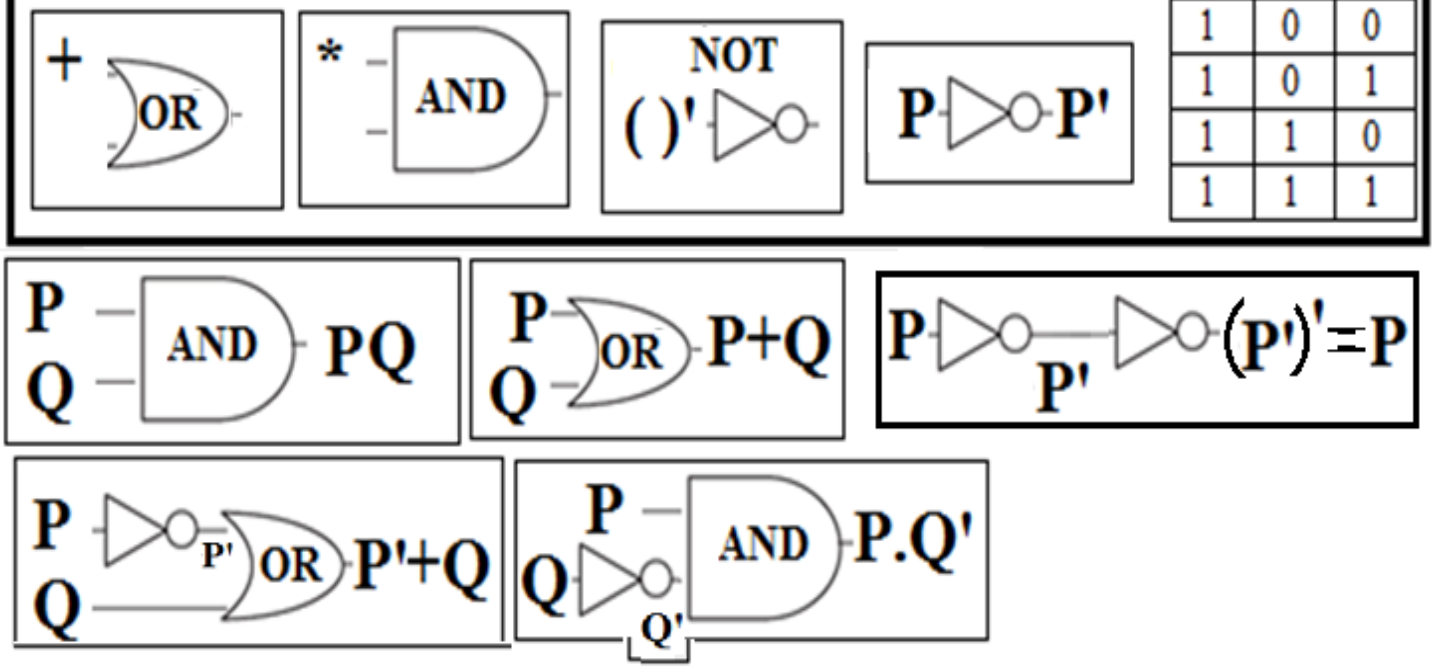
Truth Table and Logic Gates

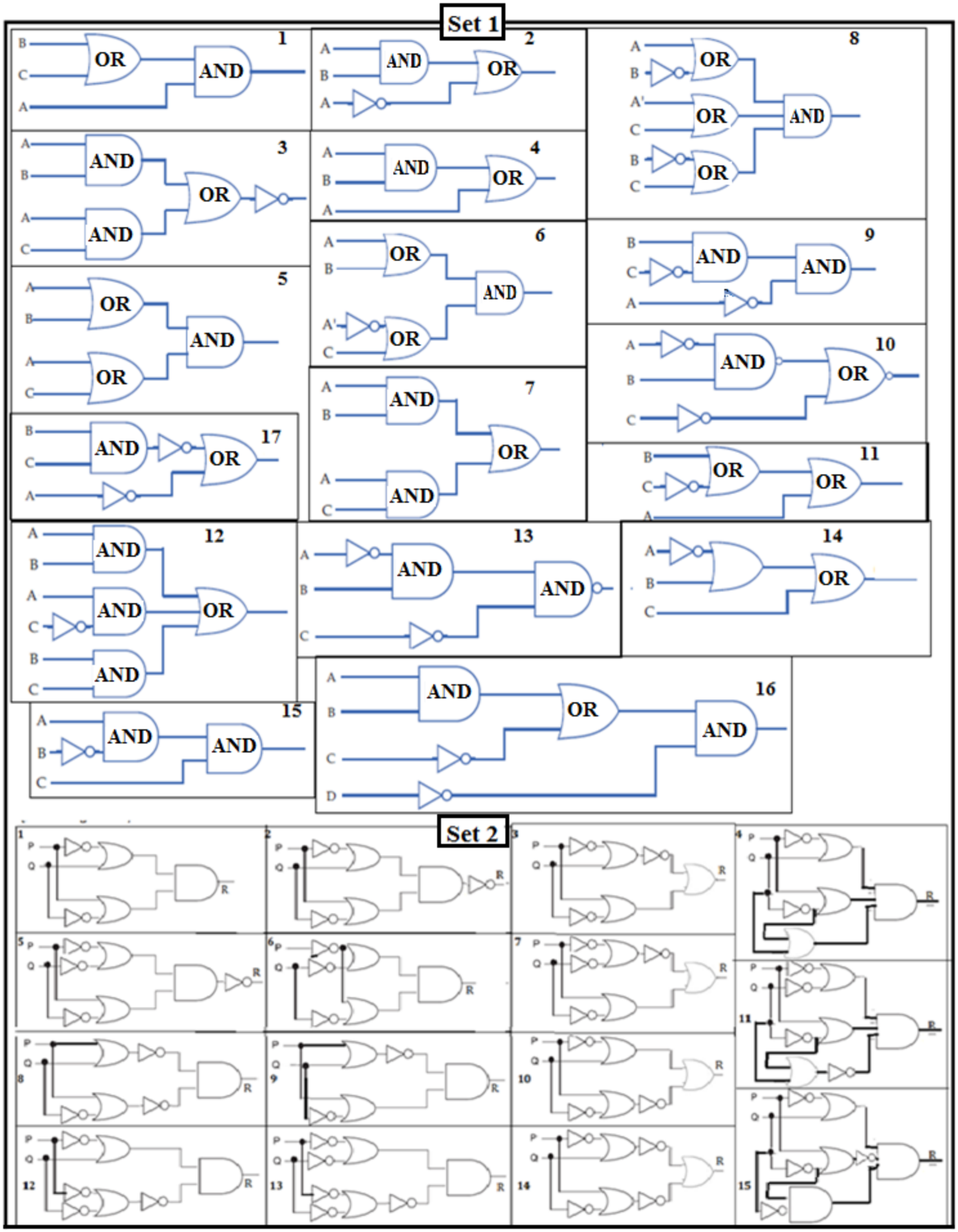
A	B	A+B	A.B
0	0	0	0
0	1	1	0
1	0	1	0
1	1	1	1

A	B	A'	B'	AB	A'B'	A'B	AB'
0	0	1	1	0	1	0	0
0	1	1	0	0	0	1	0
1	0	0	1	0	0	0	1
1	1	0	0	1	0	0	1

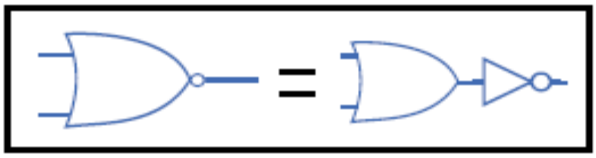
A	B	C
0	0	0
0	0	1
0	1	0
0	1	1
1	0	0
1	0	1
1	1	0
1	1	1

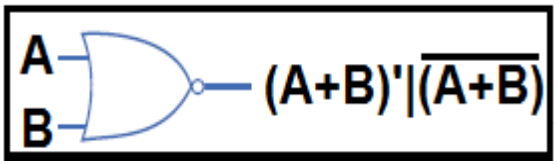


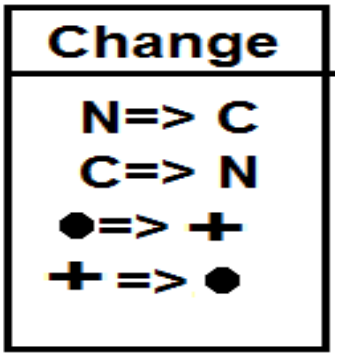
1. XY+XY
2. XZ+Y'Z
3. X'Y'+XY
4. X+YZ'
5. X'Y'+YZ'
6. AB+BC+C'D
7. AB'C+C'D
8. ABC+AB'C
9. XY'+Z
10. A(B'+C)
11. (X+Y)(X+Z')
12. (X'+Y')(X+Y')(X'+Y)
13. X(Y'+Z)
14. A(B'+C')
15. (A+B+C')(A'+B'+C)
16. (X+Y)(X'+Y')
17. *(C+B)A*
18. *AB+A'*
19. *(AB+AC)'*
20. *AB+A*
21. *(A+B)(A+C)*
22. *(A+B)(A+C)*
23. *AB+AC*
24. *(A+B')(A'+C)(B'+C)*
25. *A'B'C'*
26. *A'B+C'*
27. *B+C'+A*
28. *AB+AC'+BC*
29. *A'BC*
30. *A'+B+C*
31. *AB'C*
32. *(AB+C')D'*
33. *(BC)'+A'*
34. *(P'+Q)(Q'+P)*
35. *((P'+Q)(P+Q))'*
36. *(P'+Q)'+(Q'+P)*
37. *(P'+Q)(P+Q')(Q'+Q)*
38. *((P'+Q')(Q'+P))'*
39. *(P'+Q')(Q'+P')*
40. *(P'+Q')+(Q'+P)*
41. *(P+Q)'(Q*
42. *(P+Q)'(Q'+P)*
43. *(P+Q)(Q'+P)'*
44. *P'+Q')(P+Q')(Q'+P')*
45. *(P'+Q)(Q'+P')'*
46. *(P'+Q')(P'+Q')*
47. *(P'+Q)'+(Q'+P)'*
48. *(P'+Q)(Q'+P)'(Q'+Q)*


Set 1
1
OR
AND
2
AND
OR
8
OR
OR
AND
OR
3
AND
AND
OR
4
AND
OR
6
OR
AND
OR
9
AND
AND
5
OR
AND
OR
10
AND
OR
7
AND
OR
AND
17
AND
OR
11
OR
OR
12
AND
AND
AND
13
AND
AND
14
OR
15
AND
AND
16
AND
OR
AND
Set 2

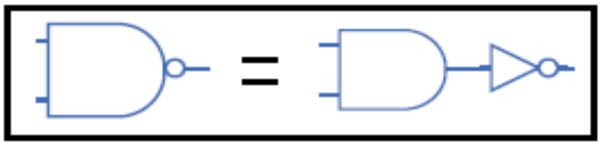
NOR => OR+NOT

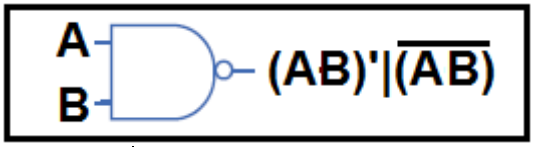






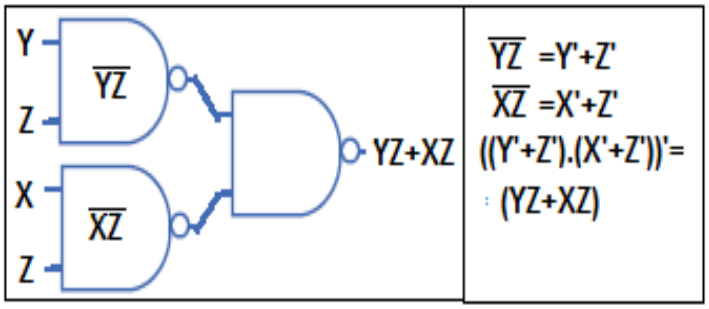
NAND =AND+NOT



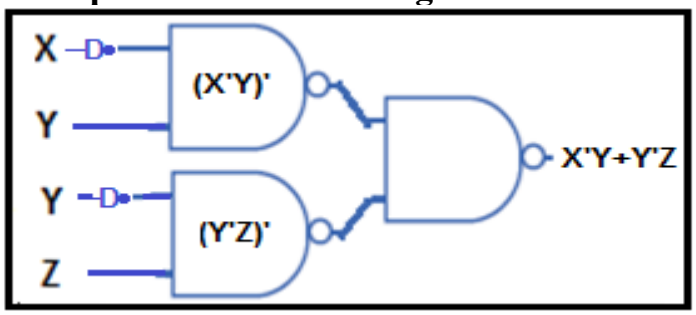


NAND+NAND=AND

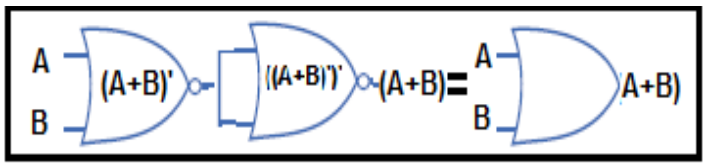
Example 1: YZ+XZ using NAND



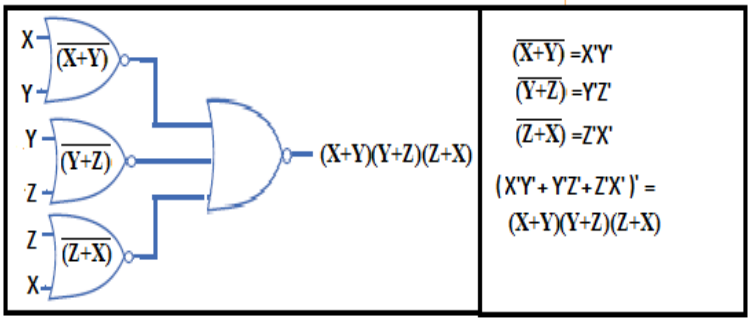
Example 2: X'Y+Y'Z using NAND



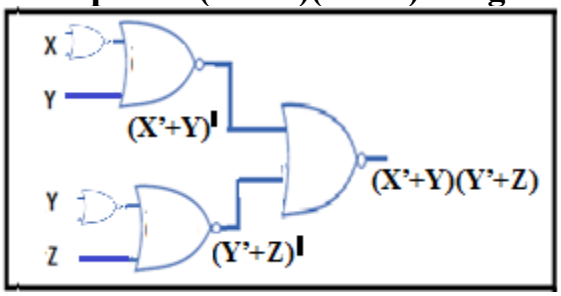
NOR+NOR=OR



Example1 : (X+Y)(Y+Z)(Z+X) using NOR



Example 2 : (X'+Y)(Y'+Z)using NOR



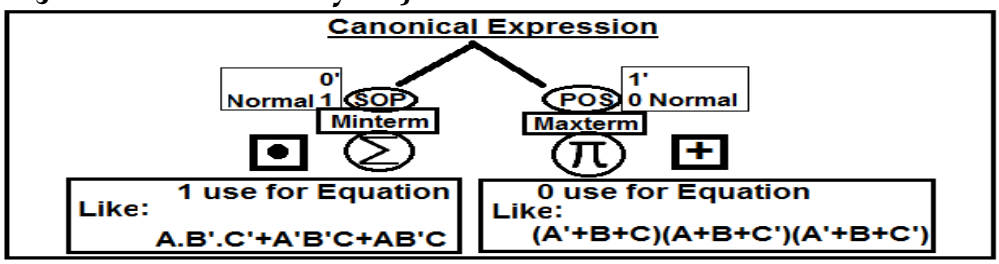
Using NAND:

1. XY+XY
2. XZ+Y'Z
3. X'Y'+XY
4. X+YZ'
5. X'Y'+YZ'
6. AB+BC+C'D
7. AB'C+C'D
8. ABC+AB'C'

Using NOR

1. XY'+Z
2. A(B'+C)
3. (X+Y)(X+Z')
4. (X'+Y')(X+Y')(X'+Y)
5. X(Y'+Z)
6. A(B'+C')
7. (A+B+C')(A'+B'+C)
8. (X+Y)(X'+Y')

Conical Forms



Example:

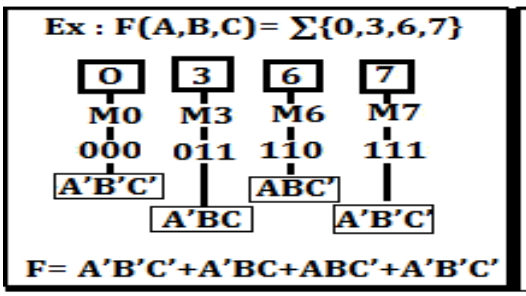
A	B	C	R	Position		SOP	POS
0	0	0	0	**0**	**M0**	A'B'C'	**A+B+C**
0	0	1	1	**1**	**M1**	**A'B'C**	A+B+C'
0	1	0	1	**2**	**M2**	**A'BC'**	A+B'+C
0	1	1	0	**3**	**M3**	A'BC	**A+B'+C'**
1	0	0	0	**4**	**M4**	AB'C'	**A'+B+C**
1	0	1	1	**5**	**M5**	**AB'C**	A'+B+C'
1	1	0	0	**6**	**M6**	ABC'	**A'+B'+C**
1	1	1	1	**7**	**M7**	**ABC**	A'+B'+C'

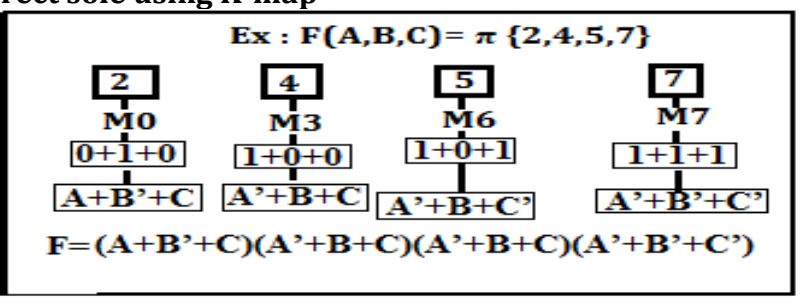
R=SOP=> A'B'C+A'BC'+AB'C+ABC OR R=∑ {1,2,5,7}

R=POS=>(A+B+C)(A+B'+C')(A'+B+C)(A'+B'+C) OR R=π{0,3,4,6}

SOP			POS		
	∑	0' & 1=>N		π	1' & 0=>N
M0	**000**	A'B'C'	**M0**	**0+0+0**	**A+B+C**
M1	**001**	**A'B'C**	**M1**	**0+0+1**	A+B+C'
M2	**010**	**A'BC'**	**M2**	**0+1+0**	A+B'+C
M3	**011**	A'BC	**M3**	**0+1+1**	**A+B'+C'**
M4	**100**	AB'C'	**M4**	**1+0+0**	**A'+B+C**
M5	**101**	**AB'C**	**M5**	**1+0+1**	A'+B+C'
M6	**110**	ABC'	**M6**	**1+1+0**	**A'+B'+C**
M7	**111**	**ABC**	**M7**	**1+1+1**	A'+B'+C'

Direct sole using K-map

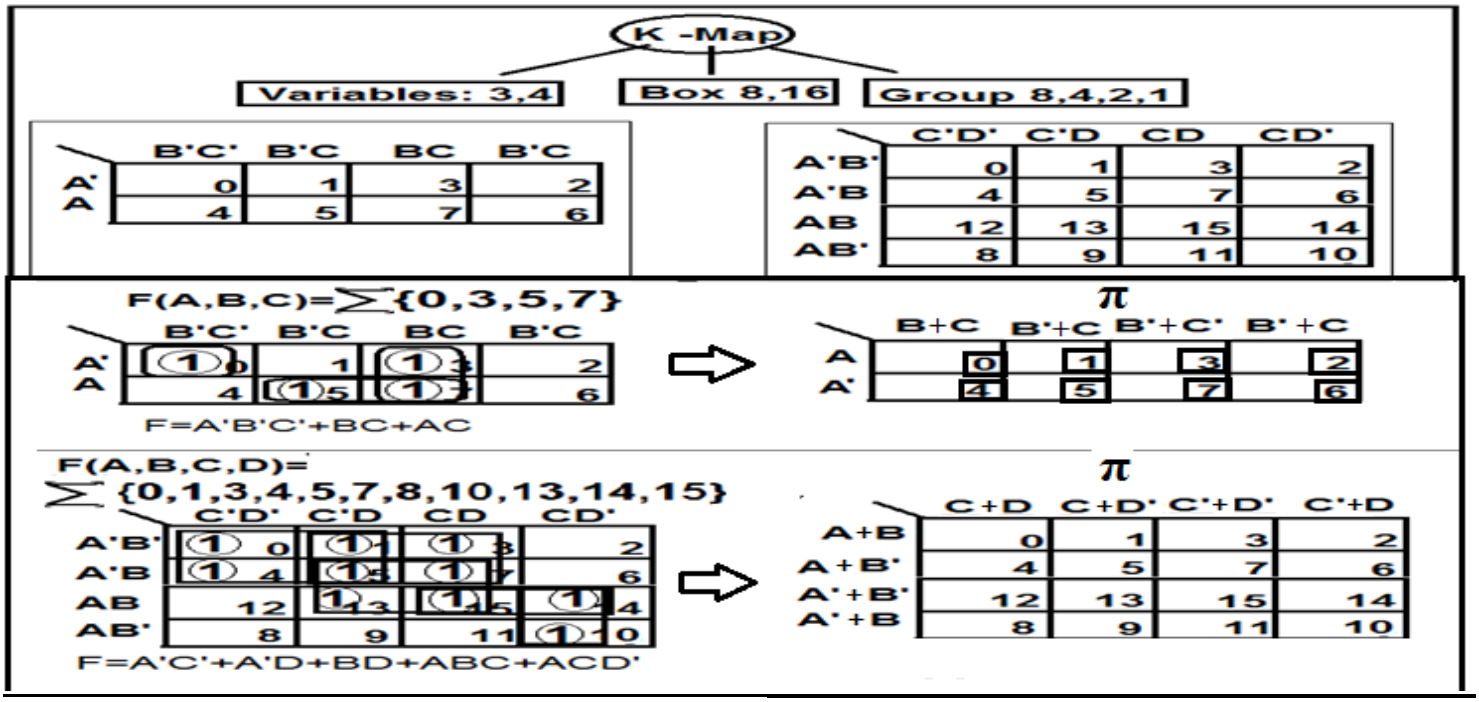


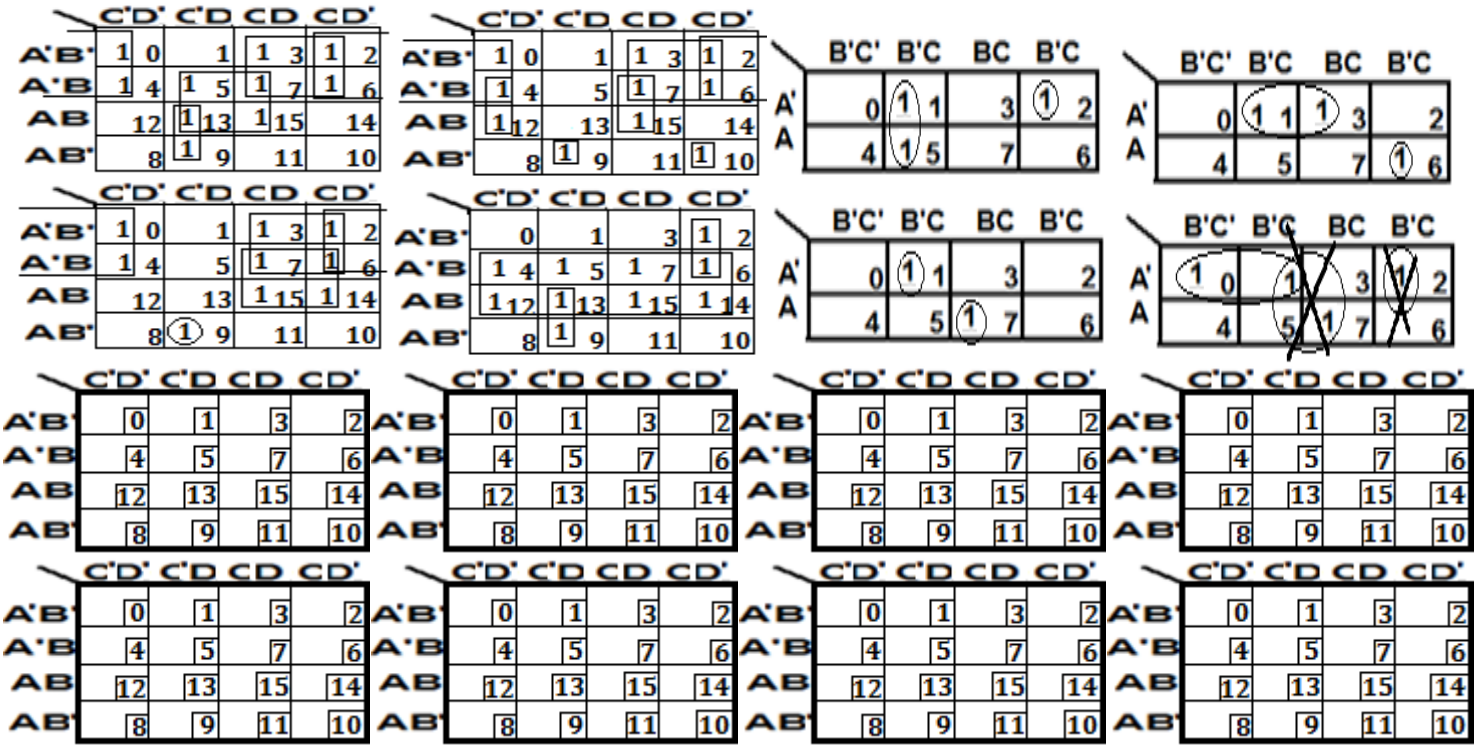


Set 3

Derive the SOP/ POS form of Boolean expression from the given truth table

A	B	C	R1	R2	R3	R4	R5	R6	R7	R8
0	0	0	0	0	0	0	0	1	1	0
0	0	1	1	1	1	1	0	1	1	0
0	1	0	1	0	0	1	1	1	1	0
0	1	1	1	1	1	1	1	1	0	0
1	0	0	1	1	0	1	0	0	0	1
1	0	1	0	0	1	1	0	0	0	1
1	1	0	0	0	0	0	1	1	0	1
1	1	1	1	1	1	1	0	1	1	1





Set 4*Find expression in SOP form*[∑]

1. F(a,b,c,d) = ∑{0,1,3,4,5,7,8,9,11,12,13,15}
2. F(a,b,c,d) = ∑{ 0,2,4,5,7,8,10,12,13,15}
3. F(X,Y,Z,W,) = ∑{ 0,1,4,5,7,8,9,12,13,15}
4. F(W,X,Y,Z) = ∑{0,2,7,8,10,15}
5. F(W,X,Y,Z) = ∑{ 0,4,8,12}
6. F(W,X,Y,Z)=Σ{2,3,6,10,11,14}
7. F(A,B,C,D)=Σ{0,1,3,4,5,6,7,9,10,11,13,15}
8. F(A,B,C,D)=Σ{0,1,2,5,6,8,9,10,13,15}
9. F(X,Y,Z)=Σ {3,4,5,6,7}
10. F(U,V,W,X)=Σ{7,9,10,11,12,13,14,15}
11. F(W,X,Y,Z)=Σ{2,3,6,10,11,14}
12. F(W,X,Y,Z) = ∑{0,1,2,36,7,9,10,11,12,13,14}

Set 5*Find expression in POS form*[∏]

F(x, y, z, w) = ∏{1,3,4,5,7,9,11,12,13,15}
F(x, y, z, w) = ∏{ 2,6,8,10,14}
F(A,B,C,D)=Π{0,1,3,4,5,6,7,9,10,11,13,15}
F(X,Y,Z)=Π{3,4,5,6,7,14,15}
F(U,V,W,X)=Π{0,2,3,7,8,10,11}
F(U,V,W,X)=Π{3,4,5,6,7,9,11,12,13,14,15}

F(A,B,C) = {0,1,2,4,5,6,7}

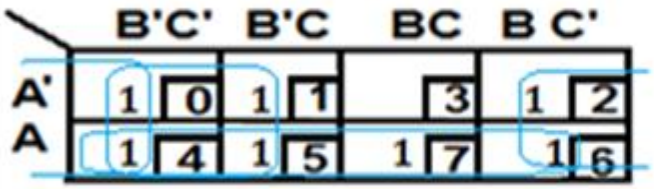


Fig 1

F(A,B,C) = {0,1,2,4,6,7}

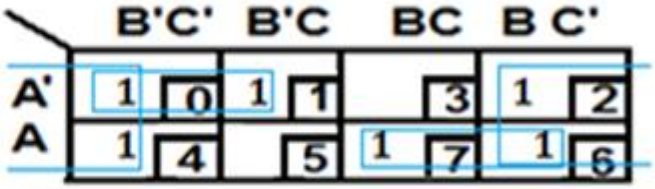


Fig 2

F(A,B,C) = {0,1,2,4,5,6}

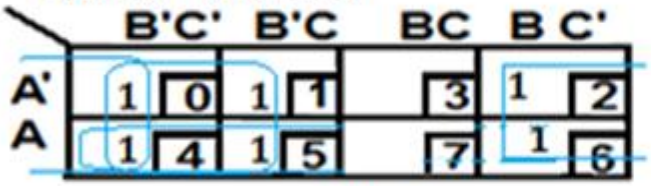


Fig 3

F(A,B,C) = {1,2,3,4,6,7}

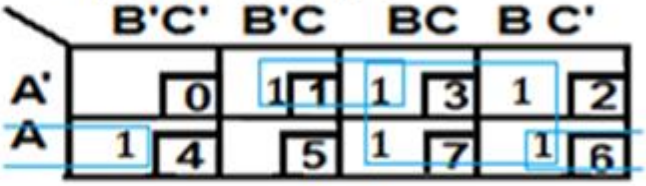


Fig 4

F(A,B,C) = {0,2,3,4,6,7}

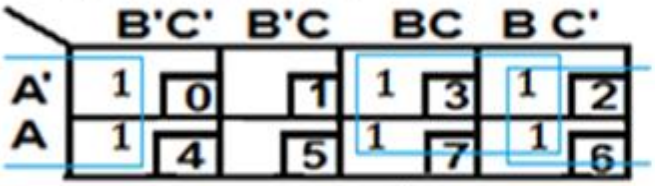


Fig 5

F(A,B,C) = {0,1,2,3,4,6}

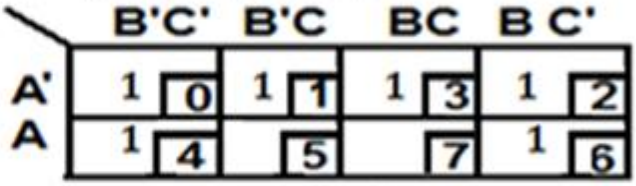


Fig 6

F(A,B,C) = {1,2,4,6,7}

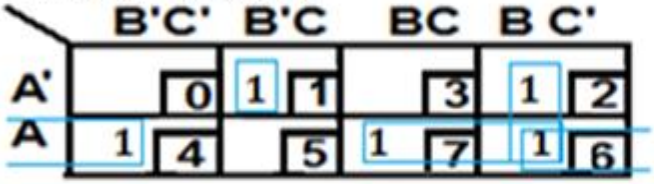


Fig 7

F(A,B,C) = {0,1,2,4,5,6,7}

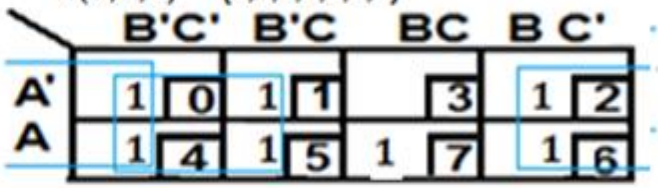


Fig 8

F(A,B,C) = {1,2,4,5,6,7}

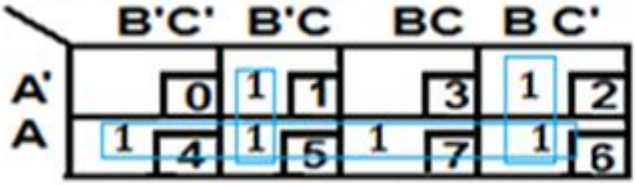


Fig 9

F(A,B,C) = {0,2,5,6,7}

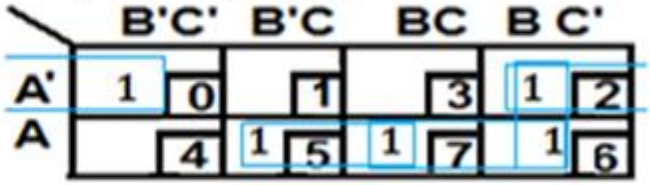


Fig 10

Fig 1 =	C'+B'+A	Fig 6 =	C'+A'
Fig 2 =	A'B'+C'+AB	Fig 7 =	A'B'C+BC'+AB+AC'
Fig 3 =	B'+C'	Fig 8 =	C'+B' +A
Fig 4 =	A'C+B+AC'	Fig 9 =	A+B'C+BC'
Fig 5 =	B+C'	Fig 10 =	A'C'+AC+BC'+AB

F(A,B,C,D)

{0,1,3,4,7,8,10,11,12,14}

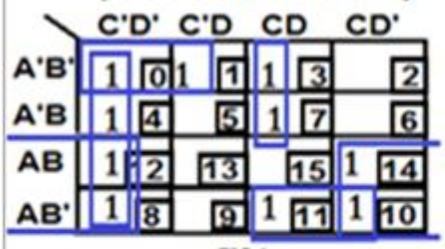


FIG 1

{0,1,3,4,8,9,10,11,12,13,14}

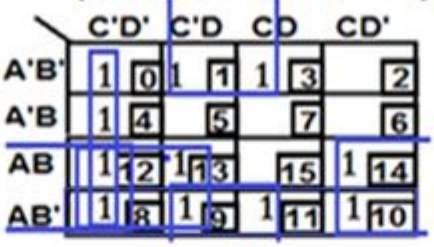


FIG 2

{0,1,3,8,9,10,13,15}

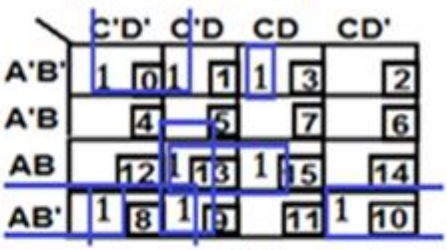


FIG 3

{0,1,2,3,4,6,7,8,10,13,15}

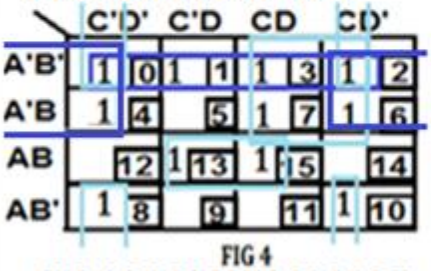


FIG 4

{0,2,4,6,8,9,11,13,15}

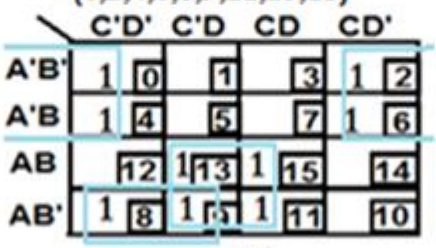


FIG 5

{0,2,6,8,9,10,11,13,15}

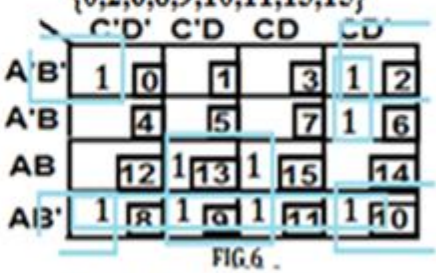


FIG.6

{0,1,6,8,9,10,11,12,13,14,15}

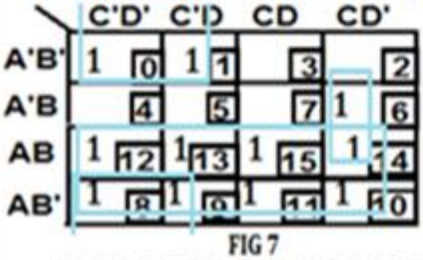


FIG 7

{0,1,6,8,10,12,14,15}

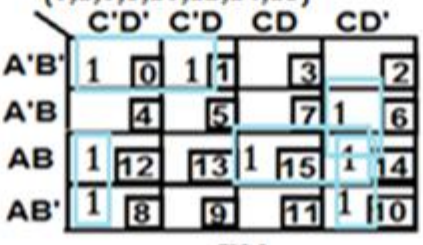


FIG 8

{0,1,6,7,8,10,14,15}

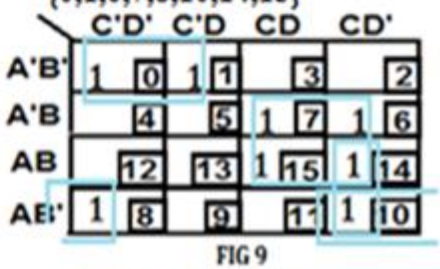


FIG 9

{0,1,2,3,6,7,8,9, 11,10,14,15}

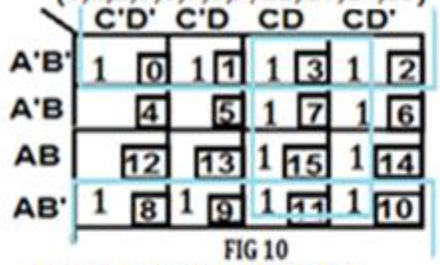


FIG 10

{0,1,2,3,5,6,8,9,10,11,13,14}

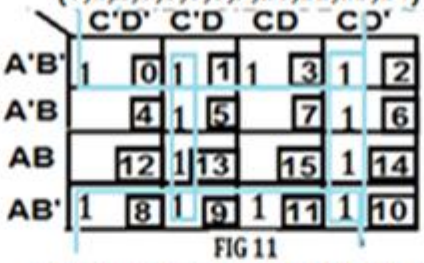


FIG 11

{0,1,2,3,4,6,8,10,14}

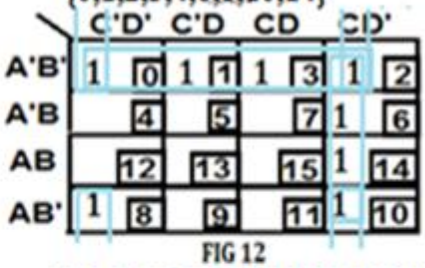


FIG 12

{0,2,3,4,5,6,8,9,12,13,14}

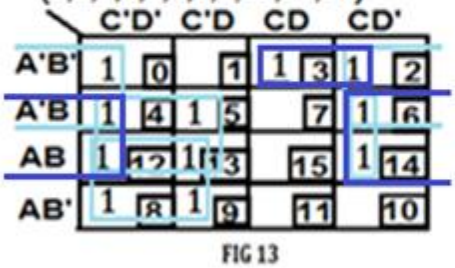


FIG 13

{0,1,2,4,5,6,7,8,9,10,12,13,14

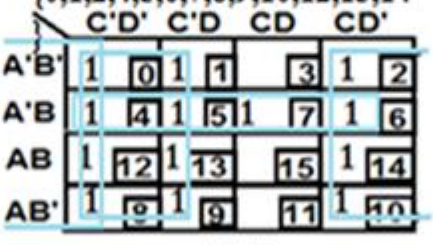


FIG 14

{0,1,2,6,7,8,9,10,12,13,14,15}

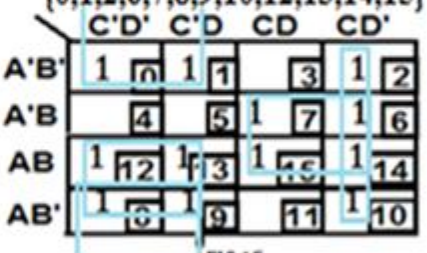


FIG 15

FIG 1 = C'D'+AD'+A'B'C'+A'CD+AB'C	FIG 6 = B'D'+AD+A'CD'+A B'	FIG 11 = B'+C'D+CD'
FIG 2 = C'B'+AC'+B'D+AD'+AB'+C'D'	FIG 7 = A+BC+BCD'	FIG 12 = A'B'+B'D'+CD'+A'D'
FIG 3 = B'C'+A'B'D+ABD+AB'D'	FIG 8 = AD'+A'B'C'+BCD'+ABC	FIG 13 = C'D'+BC'+CD'+ AC'+BD' +CA'B'
FIG 4 = A'B'+A'C +ABD+A'D' +B'D'	FIG 9 = AB'D'+AB'C'+BC	FIG 14 = C'+D'+A'B
FIG 5 = A'D'+AD+AB'C'	FIG 10 = C+B'	FIG 15 = C'B'+AC'+BC+CD'

Set 1 Logic Gates

1. *(C+B)A*
2. *AB+A'*
3. *(AB+AC)'*
4. *AB+A*
5. *(A+B)(A+C)*
6. *(A+B)(A+C)*
7. *AB+AC*
8. *(A+B')(A'+C)(B'+C)*
9. *A'BC'*
10. *((A'B)'+C')'*
11. *B+C'+A*
12. *AB+AC'+BC*
13. *AB'C*
14. *A'+B+C*
15. *AB'C*
16. *(AB+C')D'*
17. *(BC)'+A'*

Set 2 Logic Gates

1. *(P'+Q)(Q'+P)*
2. *((P'+Q)(P+Q))'*
3. *(P'+Q)'+(Q'+P)*
4. *(P'+Q)(P+Q')(Q'+Q)*
5. *((P'+Q')(Q'+P))'*
6. *(P'+Q')(Q'+P')*
7. *(P'+Q')+(Q'+P)*
8. *(P+Q)'(Q'+P)'*
9. *(P+Q)'(Q'+P)*
10. *(P+Q)(Q'+P)'*
11. *P'+Q')(P+Q')(Q'+P')*
12. *(P'+Q)(Q'+P')'*
13. *(P'+Q')(P'+Q')*
14. *(P'+Q)'+(Q'+P)'*
15. *(P'+Q)(Q'+P)'(Q'+Q)*

Set 3 POS/SOP

R1	**SOP**	*A'B'C+A'BC'+A'BC+AB'C'+ABC*
	POS	*(A+B+C)(A'+B+C')(A'+B'+C)*
R2	**SOP**	*A'B'C+A'BC+AB'C'+ABC*
	POS	*(A+B+C)(A+B+C)(A'+B+C')(A'+B'+C)*
R3	**SOP**	*A'B'C+A'BC+AB'C+ABC*
	POS	*(A+B+C)(A+B'+C)(A'+B+C)(A'+B'+C)*
F4	**SOP**	*A'B'C+A'BC'+A'BC+AB'C'+AB'C+ABC*
	POS	*(A+B+C)(A+B'+C)*
R5	**SOP**	*A'BC'+A'BC+ABC'*
	POS	*(A+B+C)(A+B+C')(A'+B+C')(A'+B'+C')(A'+B+C)*
R6	**SOP**	*A'B'C'+A'B'C+A'BC'+A'BC+ABC'+ABC*
	POS	*(A'+B+C)(A'+B+C')*
R7	**SOP**	*A'B'C'+A'B'C+A'BC'+ABC*
	POS	*(A+B'+C')(A'+B+C)(A'+B+C')(A'+B'+C)*
R8	**SOP**	*AB'C'+AB'C+ABC'+ABC*
	POS	*(A+B+C)(A+B+C)(A+B'+C)(A+B'+C')*

Unsolve Problems

Set 4 Find expression in SOP form [∑]

F(a,b,c,d) = ∑{0,1,3,4,5,7,8,9,11,12,13,15}

1

	C'D'	C'D	CD	CD'
A'B'	0	1	3	2
A'B	4	5	7	6
AB	12	13	15	14
AB'	8	9	11	10

F(a,b,c,d) = ∑{ 0,2,4,5,7,8,10,12,13,15}

2

	C'D'	C'D	CD	CD'
A'B'	0	1	3	2
A'B	4	5	7	6
AB	12	13	15	14
AB'	8	9	11	10

F(X,Y,Z,W,) = ∑{ 0,1,4,5,7,8,9,12,13,15}

3

	C'D'	C'D	CD	CD'
A'B'	0	1	3	2
A'B	4	5	7	6
AB	12	13	15	14
AB'	8	9	11	10

F(W,X,Y,Z) = ∑{0,2,7,8,10,15}

4

	C'D'	C'D	CD	CD'
A'B'	0	1	3	2
A'B	4	5	7	6
AB	12	13	15	14
AB'	8	9	11	10

F(W,X,Y,Z) = ∑{ 0,4,8,12}

5

	C'D'	C'D	CD	CD'
A'B'	0	1	3	2
A'B	4	5	7	6
AB	12	13	15	14
AB'	8	9	11	10

F(W,X,Y,Z)=Σ{2,3,6,10,11,14}

6

	C'D'	C'D	CD	CD'
A'B'	0	1	3	2
A'B	4	5	7	6
AB	12	13	15	14
AB'	8	9	11	10

F(A,B,C,D)=Σ{0,1,3,4,5,6,7,9,10,11,13,15}

7

	C'D'	C'D	CD	CD'
A'B'	0	1	3	2
A'B	4	5	7	6
AB	12	13	15	14
AB'	8	9	11	10

F(A,B,C,D)=Σ{0,1,2,5,6,8,9,10,13,15}

8

	C'D'	C'D	CD	CD'
A'B'	0	1	3	2
A'B	4	5	7	6
AB	12	13	15	14
AB'	8	9	11	10

F(X,Y,Z)=Σ {3,4,5,6,7}

9

	C'D'	C'D	CD	CD'
A'B'	0	1	3	2
A'B	4	5	7	6
AB	12	13	15	14
AB'	8	9	11	10

F(U,V,W,X)=Σ{7,9,10,11,12,13,14,15}

10

	C'D'	C'D	CD	CD'
A'B'	0	1	3	2
A'B	4	5	7	6
AB	12	13	15	14
AB'	8	9	11	10

F(W,X,Y,Z)=Σ{2,3,6,10,11,14}

11

	C'D'	C'D	CD	CD'
A'B'	0	1	3	2
A'B	4	5	7	6
AB	12	13	15	14
AB'	8	9	11	10

F(W,X,Y,Z) = ∑{0,1,2,36,7,9,10,11,12,13,14}

12

	C'D'	C'D	CD	CD'
A'B'	0	1	3	2
A'B	4	5	7	6
AB	12	13	15	14
AB'	8	9	11	10

Set 5 Find expression in POS form [Π]

F (x, y, z, w)=Π{1,3,4,5,7,9,11,12,13,15}

1

	C+D	C+D'	C'+D'	C'+D
A+B	0	1	3	2
A+B'	4	5	7	6
A'+B'	12	13	15	14
A'+B	8	9	11	10

F(x, y, z, w) = Π{ 2,6,8,10,14}

2

	C+D	C+D'	C'+D'	C'+D
A+B	0	1	3	2
A+B'	4	5	7	6
A'+B'	12	13	15	14
A'+B	8	9	11	10

F(A,B,C,D)=Π{0,1,3,4,5,6,7,9,10,11,13,15}

3

	C+D	C+D'	C'+D'	C'+D
A+B	0	1	3	2
A+B'	4	5	7	6
A'+B'	12	13	15	14
A'+B	8	9	11	10

F(X,Y,Z)=Π{3,4,5,6,7,14,15}

4

	C+D	C+D'	C'+D'	C'+D
A+B	0	1	3	2
A+B'	4	5	7	6
A'+B'	12	13	15	14
A'+B	8	9	11	10

F(U,V,W,X)=Π{0,2,3,7,8,10,11}

5

	C+D	C+D'	C'+D'	C'+D
A+B	0	1	3	2
A+B'	4	5	7	6
A'+B'	12	13	15	14
A'+B	8	9	11	10

F(U,V,W,X)=Π{3,4,5,6,7,9,11,12,13,14,15}

6

	C+D	C+D'	C'+D'	C'+D
A+B	0	1	3	2
A+B'	4	5	7	6
A'+B'	12	13	15	14
A'+B	8	9	11	10