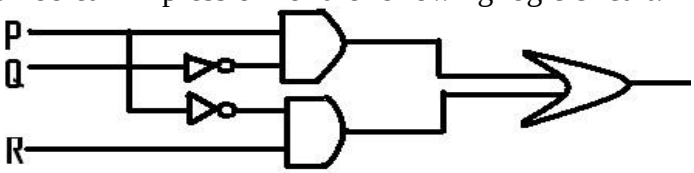
# HOLIDAYS HOMEWORK

1. (a) State and verify absorption law using truth table.
   (b) Write the equivalent Boolean Expression for the following logic circuit:




   (c)Write the POS form of a Boolean function G, which is represented in a truth table as follows

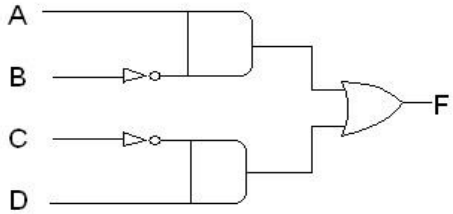
| U | V | W | G |
|---|---|---|---|
| 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 |

   (d) Reduce the following Boolean expression using K-map:
   H(U,V,W,Z) = ∑(0,1,4,5,6,7,11,12,13,14,15)

2. (a) State and Verify Absorption law in Boolean Algebra.
   (b) Draw a logical circuit diagram for the following Boolean Expression: A.(B+C')
   (c) Convert the following Boolean expression into its equivalent Canonical Product of sum form (POS): A.B'C + A'.B.C + A'.B.C'.
   (d) Reduce the following Boolean expression using K-map:
   F(A,B,C,D) = ∑(0,1,2,,4,5,8,9,10,11)

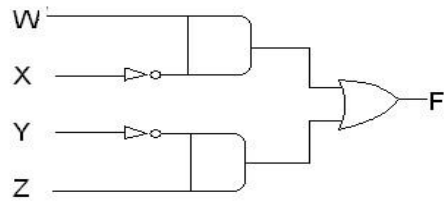
3. (a) State and verify De Morgan's law in Boolean Algebra.
   (b) Draw a Logical Circuit Diagram for the following Boolean Expression. X'.(Y'+Z)
   (c) Convert the following Boolean expression into its equivalent Canonical Sum of Product Form (SOP): (X'+Y+Z').(X'+Y+Z).(X'+Y'+Z).(X'+Y'+Z')
   (d) Reduce the following Boolean Expression using K-map.
   F(A,B,C,D) = ∑(0,2,3,4,6,7,8,10,12)

4. (a) State De Morgan's Theorems and verify the same using truth table.
   (b) Write the equivalent canonical product of sum expression for the following sum of product expression: **F(X, Y,Z) = ∑ (0, 2,4,5)**
   (c) Write the equivalent Boolean expression for the following logic circuit



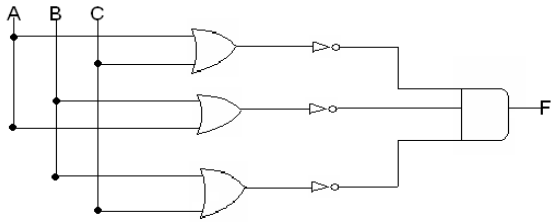

   (d) Reduce the following Boolean expression using K – Map :
   **F(A, B, C, D,) = Π (5, 6, 7, 8, 9, 12, 13, 14, 15)**

5 (a) State Distributive law and verify the same using truth table.
(b) Write the equivalent Boolean expression for the following logic circuit



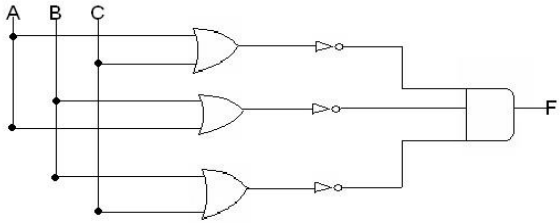

(c) Reduce the following Boolean expression using K – Map :
**F(U, V, W, Z) = ∑(0,1,2,3,4,10,11)**

6. (a) State and verify Associative Law.
(b) Write the equivalent expression for the following Logic Circuit :



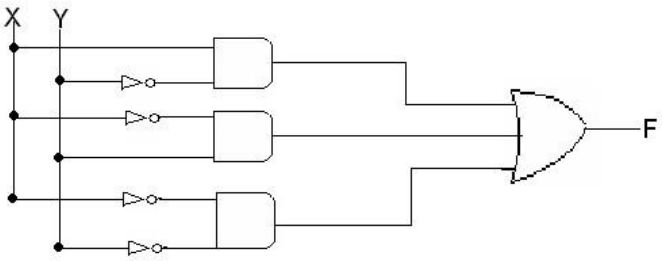

(c) Express P +Q'R in POS form.
(d) Reduce the following Boolean expression using K – Map :
**F(P, Q, R, S,) = Π (0,3,5,6,7,11,12,15)**

7. (a) State and verify Distributive Law algebrically.
(b) Write the equivalent expression for the following Logic Circuit :




(c) Reduce the following Boolean expression using K – Map :
**F(P, Q, R, S,) = ∑(0,3,5,6,7,11,12,15)**

8. (a) Write the equivalent expression for the following Logic Circuit :



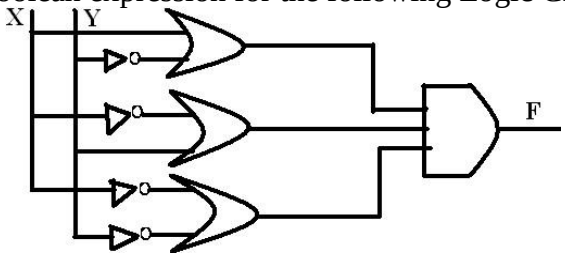
(b) Write the POS form of a Boolean Function F, Which is represented by the following truth table:

| X | Y | Z | F |
|---|---|---|---|
| 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 | 0 |
| 1 | 1 | 1 | 0 |

(c) Reduce the following Boolean expression using K – Map :

**F(A, B, C, D,) = ∑(0,1,2,3,4,5,10,11,15)**

9. (a) Write the equivalent Boolean expression for the following Logic Circuit:




(b) 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 |

(c) Reduce the following Boolean expression using K – Map :

**F(A, B, C, D,) = Π (0,1,2,3,4,5,10,11,15)**

10 (a) Give the following truth table, derive a sum of product (SOP) and Product of Sum (POS) Form of Boolean expression from it:

| A | B | C | F(A,B,C) |
|---|---|---|---|
| 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 |

(b) Obtain a simplified form for the following Boolean Expression using Karnaugh Map:

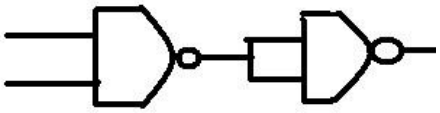
**F(a,b,c,d) = ∑(0,1,2,4,5,7,8,9,10,11,14)**

11. (a) State De Morgan's Laws. Verify one of the De Morgan's Laws using a truth table.
(b) Verify X.Y'Z+X.Y'Z'+X'.Y'Z = X.Y' + Y'.Z algebraically.
(c) Write the dual of the Boolean Expression:
(B'+C).A
(d) Obtain a simplified form for a Boolean Expression:
**F(U,V,W,Z) = ∑(0,2,3,4,7,9,10,13,14,15)**

12. (a) Prove XY + YZ + Y'Z =XY + Z , algebraically.
(b) Obtain the simplified form, of a Boolean expression using Karnaugh map.
**F(w,x,y,z)=∑(2,3,6,10,11,14)**
(c) Represent the Boolean expression (X+Y)(Y+Z)(X+Z) with help of NOR gates only.
(d) Given the following truth table, write the product of sums form of the function.

| x | y | z | 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 |

13.(a) State and verify Duality Principle.
(b) Prove algebraically: x'y'z' + x'y'z + x'yz' + x.y'z = x' + y'
(c) If F(a,b,c,d) = Π (0,1,3,4,5,7,8,9,11,12,13,15), Obtain the simplified form using K-map**.**
(d) Seven inverters are cascaded one after another. What is the output if the input is 1? (e) Given the following circuit:



What if the output if (i) both inputs are FALSE(0) (ii) one is FALSE and the other is TRUE.

**14.**(a) Prove X'.Y+Y'.Z=X'.Y.Z+X'.Y'.Z'+X.Y'.Z+X'.Y'.Z algebraically.
(b) Obtain simplified form for a boolean expression
F(x,y,z,w)= ∑ (1,3,4,5,7,9,11,12,13,15) using Karnaugh Map.
(d) Represent the Boolean expression X'Y+Y'Z with the help of NAND gates only.
(e) Write the Sum of Products form of the function G(U,V,W) . Truthe table representation of G is as follows:

| U | V | W | G |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 |

**15.** (a) Prove x+x'y=x+y algebraically.

(b) Write the dual of the Boolean expression

(x+y).(x'+y')

(c) Minimise F(w,x,y,z) using Karnaugh map.

F ( w,x,y,z) = $\sum$ (0,4,8,12)

(d) Represent the Boolean expression (x+y)(y+z)(z+x) with the help of NOR gates only.

(e) Write sum of product form of the function F(x,y,z). The truth table representation for the function F is given below:

| x | y | z | f |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 |

**ALL THE BEST**