SARDAR VALLABHBHAI PATEL INSTITUTE OF TECHNOLOGY VASAD

Digital Fundamental (3130704)

Question Bank

1. Explain why the binary number system is used for most digital systems.
2. Convert the following decimal numbers to binary, octal and hexadecimal:
    a. 584
    b. 119.84
    c. 33.45
3. Convert the following numbers from the given base to the other three bases indicated.
    a. $(11101.1101)_2 = (\_\_?\_\_)_{10} = (\_\_?\_\_)_8 = (\_\_?\_\_)_{16}$
    b. $(10001.0001)_2 = (\_\_?\_\_)_{10} = (\_\_?\_\_)_8 = (\_\_?\_\_)_{16}$
    c. $(623.77)_8 = (\_\_?\_\_)_{10} = (\_\_?\_\_)_2 = (\_\_?\_\_)_{16}$
    d. $(367.52)_8 = (\_\_?\_\_)_{10} = (\_\_?\_\_)_2 = (\_\_?\_\_)_{16}$
    e. $(8E47.AB)_{16} = (\_\_?\_\_)_{10} = (\_\_?\_\_)_2 = (\_\_?\_\_)_8$
    f. $(2AC5.D)_{16} = (\_\_?\_\_)_{10} = (\_\_?\_\_)_2 = (\_\_?\_\_)_8$
4. Convert 128.286 to binary, octal and hexadecimal with an accuracy of 0.001_{10}.
5. Determine the value of base x if $(211)_x = (152)_8$.
6. Find the 9's and 10's complement of the following decimal numbers: 123900, 00980100, 100000, 00000000.
7. Find the 1's and 2's complement of the following binary numbers: 10101110, 0111000, 10000000, 00000000.
8. Convert the following decimal numbers to BCD, Binary-coded octal and binary-coded hex.
    a. 748
    b. 29.8125
9. Differentiate between positive and negative logic system.
10. What is Boolean algebra?
11. State and prove De-Morgan's theorem.
12. Define the following:
    a) Minterm b) Maxterm
13. Differentiate between Canonical form and Standard form. Which form is preferable when implementing a Boolean function with gate? Why?
14. Reduce the expression to simplest terms:
    a) F=A'+AB'+BC
    b) F=(A+B'+C') .(A'+B+C).BC
    c) F=((AB'+ABC)'+A(B+AB'))'
15. Prove the following.
    a) AB+ABC+AB'=A

b) BCD+AC'D'+ABD=BCD+AC'D'+ABC'
c) AB+BC+A'C+A'B'C=ABC'+AB+A'C
d) AB+A'C+BC=AB+A'C
e) A+B[AC+(B+C')D]=A+BD
f) AB+CD+A'C'=A'+B+C'+D

16. If AB'+A'B = C then show that AC'+A'C = B
17. Write the expression for F if F is equal to 1 when any of the minterm m_0, m_3, m_4 or m_6 is present. Assume A is the MSB.
18. Explain the boolean function in SOP & POS form.
    a) F = A+B'C
    b) Y = AB+ACD
    c) F= (A'+B).(B'+C)
    d) F= (XY+Z).(Y+XZ)
19. Plot the K-map for following function:
    a) F = (A'+B').(C'+D').(B'+D)
    b) F = (AB+CD').(AC'+BD)
    c) F = A'B'C'D+A'BC'D+A'B'CD+ABCD'+ABC'D
20. Build a minimal hardware system to realize a function F that equals 1 when a 4- bit input code equals 1, 2, 5, 6, 8, 11, 12 and 14. F should be 0 for input 4, 7, 9, and 10. Remaining will never occur.
21. Realize using only NAND Gate only:
    a) F = AB+CD+E
    b) F =BD+BCD+AB'C'D'+A'B'CD'
    c) F= (AB+A'B')(CD'+C'D)
22. Realize using only NOR Gate only:
    a) F = (A+B).(C+D).E
    b) F = X'Y+XY'+Z
    c) F = AB'CD'+A'BCD'+AB'C'D+A'BC'D
23. What is a digital computer and explain its block diagram with figure.
24. Convert Decimal Number 250.5 to base 3, base 4, base 7, base 16 and base 8
25. Convert Decimal Number 255.225 to binary, octal and hexadecimal
26. Convert the following Number as directed
    a) 52 base 10 = (_____) base 2
    b) 101001011 base 2 = (_____) base 10
    c) 11101110 base 2 = (_____) base 8
    d) 68 base 10 = (_____) base 16
27. Convert following hexadecimal number to decimal : B28, FFF, F28
28. Convert following octal to hexadecimal and binary : 414, 574,725.25
29. Convert the following number to decimal
    a) 10001.101
    b) 101011.11101

c) (0.365)8
d) A3E5
e) CDA4
f) 11101.001
g) B2D4

30. Write first 10 decimal numbers in base 11, base 7 and base 12 number system.
31. Perform subtraction with following binary number using 1's complement and 2's complement
    a) 11010-1101
    b) 10010-10011
    c) 100-110000
    d) 11010-10000
32. Explain comparison between 1's and 2's complements with appropriate example
33. Explain different types of binary codes in detail.
34. Simplify the following Boolean function to a minimum no of literal.
    (a) ABC+A'BC+A'B'C+ABC'+A'B'C' (to five literals)
    (b) xy'+y'z'+x'z'
    (c) (A'+C)(A'+C')(A+B+C'D)
    (d) (x'y'+z)'+z+xy+wz
    (e) (A+C+D)(A+C+D')(A+C'+D)(A+B') (to four literals)
    (f) A'B(D'+C'D)+B(A+A'CD)
    (g) BC+AC'+AB+BCD (to four literals)
    (h) [(CD)'+A]'+A+CD+AB (to three literals)
35. Implement the Boolean functions.(a) xyz+x'y+xyz' (b) (A+B)'(A'+B')' and F= xy+xy'+y'z with logic gates.
36. Obtain the simplified expression in sum of product for the following Boolean functions.
    (a) F= Σ(0,1,4,5,10,11,12,14) and(b) F=Σ(11,12,13,14,15).
37. Implement the functions F=Σ(1,3,7,11,15) with don't care conditions d=Σ(0,2,5) Discuss the effect of don't care conditions
38. Find the complement of the following Boolean function and reduce to a minimum number of literals.
    B'D + A'BC' + ACD + A'BC
39. Obtain the simplified expressions in sum of products using K-map:
    x'z + w'xy' + w(x'y + xy')
40. Given Boolean function
    F= x y + x' y' + y' z
    1. Implement it with only OR & NOT gates
    2. Implement it with only AND & NOT gates
41. Simplify the following Boolean function using K-Map.
    F=A'B'C'+B'CD'+A'BCD'+AB'C'

42. Simplify the following Boolean function by using K-Map.

    $F = \Sigma (0,1,2,8,10,11,14,15)$

43. Simplify Boolean function $F (w,x,y,z) = \Sigma (0,1,2,4,5,6,8,9,12,13,14)$ using K-map and Implement it using (i) NAND gates only (ii) NOR gates only.
44. Simplify the following Boolean function using K-Map and draw logic diagram using NOR gates only.

    $F(w,x,y,z) = \Sigma(0 ,1 , 2 , 8 ,10 ,11,14,15)$

45. Simplify the Boolean function:

    (1)$F(w,x,y,z) = \Sigma (0,1,2,4,5,6,8,9,12,13,14)$

    (2)$F(w,x,y) = \Sigma (0,1,3,4,5,7)$

46. Explain with figures how NAND gate and NOR gate can be used as Universal gate.
47. Simplify the Boolean function:

    (1) F = A'B'C'+B'CD'+A'BCD'+AB'C'

    (2) F =A'B'D'+A'CD+A'BC

    d=A'BC'D+ACD+AB'D' Where "d" indicates Don't care conditions.

48. Obtain the simplified expressions in sum of products for the following Boolean functions:

    $F(A,B,C,D,E) =\Sigma(0,1,4,5,16,17,21,25,29)$

49. Simplify the Boolean functions using K- map

    $F(A,B,C,D,E,F) = \sum(6,9,13,18,19,25,27,29,41,45,57,61).$

    $F(A,B,C,D,E,F,G)= \sum(20,28,52,60)$

50. Implement the following Boolean functions using don't care conditions.

    $F(A,B,C,D) = \sum(0,1,2,9,11)$ $d(A,B,C,D) =\sum(8,10,14,15)$

    F= B'D + B'C +ABCD d= A'BD+ AB'C'D'