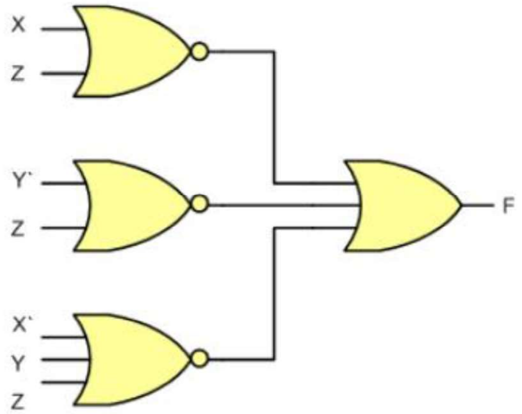
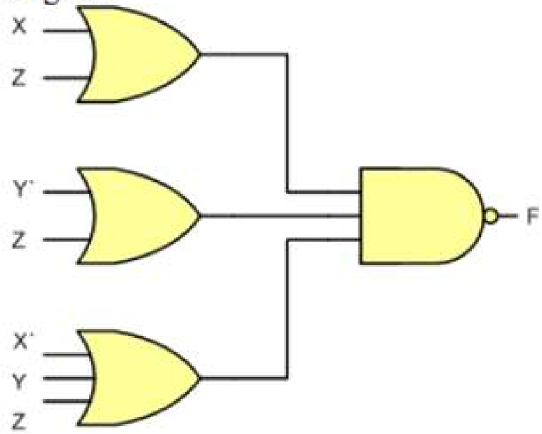
Since **F'** is in POS form, it can be implemented by using NOR-NOR circuit.
By complementing the output we can get **F**, **or** by using ***NOR-OR*** circuit as shown in the figure.




It can also be implemented using ***OR-NAND*** circuit as it is equivalent to NOR-OR circuit as shown in the figure.




**1.43 Two marks Questions and Answers**

1. **Define Digital Systems.**
   A System which is 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 nibble. 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. 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.**

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.

**16. 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:

i). A+ (B+C) = (A+B) +C ii). A (B
C) = (A B) C

**17. 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: i). A+B=B+A , ii). A.B = B.A

**18. 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 several variables and then AND ing the sums. The distributive property is: i). A+BC = (A+B)(A+C), ii). A (B+C) = AB + AC

**19. 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.

**20. 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.

**21. 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.

**22. 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.

**23. 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.

**24. 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.

**25. What is power dissipation?**

The electrical energy used by logic circuits in specified period of time. (Expresses in milliwatts or nanowatts).

Power dissipation = Supply voltage * meant current taken from that supply.

**26. Define Fan-in & Fan-out.**

Fan-in: The fan-in of a gate is the number of inputs connected to the gate without any degradation in the voltage levels.

Fan-out: It is defined as the maximum number of inputs of the same IC family that a gate can drive maintaining its output levels within the specified limits.

**27. What is Noise margin?**

Noise margin is the maximum external noise voltage added to an input signal that does not cause an undesirable change in the circuit output.

**28. Define Figure of Merit (SPP).**

Figure of merit is defined as the product of speed and power. The speed is specified in terms of propagation delay time expressed in nano seconds.

Figure of merit = Propagation delay time (ns) * Power (mW).

**29. Define Noise Immunity.**

The ability of a logic circuit to tolerate the noise without causing any unwanted changes in the output.

**30. Mention the characteristics of MOS transistor?**

1. The n- channel MOS conducts when its gate- to- source voltage is positive.
2. The p- channel MOS conducts when its gate- to- source voltage is negative
3. Either type of device is turned off if its gate- to- source voltage is zero.

**31. Why totem pole outputs cannot be connected together.**

Totem pole outputs cannot be connected together because such a connection might produce excessive current and may result in damage to the devices.

**32. State advantages and disadvantages of TTL Advantage:**

1. Easily compatible with other ICs
2. Low output impedance

Disadvantage:

1. Wired output capability is possible only with tristate and open collector types
2. Special circuits in Circuit layout and system design are required.

**33. What is Operating temperature?**

All the gates or semiconductor devices are temperature sensitive in nature. The temperature in which the performance of the IC is effective is called as operating temperature. Operating temperature of the IC vary from 0'C to 70'C.

**34. 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.

35. **Convert (634) 8 to binary.**

6 3 4 - 110 011 100

Ans = 110011100

36. **Convert (9B2 - 1A) H to its decimal equivalent.**

N = 9 x 16 2 + B x 16 1 + 2 x 16 0 + 1 x 16 -1 + A (10) x 16 -2

= 2304 + 176 + 2 + 0.0625 + 0.039

= 2482.1 10

37. **State the different classification of binary codes?**

1. Weighted codes
2. Non - weighted codes
3. Reflective codes
4. Sequential codes
5. Alphanumeric codes
6. Error Detecting and correcting codes.

38. **Convert 0.640625 decimal number to its octal equivalent.**

0.640625 x 8 = 5.125

0.125 x 8 = 1.0

= 0.640 625 10 = (0.51) 8

39. **Convert 0.1289062 decimal number to its hex equivalent**

0.1289062 x 16 = 2.0625

0.0625 x 16 = 1.0

= 0.21 16

40. **State the steps involved in Gray to binary conversion?**

The MSB of the binary number is the same as the MSB of the gray code number. So write it down. To obtain the next binary digit, perform an exclusive OR operation between the bit just written down and the next gray code bit. Write down the result.

41. **Convert gray code 101011 into its binary equivalent**.

Gray Code: 1 0 1 0 1 1

Binary Code: 1 1 0 0 1 0

42. **Substract (0 1 0 1) 2 from (1 0 1 1) 2**

1 0 1 0

0 1 0 1

Answer = 0 1 1 0

43. **Add (1 0 1 0) 2 and (0 0 1 1) 2**

1 0 1 0

0 0 1 1

Answer = (1 1 0 1) 2

44. **Using 10's complement subtract 72532 - 3250**

M = 72532

10's complement of N = + 96750

-----------
Sum = 169282
Discard end carry
Answer = 69282

**45. Find 2'S complement of (1 0 1 0 0 0 1 1) 2**

0 1 0 1 1 1 0 0 1 - 1's Complement
+ 1
0 1 0 1 1 1 0 1 0 - 2's complement.

**46. Substract 1 1 1 0 0 1 2 from 1 0 1 0 1 1 2 using 2's complement method**

1 0 1 0 1 1
+ 0 0 0 1 1 1 - 2's comp. of 1 1 1 0 0 1
1 1 0 0 1 0 in 2's complement form
Answer (0 0 1 1 1 0)2

**47. Find the excess -3 code and 9's complement of the number 403 10** 4 0 3

0 1 0 0 0 0 0 0 0 0 1 1
0 0 1 1 0 0 1 1 0 0 1 1 +
0 1 1 1 0 0 1 1 0 1 1 0 ----- excess 3 code
9's complement 1 0 0 0 1 1 0 0 1 0 0 1

**48. What is meant by bit?**

A binary digit is called bit

**49. Define byte?**

Group of 8 bits.

**50. List the different number systems?**

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

**51. State the abbreviations of ASCII and EBCDIC code?**

ASCII-American Standard Code for Information Interchange.
EBCDIC-Extended Binary Coded Decimal Information Code.

**52. What are the different types of number complements?**

i) r's Complement,
ii) (r-1)'s Complement.

**53. Define duality property.**

Duality property states that every algebraic expression deducible from the postulates of Boolean algebra remains valid if the operators and identity elements are interchanged. If the dual of an algebraic expression is desired, we simply interchange OR and AND operators and replace 1's by 0's and 0's by 1's.

**54. What is a karnaugh map?**

A karnaugh map or k map is a pictorial form of truth table, in which the map diagram is made up of squares, with each squares representing one minterm of the function.

**55. Mention the different IC packages?**

DIP- Dual in line package

LCC- Leadless Chip Carrier
PLCC- Plastic Leaded Chip carrier
PQFP- Plastic Quad Flat Pack
PGA- Pin Grid Array

**56. Mention the important characteristics of digital IC's?**

Fan out
Power dissipation
Propagation Delay
Noise Margin
Fan In
Operating temperature
Power supply requirements

**57. What is propagation delay?**

Propagation delay is the average transition delay time for the signal to propagate from input to output when the signals change in value. It is expressed in ns.

**58. List the different versions of TTL**

1.TTL (Std.TTL) 2.LTTL (Low Power TTL)
3.HTTL (High Speed TTL) 4.STTL (Schottky TTL)
5.LSTTL (Low power Schottky TTL)