

# CS504 (Digital Logic & Computers Organization) – Exam Questions Samples

▪ Mark each of the following statements as true (T) or as false (F):

1. The days of week is an example analog parameter.
2. The digital synchronous signal is discrete in both of time and value.
3. Digital systems can operate with extreme reliability by using error-correcting codes.
4. The minimum number of bits required to code four distinct elements is four.
5. In general, coding requires more bits than conversion.
6. The coding of a decimal number between 0 and 9 in BCD needs the same number of bits as the conversion of this decimal number to its equivalent binary value.
7. Excess-3 is weighted coding method of decimal numbers where each digit in the decimal number is coded into four bits.
8. Self-complementing property means that the 9's complement of a decimal number is obtained directly by changing 1's to 0's and 0's to 1's in its binary code.
9. 6311 coding method uses only 10 combinations out of 16 to represent 10 decimal digits (0-9).
10. The 7-bit ASCII binary codes takes the decimal range from 0 to 128.
11. Parity bit method can detect and correct all single-bit errors.
12. Only the odd parity can detect an odd number of bit errors while the even parity cannot.
13. Unique truth table but different Boolean equations and logic diagrams can express a function.
14. In actual physical gates, if an input changes then the output change occurs instantaneously.
15. Switching algebra is a multi-valued form of Boolean algebra.
16. The dual of an algebraic expression is obtained by only interchanging  $+$  and  $.$  symbols.
17. An algebraic expression is self-dual when its dual is equal to the algebraic expression itself.
18. The absorption theorem states that: (1)  $X + X'Y = X + Y$                       (2)  $X . (X' + Y) = X . Y$
19. The De Morgan of an algebraic expression is obtained by taking the dual of the algebraic expression and complementing each literal and constant in it.
20. The De Morgan theorem of switching algebra is proved to be generalized to multiple number of Boolean variables.
21. Minterm is AND term so it is also called the standard sum.
22. Standard product or standard sum are used to express Boolean function in standard form.
23. Boolean function of  $n$  variables has  $2^n/2$  minterms and  $2^n/2$  maxterms in its truth table.
24.  $(b + a + c)$  is a valid maxterm of a Boolean function  $F(a, b, c)$ .
25.  $ab$  is a valid minterm of a Boolean function  $F(a, b, c)$ .
26. Minterm evaluates to '1' for its corresponding entry in the Boolean function truth table.
27. POM is an abbreviation of "Product of Minterms" canonical form.
28. Maxterm is the complement of minterm but not vice-versa.

29. The complement of a function expressed in SOM is simply the POM with the same indices.
30. The algebraic Boolean function expression:  $F = Y' + X'Z'$  can be written in SOM canonical form:  
 $F = \sum(0, 1, 2, 4, 5)$
31. The algebraic Boolean function expression:  $G = A + B'C$  can be written in POM canonical form:  
 $G = \prod(0, 2, 3)$
32. Given:  $F'(x, y, z) = \prod(1, 3, 5, 7)$ , then  $F(x, y, z) = \sum(0, 2, 4, 6)$
33. SOM of  $n$ -variable Boolean function is implemented as network of  $n$ -input AND gates connected to an OR gate.
34. In general, canonical form must have fewer literals than standard form for Boolean function.
35. SOP and POS are simplified forms of SOM and POM respectively.
36. Each of AND, OR, XOR and XNOR gates can be extended to have more than two inputs.
37. A gate implements a positive logic AND function will implement a negative logic OR function, and vice-versa.
38. Circuit optimization is a more formal approach to simplification that requires three cost criteria to measure the simplicity of a circuit.
39. Each square in K-map represents a maxterm.
40. On 3-variable K-map, a combined eight adjacent squares represent 0-variable term.
41. AND-Invert and Invert-OR both represent NAND gate.
42. A 2-level POS circuit can be converted easily to a NAND-NAND implementation.
43. NAND and NOR gates are neither commutative nor associative.
44. A NOR gate with one input is an inverter.
45. NOR-NOR implementation requires function to be in POM/POS form.
46. To implement a Boolean function as two-level NOR-OR circuit, its 0's in the k-map must be combined into SOP form.
47. XOR and XNOR are also known as the odd and even functions respectively.
48. XOR and XNOR functions are associative but not commutative.
49. Analysis finds out function of given circuit, while design determines circuit of given function.
50. The full adder circuit can be implemented using two cascaded half adder circuits.
51. When two signed binary numbers are added, an overflow can be detected from the end carry out of the most significant bit position.

▪ **Choose the correct answer (A,B,C or D) for each of the following statements:**

1. The digital asynchronous signal is ..... in time and ..... in value.
  - A. discrete - continuous
  - B. discrete - discrete
  - C. continuous - discrete
  - D. continuous – continuous

2. The electrical signals in most present-day digital systems use just ..... discrete values.
- A. two
  - B. three
  - C. four
  - D. five
3. The number of bits,  $n$ , is required to code at maximum ..... distinct elements.
- A.  $n^3$
  - B.  $n^2$
  - C.  $2^n$
  - D.  $n * \log(n)$
4. A number with  $n$  decimal digits is coded with ..... bits in Excess-3.
- A.  $2^n$
  - B.  $n^2$
  - C.  $n^3$
  - D.  $4n$
5. The weights of BCD code are .....
- A. 8,4,-2,-1
  - B. 8,4,2,1
  - C. 6,3,1,1
  - D. 6,4,2,1
6. All the following binary coding methods are self-complementing except .....
- A. BCD
  - B. Excess-3
  - C. 2421
  - D. 84-2-1
7. 2421 binary coding methods codes each decimal digit into ..... bits.
- A. 9
  - B. 6
  - C. 4
  - D. 2
8. The Excess-3 code of the decimal number,  $(945)_{10}$ , is .....
- A. 100101000101
  - B. 1110110001
  - C. 110001111000
  - D. 1001100101

9. Error correction during transmission of .....-coded decimal digits is easiest of all other binary codes because only 1 bit changes from one binary value to the next value.
- A. BCD
  - B. Excess3
  - C. ASCII
  - D. Gray
10. The extended-ASCII uses .....-bit to code 128 elements of the alphanumeric character set.
- A. 7
  - B. 8
  - C. 16
  - D. 32
11. There are ..... basic binary logical operations.
- A. two
  - B. three
  - C. four
  - D. five
12. The decoded decimal value of  $(100010010111)_2$  in 84-2-1 coding is .....
- A.  $(897)_{10}$
  - B.  $(564)_{10}$
  - C.  $(871)_{10}$
  - D.  $(675)_{10}$
13. An 8-bit binary code is decoded into ..... -digit decimal number using 6432 coding.
- A. 6
  - B. 4
  - C. 3
  - D. 2
14. The theorem of Boolean algebra states that: (1)  $X + X = X$  (2)  $X \cdot X = X$  is named .....
- A. identity
  - B. idempotence
  - C. involution
  - D. complement
15. The postulate of Boolean algebra states that: (1)  $X + Y = Y + X$  (2)  $X \cdot Y = Y \cdot X$  is named .....
- A. commutative
  - B. associative
  - C. distributive
  - D. De Morgan

16. The precedence of Boolean operators from the highest to the lowest written in order from the left to the right is .....
- A. NOT, AND, OR, Parentheses
  - B. NOT, Parentheses, AND, OR
  - C. Parentheses, NOT, AND, OR
  - D. Parentheses, AND, NOT, OR
17. The ..... theorem states that:  $AB + A'C + BC = AB + A'C$
- A. simplification
  - B. minimization
  - C. absorption
  - D. consensus
18. .... is AND term with all variables are present in order either normal or complemented form.
- A. Minterm
  - B. Product
  - C. Maxterm
  - D. Sum
19. Standard sum is another name of .....
- A. minterm
  - B. product
  - C. maxterm
  - D. sum
20. For ....., '1' in its binary index means that the corresponding variable is normal (not complemented) while '0' means that the corresponding variable is complemented.
- A. minterm
  - B. product
  - C. maxterm
  - D. sum
21. .... evaluates to '0' for its corresponding entry in the Boolean function truth table.
- A. Minterm
  - B. Product
  - C. Maxterm
  - D. Sum
22. .... is a canonical form that expresses Boolean function by "ANDing" its standard sums corresponding to '0' entries in the Boolean function truth table.
- A. SOM
  - B. SOP

- C. POM
- D. POS

23. The equivalent algebraic expression of the canonical form:  $F(a, b, c, d) = \prod(1, 3, 6, 11)$  is .....

- A.  $(a + b + c + d') . (a + b + c' + d') . (a + b' + c' + d) . (a' + b + c' + d')$
- B.  $(a' + b' + c' + d) . (a' + b' + c + d) . (a' + b + c + d') . (a + b' + c + d)$
- C.  $(b + c + d') . (b + c' + d') . (b' + c' + d) . (a' + b + c' + d')$
- D.  $(c + d') . (c' + d') . (b' + c' + d) . (a' + b + c' + d')$

24. The canonical form: ..... is the equivalent to the following algebraic expression:

$$a'b'c'd' + a'b'c'd + abc'd' + abcd$$

- A.  $G(a, b, c, d) = \prod(0, 1, 12, 15)$
- B.  $G(a, b, c, d) = \sum(0, 1, 12, 15)$
- C.  $G(a, b, c, d) = \prod(0, 3, 14, 15)$
- D.  $G(a, b, c, d) = \sum(0, 3, 14, 15)$

25. The form of POM or POS is implemented as network from two-levels of ..... gates.

- A. ANDs-AND
- B. ANDs-OR
- C. ORs-AND
- D. ORs-OR

26. The algebraic expression  $F(A, B, C) = (B + C).(A + C)$  is in ..... form.

- A. SOM
- B. POM
- C. SOP
- D. POS

27. A gate can be extended to multiple inputs if the binary operation it represents is .....

- A. commutative and associative
- B. commutative and distributive
- C. associative and distributive
- D. associative and De Morgan

28. .... binary Boolean operations are commutative but not associative, so they are not extendable to more than two inputs.

- A. AND and OR
- B. Buffer and Inverter
- C. NAND and NOR
- D. XOR and XNOR

29. .... are known as the odd and even functions respectively.

- A. AND and OR
- B. Buffer and Inverter
- C. NAND and NOR
- D. XOR and XNOR

30. A gate implements a positive logic OR function will implement a negative logic ..... function.

- A. NOR
- B. XOR
- C. XNOR
- D. AND

31.  $F = (A + C') \cdot (B' + C) \cdot (A' + B)$  has the following costs: .....

- A. L = 6, G = 9 and GN = 12
- B. L = 6, G = 8 and GN = 11
- C. L = 3, G = 6 and GN = 9
- D. L = 3, G = 9 and GN = 12

32. By combining adjacent squares in K-map, we reduce number of literals in an output .....

- A. minterm
- B. maxterm
- C. product term
- D. sum term

33. On 4-variable K-map, a combined four adjacent squares represent .....-variable term.

- A. 1
- B. 2
- C. 3
- D. 4

34. The optimum POS of  $F(W, X, Y, Z) = \sum (1, 2, 3, 9, 10, 11, 13, 14, 15)$  is .....

- A.  $F(W, X, Y, Z) = WZ + WY + X'Z + X'Y$
- B.  $F(W, X, Y, Z) = Y'Z' + W'X$
- C.  $F(W, X, Y, Z) = (Y' + Z')(W' + X)$
- D.  $F(W, X, Y, Z) = (Y + Z)(W + X')$

35. The optimum SOP of  $F(A, B, C, D) = \sum (3, 9, 11, 12, 13, 14, 15) + \sum_d (1, 4, 6)$  is .....

- A.  $F(A, B, C, D) = A'B + B'D'$
- B.  $F(A, B, C, D) = AB + B'D$
- C.  $F(A, B, C, D) = (A + B') \cdot (B + D)$
- D.  $F(A, B, C, D) = (A' + B') \cdot (B + D')$

36. The optimum SOP of  $F(A, B, C, D) = \sum (0, 2, 3, 5, 7, 8, 9, 10, 11, 13, 15)$  has ..... essential prime implicants.
- A. 0
  - B. 1
  - C. 2
  - D. 3
37. Invert-AND represents ..... gate.
- A. NAND
  - B. NOR
  - C. XOR
  - D. XNOR
38. AND is equivalent to ..... with inverted inputs.
- A. NAND
  - B. NOR
  - C. XOR
  - D. XNOR
39. Two-level ..... circuit can be easily converted to NOR-NOR implementation.
- A. AND-OR
  - B. AND-OR-Invert
  - C. OR-AND
  - D. OR-AND-Invert
40. AND-OR-Invert implementation of a circuit can be easily converted to .....
- A. OR-NAND
  - B. NAND-AND
  - C. NOR-OR
  - D. AND-NAND
41. .... is also known as the equivalence function.
- A. NAND
  - B. NOR
  - C. XOR
  - D. XNOR
42. .... gates are used for implementing parity generators and checkers circuits
- A. Buffer and inverted
  - B. AND and OR
  - C. XOR and XNOR
  - D. NAND and NOR

43. To check for errors in the even parity of 3-bit codes, it is needed to use ..... checker circuit.
- A. 3-bit odd function
  - B. 3-bit even function
  - C. 4-bit odd function
  - D. 4-bit even function
44. To perform circuit analysis, a ..... must be provided as an input to the analysis process.
- A. problem statement
  - B. Boolean function
  - C. truth table
  - D. logic diagram
45. The carry output of half adder circuit has the same truth table of ..... gate.
- A. NAND
  - B. NOR
  - C. AND
  - D. OR
46. The full adder circuit adds ..... bits together.
- A. two
  - B. three
  - C. four
  - D. five
47. Overflow occurs if the two binary numbers added are .....
- A. both positive
  - B. both negative
  - C. both positive or both negative
  - D. one of them is positive and the other is negative
48. Active-low decoder is implemented with ..... gate.
- A. NAND
  - B. AND
  - C. NOR
  - D. OR
49. .... selects binary information from one of many input lines and directs it to a single output line.
- A. adder
  - B. decoder
  - C. encoder
  - D. multiplexer