1) 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.

2) Convert (634) 8 to binary

6 3 4

110 011 100

Ans = 110011100

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

$N = 9 \times 16^2 + B \times 16^1 + 2 \times 16^0 + 1 \times 16^{-1} + A\ (10) \times 16^{-2}$

= 2304 + 176 + 2 + 0.0625 + 0.039

= **2482.1_{10}**

4) 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.

5) Convert 0.640625 decimal numbers to its octal equivalent.

0.640625 x 8 = 5.125

0.125 x 8 = 1.0

= 0.640 625 10 = **(0.51) 8**

6) Convert 0.1289062 decimal number to its hex equivalent

0.1289062 x 16 = 2.0625

0.0625 x 16 = 1.0

= **0.21_{16}**

7) Convert 22.64 to hexadecimal number.

16 22 -6

16 1 -1

0

0.64 x 16 = 10.24

0.24 x 16 = 3.84

0.84 x 16 = 13.44

.44 x 16 = 7.04

Ans = (16. A 3 D 7) 16

8) 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.

9) Convert gray code 101011 into its binary equivalent.

Gray Code: 1 0 1 0 1 1

Binary Code: **1 1 0 0 1 0**

10) 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

11) 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

12) Using 10's complement subtract 72532 - 3250

M = 72532

10's complement of N = + 96750

Sum = 169282

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Discard end carry

Answer = 69282

13) 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.

14) 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

15) 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

16) What is meant by bit?

A binary digit is called bit

17) Define byte?

Group of 8 bits.

18) List the different number systems?

i) Decimal Number system

ii) Binary Number system

iii) Octal Number system

iv) Hexadecimal Number system

19) State the abbreviations of ASCII and EBCDIC code?

ASCII-American Standard Code for Information Interchange.

EBCDIC-Extended Binary Coded Decimal Information Code.

20) What are the different types of number complements?

i) r’s Complement

ii) (r-1)’s Complement.

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21) Given the two binary numbers X = 1010100 and Y = 1000011, perform the subtraction

(a) X -Y and (b) Y - X using 2's complements.

a) X = 1010100

2's complement of Y = 0111101

Sum = 10010001

Discard end carry

Answer: **X - Y = 0010001**

b) Y = 1000011

2's complement of X = + 0101100

Sum = 1101111

There is no end carry, The MSB BIT IS 1.

Answer is Y-X = -(2's complement of 1101111) = - 0010001

22) Given the two binary numbers X = 1010100 and Y = 1000011, perform the subtraction

(a) X -Y and (b) Y - X using 1's complements.

a) X - Y = 1010100 - 1000011

X = 1010100

1's complement of Y = + 0111100

Sum = 10010000

End -around carry = + 1

Answer: **X - Y = 0010001**

b) Y - X = 1000011 - 1010100

Y = 1000011

1's complement of X = + 0101011

Sum = + 1101110

There is no end carry.

Therefore the answer is Y - X = -(1's complement of 1101110) = -0010001

23) Write the names of basic logical operators.

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1. NOT / INVERT

2. AND

3. OR

24) What are basic properties of Boolean algebra?

The basic properties of Boolean algebra are commutative property, associative property

and distributive property.

25) 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:

A+ (B+C) = (A+B) +C

26) 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:

A+B=B+A

27) 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:

A+BC= (A+B) (A+C)

28) State the absorption law of Boolean algebra.

The absorption law of Boolean algebra is given by X+XY=X, X(X+Y) =X.

29) Simplify the following using De Morgan's theorem [((AB)'C)'' D]'

[((AB)'C)'' D]' = ((AB)'C)'' + D' [(AB)' = A' + B']

$= (AB)' C + D'$

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

30) 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.

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

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

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

31) Reduce A.A'C

$A.A'C = 0.C$ [A.A' = 1]

$= 0$

31) Reduce A(A + B)

$A(A + B) = AA + AB$

$= A(1 + B)$ [1 + B = 1]

$= A$.

32) Reduce A'B'C' + A'BC' + A'BC

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

$= A'C' + A'BC$ [A + A' = 1]

$= A'(C' + BC)$

$= A'(C' + B)$ [A + A'B = A + B]

33) Reduce AB + (AC)' + AB'C(AB + C)

$AB + (AC)' + AB'C(AB + C) = AB + (AC)' + AAB'BC + AB'CC$

$= AB + (AC)' + AB'CC$ [A.A' = 0]

= AB + (AC)' + AB'C [A.A = 1]

= AB + A' + C' =AB'C [(AB)' = A' + B']

= A' + B + C' + AB'C [A + AB' = A + B]

= A' + B'C + B + C' [A + A'B = A + B]

= A' + B + C' + B'C

=A' + B + C' + B'

=A' + C' + 1

= 1 [A + 1 =1]

34) Simplify the following expression Y = (A + B)(A + C')(B' + C')

Y = (A + B)(A + C')(B' + C')

= (AA' + AC +A'B +BC)(B' + C') [A.A' = 0]

= (AC + A'B + BC)(B' + C')

= AB'C + ACC' + A'BB' + A'BC' + BB'C + BCC'

= AB'C + A'BC'

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35) Show that (X + Y' + XY)(X + Y')(X'Y) = 0

(X + Y' + XY)(X + Y')(X'Y) = (X + Y' + X)(X + Y')(X' + Y) [A + A'B = A + B]

= (X + Y')(X + Y')(X'Y) [A + A = 1]

= (X + Y')(X'Y) [A.A = 1]

= X.X' + Y'.X'.Y

= 0 [A.A' = 0]

36) Prove that ABC + ABC' + AB'C + A'BC = AB + AC + BC

ABC + ABC' + AB'C + A'BC=AB(C + C') + AB'C + A'BC

=AB + AB'C + A'BC

=A(B + B'C) + A'BC

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

$=AB + AC + A'BC$

$=B(A + C) + AC$

$=AB + BC + AC$

$=AB + AC +BC$ ...Proved

37) Convert the given expression in canonical SOP form $Y = AC + AB + BC$

$Y = AC + AB + BC$

$=AC(B + B') + AB(C + C') + (A + A')BC$

$=ABC + ABC' + AB'C + AB'C' + ABC + ABC' + ABC$

$=ABC + ABC' +AB'C + AB'C'$ $[A + A =1]$

38) 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.

39) Find the complement of the functions $F1 = x'yz' + x'y'z$ and $F2 = x(y'z' + yz)$. By

applying De-Morgan's theorem.

$F1' = (x'yz' + x'y'z)' = (x'yz')'(x'y'z)' = (x + y' + z)(x + y +z')$

$F2' = [x(y'z' + yz)]' = x' + (y'z' + yz)'$

$= x' + (y'z')'(yz)'$

$= x' + (y + z)(y' + z')$

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40) Simplify the following expression

$Y = (A + B) (A = C) (B + C)$

= (A A + A C + A B + B C) (B + C)

= (A C + A B + B C) (B + C)

= A B C + A C C + A B B + A B C + B B C + B C C

= A B C

41) What are the methods adopted to reduce Boolean function?

i) Karnaug map

ii) Tabular method or Quine Mc-Cluskey method

iii) Variable entered map technique.

42) State the limitations of karnaugh map.

i) Generally it is limited to six variable map (i.e) more then six variable involving expression 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.

43) 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.

44) Find the minterms of the logical expression Y = A'B'C' + A'B'C + A'BC + ABC'

Y = A'B'C' + A'B'C + A'BC + ABC'

=m0 + m1 +m3 +m6

=_m(0, 1, 3, 6)

45) Write the maxterms corresponding to the logical expression

Y = (A + B + C')(A + B' + C')(A' + B' + C)

= (A + B + C')(A + B' + C')(A' + B' + C)

=M1.M3.M6

=_ M(1,3,6)

46) 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.

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47) 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.

48) What is an essential implicant?

If a min term is covered by only one prime implicant, the prime implicant is said to be

essential