BAL BHARATI PUBLIC SCHOOL

Ganga Ram Hospital Marg, New Delhi-60

CLASS –XII   SUBJECT – COMPUTER SCIENCE

ASSIGNMENT- 5   TOPIC – Boolean Algebra

1. State Demorgan's laws. Verify one of the laws using truth table.

2. State and prove
   a. Law of Duality. Give the dual of (A+BC+(AB)').
   b. Distributive Law
   c. Idempotent Law
   d. Absorption Law

3. Reduce the following Boolean expression:
   a. $H(U,V,W,Z) = \sum(0,1,4,5,6,7,11,12,13,14,15)$
   b. $F(A,B,C,D) = \pi(5,6,7,8,9,12,13,14,15)$

4. Verify the following algebraically:
   a. X.Y'.Z+X.Y'.Z'+X'.Y'.Z = X.Y'+Y'
   b. XY+YZ+Y'Z = XY+Z
   c. XY+YZ+YZ'=Y

5. Draw a logic circuit diagram for the following Boolean expressions:
   a. A.(B+C')
   b. X.Y'+Y.Z' (using NAND gates only)
   c. (A+B)(A+B')
   d. X(Y'+Z) (using NOR gate only)

6. Given the following truth table, derive the SOP and POS

X	Y	Z	G(X,Y,Z)
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

7. A majority gate is a digital circuit whose output is 1 if the majority of inputs are 1's. The output is 0 otherwise. By means of a truth table, find the Boolean function implemented by 3-input majority gates.

8. Simplify using K-map for:
   a. $F(w,x,y,z) = M_2 + M_3 + M_4 + M_5 + M_6 + M_7 + M_9 + M_{11} + M_{13}$ (M-Maxterm, m-Minterm)
   b. $F(a,b,c,d) = \pi(1,2,4,5,7,10,15)$
   c. $F(w,x,y,z) = m_2 + m_3 + m_5 + m_6 + m_7 + m_9 + m_{11} + m_{13}$ (M-Maxterm, m-Minterm)
   d. $F(a,b,c,d) = \sum(0,7,8,9,10)$
   e. $y't' + y'z' + yzt' + yz't'$

9. Use the NAND gate to form
   a. Two input OR gate
   b. Two-input AND gate
   c. NOT gate

10. Use the NOR gate to form
    a. Two input OR gate
    b. Two-input AND gate
    c. NOT gate