Assignment -3

Ans 1) (a) ⇒ $E_1 \Rightarrow xyz + xy\bar{z} + \bar{x}y\bar{z} + \bar{x}\bar{y}z$

111 110 010 001

x \ yz	00	01	11	10
0		1		1
1			1	1

$= \bar{x}\bar{y}z + y\bar{z} + xy$

(b) $E_2 \Rightarrow xyz + xy\bar{z} + x\bar{y}z + \bar{x}\bar{y}z + \bar{x}yz$

111 110 101 001 011

$= (7, 6, 5, 1, 3)$

x \ yz	00	01	11	10
0		1	1	
1		1	1	1

$= z + xy$

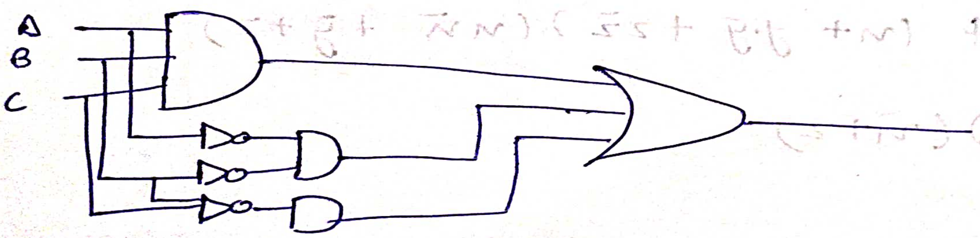
(c) $E_3 \Rightarrow xyz + xy\bar{z} + \bar{x}y\bar{z} + \bar{x}\bar{y}z + \bar{x}\bar{y}\bar{z}$

111 110 010 001 000

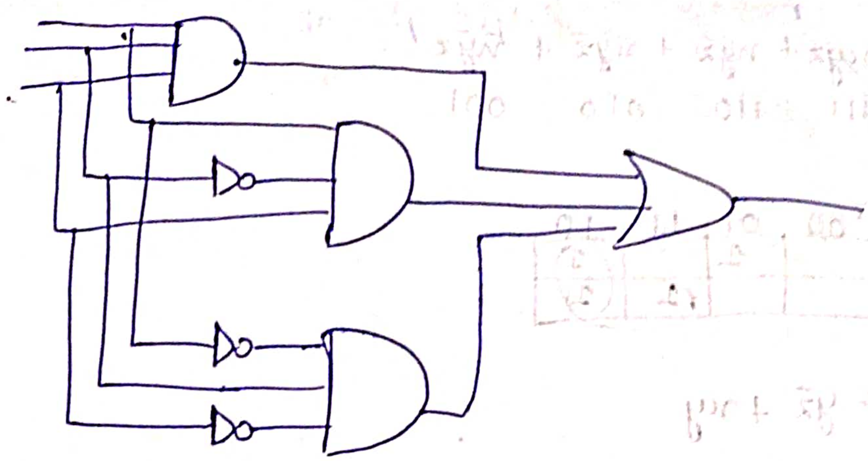
x \ yz	00	01	11	10
0	1	1		1
1			1	1

$= \bar{x}\bar{y} + xy + y\bar{z}$

Ans 2:- $Y = ABC + \bar{A}\bar{C} + B\bar{C}$



b) $y = A\bar{B}C + ABC + A\bar{B}\bar{C}$



Ans 3:- $F = x(y+\bar{y})(z+\bar{z}) + (x+\bar{x})\bar{y}z$

$= (xy + x\bar{y})(z+\bar{z}) + x\bar{y}z + \bar{x}\bar{y}z$

$= xyz + xy\bar{z} + x\bar{y}z + x\bar{y}\bar{z} + x\bar{y}z + \bar{x}\bar{y}z$

$= 111 \quad 110 \quad 101 \quad 100 \quad 101 \quad 001$

$= (7,6,5,4,1)$

x \ yz	00	01	11	10
0		1		
1	1	1	1	1

$x + \bar{y}z$

POS $= x + \bar{y}z$

By the property $x + (a \cdot b)$

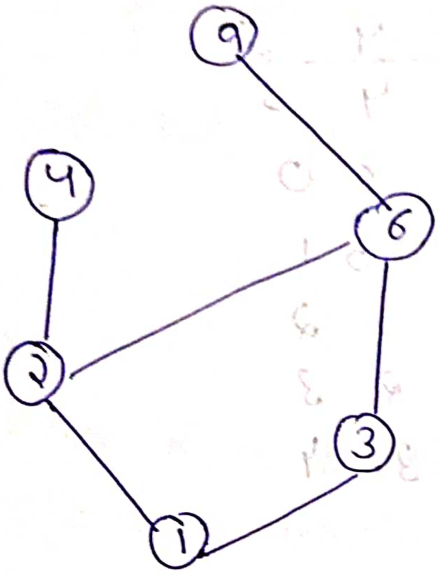
$= (xa) + (xb)$

$= \cancel{(x\bar{y})} + (x + y\cdot\bar{y} + z\bar{z})(x\bar{x} + \bar{y} + z)$

$= (x+\bar{y})(x+z)$

Ans 4:-

R = {(1,1) (1,2) (1,3) (1,4) (1,6) (1,9) (2,4) (2,6) (2,3) (3,6) (3,4) (3,3) (4,4) (6,6) (9,9)}



Join

$\wedge$	1	2	3	4	6	9
1	1	2	3	4	6	9
2	2	2	6	4	6	–
3						
4						
6						
9						

Meet

$\vee$	1	2	3	4	6	9
1	1	1	1	1	1	1
2	1	2	1	2	2	–
3						
4						
6						
9						

It doesnot satisfy lattice identity.

Ans 5:- The order of an element in a group is smallest positive power of elements which gives you the identity element.

Ans 6:-

$+_6$	0	1	2	3	4	5
0	0	1	2	3	4	5
1	1	2	3	4	5	0
2	2	3	4	5	0	1
3	3	4	5	0	1	2
4	4	5	0	1	2	3
5	5	0	1	2	3	4

$o(1) = 5$

Ans 7:- The order of every subgroup of a finite group is divisor of the order of the group.

$$\boxed{\frac{m}{n} = k}$$

m = order of group

n = order of subgroup

k = finite number.

Ans =8):- A subgroup H of group G is said to be a normal subgroup of G if

$$\boxed{Ha = aH}$$

for all $a \in G$, i.e,

left coset = right coset.

Ans -9):-

Min term -

A minterm of n variable is a product of n literals in which each variable appears exactly once in either type of complimented form but not both.

Max term -

A maxterm of n variable is a sum of n variables literals in which each variable appears exactly once in either true or compliments form but not both.

Ans -10):-

$$E(x,y,z) = x(\overline{y}\overline{z})$$

$$= x(y+\overline{z})$$

$$= xy + x\overline{z}$$

Ans 11) $f = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 1 & 5 & 3 & 2 & 4 \end{pmatrix}$ and $g = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 3 & 1 & 5 & 4 \end{pmatrix}$

$$f^{-1} = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 1 & 4 & 3 & 5 & 2 \end{pmatrix}$$

$$g^{-1} = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 3 & 1 & 2 & 5 & 4 \end{pmatrix}$$

$$f^{-1} o g^{-1} = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 1 & 4 & 3 & 5 & 2 \end{pmatrix} \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 3 & 1 & 2 & 5 & 4 \end{pmatrix}$$

$$= \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 3 & 1 & 2 & 5 & 4 \end{pmatrix}$$

Ans 12:- Let L be a non-empty set closed under two binary operations called meet and join denoted respectively by $\wedge$ & $\vee$.

* commutative law

- $a \wedge b = b \wedge a$
- $a \vee b = b \vee a$

* Associative law

- $(a \wedge b) \wedge c = a \wedge (b \wedge c)$
- $(a \vee b) \vee c = a \vee (b \vee c)$

* Absorption law
  - $a \wedge (a \vee b) = a$
  - $a \vee (a \wedge b) = a$

Sol^n

(a)

X_7	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	4	6	1	3	5
3	3	6	2	5	1	4
4	4	1	5	2	6	3
5	5	3	1	6	4	2
6	6	5	4	3	2	1

(b) (i) $2 \times e = 1$

$e = 4$

(ii) 3^{-1}

$3 \times e = 1$
$e = 5$

(iii) 6^{-1}

$6 \times e = 1$
$e = 6$

(C).

$2 \times 7^1 = 2$

$2 \times 7^2 = 4$

$2 \times_7 3 = 6$

$2 \times_7 4 = 1$

$2 \times_7 5 = 3$

$2 \times_7 6 = 5$

subgroup generate by $2 = \{2, 4, 6, 1, 3, 5\}$

Subgroup generate by $3 = \{3, 6, 2, 5, 1, 4\}$

Ques-14 Express $E(x, y, z) = x(\overline{\bar{y}z})$ find CSOP and POS

$= x(\overline{\bar{y}z})$

$= x(y + \bar{z})$

$= xy + x\bar{z}$

$= xy(z + \bar{z}) + x(y + \bar{y})\bar{z}$

$= xyz + xy\bar{z} + xy\bar{z} + x\bar{y}\bar{z}$ (CSOP)

$= (x+y+z) \cdot (x+y+\bar{z}) \cdot (x+y+\bar{z}) \cdot (x+\bar{y}+\bar{z})$ (POS).

Ques-15 Prove that

$a \wedge (b \vee c) = (a \wedge b) \vee (a \wedge c)$

$a \wedge b \leq a$ — (1)

$a \wedge b \leq b \leq b \vee c$ — (2)

$a \wedge b \leq b \wedge (b \vee c)$ — (3)

$a \wedge c \leq a$ — (4)

$a \wedge c \leq c \leq b \vee c$ — (5)

$a \wedge c \leq a \wedge (b \vee c)$ — (6)

$(a \wedge b) \vee (a \wedge c) \leq a \wedge (b \vee c)$

$a \wedge (b \vee c) \leq a$

hence proved.