Tutorial Sheet -1
Subject: Digital Logic

1. Covert the following binary numbers into decimal number
   (a) 1101 (b) 11011101
2. Convert the following binary numbers to decimal
   (a) 110011.11 (b) 1011010.1010
3. Convert the following decimal fractional number to binary.
   (a) 0.98 (b) 0.347
4. Convert the following decimal number into equivalent binary number.
   (a) 17 (b) 175
5. Find the 1's Complement of the following numbers/.
   (a) 01000111 (b) 11100011
6. Find the 2's complement of the following numbers
   (a) 00110111 (b) 11001000)
7. Express the decimal number -34 in 2's complement form.
8. Express the binary number 10010011 represented in 2's complement form into a decimal number
9. Express the following decimal number in binary as an 8 bit sign- magnitude number
   (a) +29 (b) -123
10. Determine the decimal value of each signed binary number in the 1's complement form
    (a) 10011001 (b) 10111111
11. Determine the decimal value of each signed binary number in the 2's compliment form
    (a) 10011001 (b) 01110100
12. Express the following sign-magnitude binary numbers in single precision floating point format:
    (a) 0111110000101011 (b) 10110000011000
13. Convert the following binary number into equivalent Hexadecimal number:
    (a) 1111101010011100 (b) 1011110000011111
14. Convert the Hexadecimal number FFA9 into binary number
15. Find the BCD number for the 473.
16. Convert the following octal number into decimal as well as into binary
    (a) 557_8 (b) 7765_8
17. Convert the following binary number into octal
    (a) 101100011001 (b) 111111101111000
18. Convert the following decimal numbers into 8421 BCD
    (a) 156 (b) 125
19. Add the following BCD numbers
    (a) 00100101 + 00100111 (b) 010101100001 + 011100001000
20. Convert the following pair of decimal numbers to BCD, and add as indicated:
    (a) 5+2 (b) 65+58
21. Convert the following binary code to Gray Code
    (a) 11011 (b) 10010
22. Convert the following Gray Code to Binary
    (a) 00010 (b)11000010001
23. Determine which of the following even parity codes are in error
    (a) 100110010 (b) 011101010
24. Determine which of the following odd parity codes are in error.
    (a) 11110110 (b) 00110001

(By Er. Kiran Joshi)

Tutorial Sheet - 2
Subject: Digital Logic

1. Explain about basic gates used in Digital logics with symbol, truth table, Boolean Algebra.
2. Perform each addition in the 2's complement form
    a. 00010110 + 00110011 b. 01110000 + 10101111
3. Convert each of the pair of number into binary and add in 2's Complement form
    a. -46 and 25 b. -110 and - 84
4. Subtract Two binary numbers:
    a. 1100 from 1111 b. 101010 from 010101
5. Add the following BCD numbers:
    a. 1001 + 0100 b. 1001 + 1001 c. 01001000 + 00110100
6. Add an Even Parity to the following ASCII Number:
    a. 1001011 b. 1110010
7. Add an ODD Parity to the following ASCII Number:
    a. 1011011 b.1110010
8. State and verify De-Morgan's Theorem.
9. Find the complement of F (x, y) = xy + x y
10. How can you neither say that NOR gate is a universal gate. Prove it.
11. Use a NAND GATE to implement XNOR gate.
12. Implement the function using $F(X, Y, Z) = \sum (3, 5, 7)$ with NOR gates.
13. Simplify the Boolean function with don't care, 'D' to represent it in POS with minimum number of literals. Also realize the simplified function with logic gates
    $F (W, X, Y, Z) = \sum (1, 3, 7, 11, 15)$
    $D (W, X, Y, Z) =\sum(0,2,5)$
14. Design a full subtractor.
15. Design a look ahead carry generator.
16. What is a CARRY PROPAGATION faced in a Binary Parallel Adder? Design a circuit to rectify this problem.
17. What is Combinational logic circuit?
18. Design half-adder circuit.
19. Design full-adder circuit from two half-adders and an OR gate.
20. Write short notes on: (a) Half-subtractor (b) n-bit adder
21. Prove that: (i) $(X+Y)'(X'+Y')=0$ (ii) $X\oplus Y\oplus Z=X'Y'Z+X'YZ'+XY'Z'+ XYZ$
22. Simplify the following:
    (i) $F(X,Y,Z)=\sum(1,3,4,6)$
    (ii) $F(X,Y,Z)=\prod(0,2,5,7)$ and also draw their simplified logic circuit.

23. Simlify the Boolean function with don't care,'d' to represent it in PoS with minimum number of literals. Also realize the simplified function with logic gates. $F(W1,X1,Y1,Z)=\sum(1,3,7,11,15)$ and $D(W1,X1,Y1,Z)=\sum(0,2,5)$
24. Define parity bit. Why NAND gate is called universal gate?
25. Why are NAND and NOR gates called the universal gates? Verify the universality of any one of them.
26. Express the following Boolean function in the simplest form using K-map: $F(w,x,y,z)=\sum m(0,2,5,7,8,10,13,15)$.
27. Use K-map to simplify $Y=A'BC+ABC+AB'C'+AB'C+ABC'$
28. Obtain the minimal expression for $\sum m(1,2,4,6,7)$ and implementit using Universal Gates.
29. Find the complement of $F(X,Y)=XY'+X'Y$.
30. Implement the function $F(X,Y,Z)=\sum(3,5,7)$ with NOR gates.
31. Simplify the following using K-map and implement using NAND gate only. $F(x,y,z)=\sum(0,2,5)$ and $d(x,y,z)=\sum(1,6)$.
32. Implement NOR gates to build AND gate and X-NOR gates.
33. Design full adder with look ahead carry generator.
34. What is a binary parallel adder and why is a look ahead carry generator used?

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