements.

$$(A \cdot B)' = A' + B'$$

(Truth Table)

A	B	$(AB)'$	$A' + B'$
0	0	1	1
0	1	1	1
1	0	1	1
1	1	0	0

2) The complement of a sum term is equal to the product of the complements.

$$(A + B)' = A'B'$$

(Truth Table)

A	B	$(A+B)'$	$A' B'$
0	0	1	1
0	1	0	0
1	0	0	0
1	1	0	0

19. What are the 2 forms of Boolean expression?

The two forms of Boolean expressions are:

i). Sum of Products Form

ii). Product of Sum Form

20. Define Minterm & Maxterm.

The products of Boolean expression where all possible variables appear once in complement or uncomplement variables are called **Minterm**.

A sum terms in a Boolean expression where all possible variables appear once, in complement or uncomplement form are called **Maxterm**.

21. What is meant by karnaugh map or K-Map method?

A karnaugh map or k map is a pictorial form of truth table, in which the map diagram is made up of cells, with each cell representing one minterm or maxterm of the function. This method provides a simple straight forward procedure for minimizing Boolean function.

22. Define Cell.

The smallest unit of a karnaugh map, corresponding to one rows of a truth table. The input variables are the cells coordinates and the output variable is the cells contents.

23. Define Pair, Quad, and Octet.

i). **Pair:** A group of two adjacent cells in a karnaugh map. A pair cancels one variable in a K-Map simplification.

ii). **Quad:** A group of four adjacent cells in a karnaugh map. A quad cancels two variable in a K-Map simplification.

iii). **Octet:** A group of eight adjacent cells in a karnaugh map. A pair cancels three variable in a K-Map simplification.

24. What are called don't care conditions?

In some logic circuits certain input conditions never occur, therefore the corresponding output never appears. In such cases the output level is not defined, it can be either high or low. These output levels are indicated by 'X' or 'd' in the truth tables and are called **don't care conditions** or incompletely specified functions.

25. What is tabulation method?

A method involving an exhaustive tabular search method for the minimum expression to solve a Boolean equation for more variables is called as a tabulation method.

26. State the limitations of karnaugh map.

i) Generally it is limited to six variable map (i.e.) more then six variable involving expressions are not reduced.

ii) The map method is restricted in its capability since they are useful for simplifying only Boolean expression represented in standard form.

27. What is a prime implicant?

A prime implicant is a product term obtained by combining the maximum possible number of adjacent squares in the map. They cannot be reduced further.

(Or)

A prime implicant is a group of minterms which cannot be combined with any other minterm or groups.

28. What is an essential prime implicant?

The Essential Prime Implicant is a prime implicant in which one or more minterms are unique, it contains at least one minterm which is not contained in any other prime implicant.

29. Explain or list out the advantages and disadvantages of K-map method?

The advantages of the K-map method are:

- i). It is a fast method for simplifying expression up to four variables.
- ii). It gives a visual method of logic simplification.
- iii). Prime implicants and essential prime implicants are identified fast.
- iv). Suitable for both SOP and POS forms of reduction.
- v). It is more suitable for class room teachings on logic simplification.

The disadvantages of the K-map method are:

- i). It is not suitable for computer reduction.
- ii). K-maps are not suitable when the number of variables involved exceed four.
- iii). Care must be taken to fill in every cell with the relevant entry, such as a 0, 1 (or) don't care terms.

30. List out the advantages and disadvantages of Quine-Mc Cluskey method?

The advantages are:

- i). This is suitable when the number of variables exceed four.
- ii). Digital computers can be used to obtain the solution fast.
- iii). Essential prime implicants, which are not evident in K-map, can be clearly seen in the final results.

The disadvantages are:

- i). Lengthy procedure than K-map.
- ii). Requires several grouping and steps as compared to K-map.
- iii). It is much slower.
- iv). No visual identification of reduction process.
- v). The Quine Mc Cluskey method is essentially a computer reduction method.

31. Define Duality Theorem.

The Duality theorem states that starting with a Boolean relation we can derive another Boolean relation by:

- i). Changing OR (operation) i.e., + (Plus) sign to an AND (operation) i.e., (dot) and vice-versa.
- ii). Complement any 0 or 1 appearing in the expression i.e., replacing contains 0 and 1 by 1 and 0 respectively.