



# INDIAN SCHOOL DARSAIT DEPARTMENT OF ICT



**Subject:** Computer Science

**Topic:** Boolean Algebra

**Worksheet No.:**10

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**Date:**\_\_\_\_\_

**Name of the Student :**\_\_\_\_\_

**Class &Div:** XII A

**Roll Number :**\_\_\_\_\_

1. State De Morgan's Law. Verify the De Morgan's Laws using truth tables.
2. State the Distribute law. Verify the law using truth table.
3. State Absorption Laws. Verify one of the Absorption Laws using truth tables.
4. State and verify Involution law.
5. State the associative law and verify the law using truth table.
6. State and prove the absorption law algebraically.
7. State and verify Associative law in Boolean algebra.
8. Verify using truth table:

i)  $X'Y + X.Y' + X'.Y' = (X'+Y')$

ii)  $U.(U' + V) = (U+V)$

iii)  $X.X' = 0$  and  $X+1 = 1$

iv)  $X+(Y+Z) = (X+Y)+Z$

9. Verify the following algebraically.

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

ii)  $A' + B'.C = A'.B'.C' + A'.B.C' + A'.B.C + A'.B'.C + A.B'.C$

iii)  $X'.Y + X.Y' = (X'+Y').(X+Y)$

iv)  $X + Y' = X.Y + X.Y' + X'.Y'$

v)  $X'Y + Z = (X' + Y' + Z)(X' + Y + Z)(X + Y + Z)$

vi)  $X + X'Y = X + Y$

vii)  $X'.Y + Y'.Z = X'.Y.Z + X'.Y'.Z' + X.Y'.Z + X'.Y'.Z$

viii)  $XY + YZ + YZ' = Y$

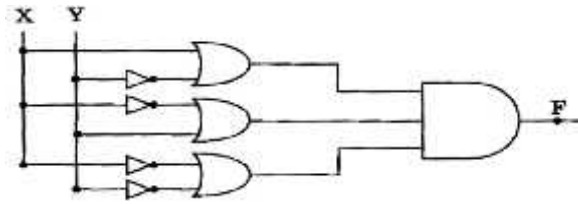
10. Write the dual of the Boolean expression  $(U+ W)(V'U + W)$

11. Write the dual of the Boolean expression  $(x+y).(x'+y')$

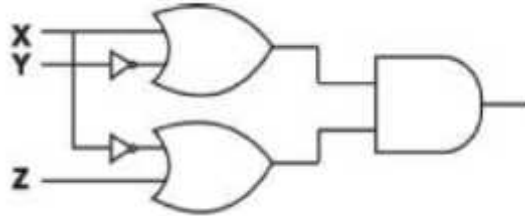
12. A Boolean function F defined on three input variable X,Y,Z is 1 if and only if the number of 1(One) input is odd (e.g. F is 1 if X=1,Y=0,Z=0). Draw the truth table for the above function and express it in canonical sum of product form.

13. Draw the logic circuit for  $(P+Q)R'$

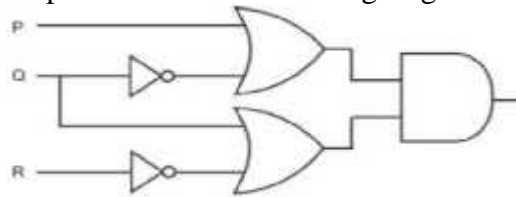
14. Write the equivalent Boolean expression for the following Logic Circuit :



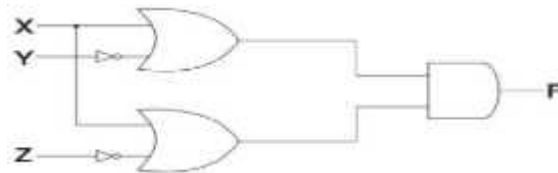
15. Write the equivalent Boolean Expression for the following Logic Circuit:



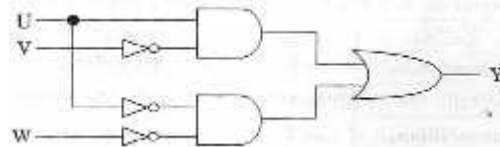
16. Write the equivalent Boolean Expression for the following Logic circuit :



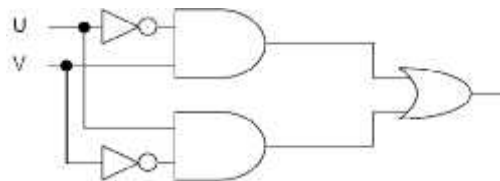
17. Write the equivalent Boolean Expression for the following Logic Circuit.



18. Write the equivalent Boolean Expression for the following Logic Circuit.



19. Write the equivalent Boolean Expression for the following Logic Circuit.



20. Draw a logical Circuit Diagram for the following Boolean Expression:  $A.(B+C')$

21. Draw the logic circuit for  $F=AB' + CD'$

22. Design  $(A+B).(C+D)$  using NAND Gate

23. Design  $A+B.C'$  using NOR gates only.

24. Represent the Boolean expression  $YZ+XZ$  with the help of NAND gates only

25. Represent Not gate using only NAND gates.

26. Write the SOP form of a Boolean Function F, which is represented by the following truth table

A	B	C	F
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1

27. Write the POS form of a Boolean Function H, which represented in a truth table as follows

A	B	C	H
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

28. Write the POS form of Boolean function H, which is represented in a truth table as follows

X	Y	Z	H
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	0

29. Write the POS form of a Boolean function F, which is represented in a truth table as follows

A	B	C	F
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

30. Write the SOP form of a Boolean function G, which is represented in a truth table as follows

P	Q	R	G
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1

31. Given the following truth table, derive a sum of product (SOP) and Product of Sum (POS)

A	B	C	F(A,B,C)
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	0

32. Write the equivalent Canonical Sum of Product for the following Product of Sum Expression

$$F(X,Y,Z) = \prod (1,3,6,7)$$

33. Convert the following Boolean expression into its equivalent Canonical Product of Sum form

$$X.Y'.Z + X'.Y.Z + X'.Y.Z'$$

34. Write the equivalent Canonical Sum of Product expression for the following SOP Expression.

$$F(W,X,Y,Z) = \sum (1,3,6,7,9,12)$$

35. Reduce the following Boolean expression using K - Map:

a)  $F(U,V,W,Z) = \sum (0, 1, 2, 3, 4, 10, 11)$

b)  $F(A, B, C, D) = \prod (0, 1, 2, 3, 4, 5, 10, 11, 15)$

c)  $F(P, Q, R, S) = \sum (1, 2, 3, 5, 6, 7, 9, 11, 12, 13, 15)$

d)  $F(U,V,W,Z) = \prod (3,5,7,10,11,13,15)$

e)  $F(P, Q, R, S) = \sum (0, 1, 2, 4, 5, 6, 8, 12)$

f)  $F(A,B,C,D) = \sum (2,3,4,5,6,7,8,10,11)$

g)  $F(U,V,W,Z) = \prod (0,1,2,4,5,6,8,10)$

h)  $F(A,B,C,D) = \sum (0,1,2,4,5,6,8,10)$

i)  $F(A,B,C,D) = M_0.M_1.M_2.M_4.M_5.M_6.M_8.M_{10}$

j)  $F(M,N,O,P) = \prod (0,1,3,4,5,6,7,9,10,11,13,15)$

k)  $F(u,v,w,z) = \sum (0,1, 3, 5, 7, 9,10,11,12, 13,15)$

l)  $F(w, x, y, z) = m_0 + m_4 + m_8 + m_{12}$

m)  $F(X,Y,Z,W) = \sum (1,3,4,5,7,9,10,11,13,15)$