Tabular Method

Step 1

- In the 1st column, list all the minterms in binary for which the output is a 1 or don't care.

Step 2

- Arrange the terms present in column 1 and column 2 considering the number of 1’s in each term.

Step 3

- Identify terms that differ from another by only 1 digit and list them in the 3rd column.
- Replace the different digit by hyphen (-).

Step 4

- Repeat step 3 until no more combination can be made.

Step 5

- The term which are not carried to the next column are called “PRIME IMPLICANTS”.
- Select sufficient prime implicants to cover all the minterms.
- For this purpose, prepare a “table of choice” (prime implicant table).

Prime Implicant (PI)

- To prepare a table of choice, write PI's in rows and minterms in columns and check the minterms covered by each PI.
- If a Minterm is present only in one PI, that PI is called and "Essential PI"

  - Implicants – Groups of 1's
  - Prime Implicants – Largest groups of 1's
  - Essential Prime implicant – Having at least 1 minterm that cannot group any other way

Step 6

- Select the optimal set of PI; which covers all the original minterms, and this gives the solution.

Example

- Z = f (A, B, C, D)
  - Z= 1 for the minterms (0, 3, 5, 11, 13)
  - Z = don’t care for the minterms (1, 4, 12)
  - Z = 0 for the remaining minterms

- Simplify Z using:
  - K – Map method
  - Tabular method

Step 1

Z = f (A, B, C, D)

Z= 1 for the minterms (0, 3, 5, 11, 13)

Z = don't care for the minterms (1, 4, 12)

Z = 0 for the remaining minterms

	col1		col2		col3		col4
MT	ABCD	MT	ABCD	MT	ABCD	MT	ABCD
0							
3							
5							
11							
13							
1							
4							
12							

A	B	C	D	
0	0	0	0	m0
0	0	0	1	m1
0	0	1	0	m2
0	0	1	1	m3
0	1	0	0	m4
0	1	0	1	m5
0	1	1	0	m6
0	1	1	1	m7
1	0	0	0	m8
1	0	0	1	m9
1	0	1	0	m10
1	0	1	1	m11
1	1	0	0	m12
1	1	0	1	m13
1	1	1	0	m14
1	1	1	1	m15

Step 1

Z = f (A, B, C, D)

Z= 1 for the minterms (0, 3, 5, 11, 13)

Z = don't care for the minterms (1, 4, 12)

Z = 0 for the remaining minterms

	col1		col2		col3		col4
MT	ABCD	MT	ABCD	MT	ABCD	MT	ABCD
0	**0000**						
3	**0011**						
5	**0101**						
11	**1011**						
13	**1101**						
1	**0001**						
4	**0100**						
12	**1100**						

A	B	C	D	
0	0	0	0	m0
0	0	0	1	m1
0	0	1	0	m2
0	0	1	1	m3
0	1	0	0	m4
0	1	0	1	m5
0	1	1	0	m6
0	1	1	1	m7
1	0	0	0	m8
1	0	0	1	m9
1	0	1	0	m10
1	0	1	1	m11
1	1	0	0	m12
1	1	0	1	m13
1	1	1	0	m14
1	1	1	1	m15

Step 2

	col1		col2		col3		col4
MT	ABCD	MT	ABCD	MT	ABCD	MT	ABCD
0	0000	**0**	**0000**				
3	0011						
5	0101						
11	1011						
13	1101						
1	0001						
4	0100						
12	1100						

Step 2

	col1		col2		col3		col4
MT	ABCD	MT	ABCD	MT	ABCD	MT	ABCD
0	0000	**0**	**0000**				
3	0011	**1**	**0001**				
5	0101	**4**	**0100**				
11	1011						
13	1101						
1	0001						
4	0100						
12	1100						

Step 2

	col1		col2		col3		col4
MT	ABCD	MT	ABCD	MT	ABCD	MT	ABCD
0	0000	**0**	**0000**				
3	0011	**1**	**0001**				
5	0101	**4**	**0100**				
11	1011	**3**	**0011**				
13	1101	**5**	**0101**				
1	0001	**12**	**1100**				
4	0100						
12	1100						

Step 2

	col1		col2		col3		col4
MT	ABCD	MT	ABCD	MT	ABCD	MT	ABCD
0	0000	**0**	**0000**				
3	0011	**1**	**0001**				
5	0101	**4**	**0100**				
11	1011	**3**	**0011**				
13	1101	**5**	**0101**				
1	0001	**12**	**1100**				
4	0100	**11**	**1011**				
12	1100	**13**	**1101**				

Step 3

	col1		col2		col3		col4
MT	ABCD	MT	ABCD	MT	ABCD	MT	ABCD
0	0000	0	0000	**(0,1) (0,4)**	**000 – 0 – 00**		
3	0011	1	0001				
5	0101	4	0100				
11	1011	3	0011				
13	1101	5	0101				
1	0001	12	1100				
4	0100	11	1011				
12	1100	13	1101				

Step 3

	col1		col2		col3		col4
MT	ABCD	MT	ABCD	MT	ABCD	MT	ABCD
0	0000	0	0000	**(0,1)** **(0,4)**	**000 –** **0 – 00**		
3	0011	1	0001	**(1,3)** **(1,5)**	**00 – 1** **0 – 01**		
5	0101	4	0100	**(4,5)** **(4,12)**	**010 –** **– 100**		
11	1011	3	0011				
13	1101	5	0101				
1	0001	12	1100				
4	0100	11	1011				
12	1100	13	1101				

Step 3

	col1		col2		col3		col4
MT	ABCD	MT	ABCD	MT	ABCD	MT	ABCD
0	0000	0	0000	**(0,1)** **(0,4)**	**000 –** **0 – 00**		
3	0011	1	0001	**(1,3)** **(1,5)**	**00 – 1** **0 – 01**		
5	0101	4	0100	**(4,5)** **(4,12)**	**010 –** **– 100**		
11	1011	3	0011	**(3,11)**	**– 011**		
13	1101	5	0101	**(5,13)**	**– 101**		
1	0001	12	1100	**(12,13)**	**110 –**		
4	0100	11	1011				
12	1100	13	1101				

Step 3

	col1		col2		col3		col4
MT	ABCD	MT	ABCD	MT	ABCD	MT	ABCD
0	0000	0	0000	**(0,1)** **(0,4)**	**000 –** **0 – 00**	**(0,1,4,5)** **(0,4,1,5)**	**0 – 0 –** **0 – 0 –**
3	0011	1	0001	**(1,3)** **(1,5)**	**00 – 1** **0 – 01**		
5	0101	4	0100	**(4,5)** **(4,12)**	**010 –** **– 100**		
11	1011	3	0011	**(3,11)**	**– 011**		
13	1101	5	0101	**(5,13)**	**– 101**		
1	0001	12	1100	**(12,13)**	**110 –**		
4	0100	11	1011				
12	1100	13	1101				

Step 3

	col1		col2		col3		col4
MT	ABCD	MT	ABCD	MT	ABCD	MT	ABCD
0	0000	0	0000	**(0,1)** **(0,4)**	**000 –** **0 – 00**	**(0,1,4,5)** **(0,4,1,5)**	**0 – 0 –** **0 – 0 –**
3	0011	1	0001	**(1,3)** **(1,5)**	**00 – 1** **0 – 01**	**(4,5,12,13)** **(4,12,5,13)**	**– 10 –** **– 10 –**
5	0101	4	0100	**(4,5)** **(4,12)**	**010 –** **– 100**		
11	1011	3	0011	**(3,11)**	**– 011**		
13	1101	5	0101	**(5,13)**	**– 101**		
1	0001	12	1100	**(12,13)**	**110 –**		
4	0100	11	1011				
12	1100	13	1101				

Step 3

	col1		col2		col3		col4
MT	ABCD	MT	ABCD	MT	ABCD	MT	ABCD
0	0000	0	0000	**(0,1)** **(0,4)**	**000 –** **0 – 00**	**(0,1,4,5)** **(0,4,1,5)**	**0 – 0 –** **0 – 0 –**
3	0011	1	0001	**(1,3)**	**00 – 1**	**(4,5,12,13)** **(4,12,5,13)**	**– 10 –** **– 10 –**
				(1,5)	**0 – 01**		
5	0101	4	0100	**(4,5)** **(4,12)**	**010 –** **– 100**		
11	1011	3	0011	**(3,11)**	**– 011**		
13	1101	5	0101	**(5,13)**	**– 101**		
1	0001	12	1100	**(12,13)**	**110 –**		
4	0100	11	1011				
12	1100	13	1101				

Step 3

	col1		col2		col3		col4
MT	ABCD	MT	ABCD	MT	ABCD	MT	ABCD
0	0000	0	0000	**(0,1)**	**000 –**	**(0,1,4,5)**	**0 – 0 –**
				(0,4)	**0 – 00**	**(0,4,1,5)**	**0 – 0 –**
3	0011	1	0001	**(1,3)**	**00 – 1**	**(4,5,12,13)**	**– 10 –**
				(1,5)	**0 – 01**	**(4,12,5,13)**	**– 10 –**
5	0101	4	0100	**(4,5)**	**010 –**		
				(4,12)	**– 100**		
11	1011	3	0011	**(3,11)**	**– 011**		
13	1101	5	0101	**(5,13)**	**– 101**		
1	0001	12	1100	**(12,13)**	**110 –**		
4	0100	11	1011				
12	1100	13	1101				

P

Q

R

S

Prime Implicant Table

	MT / PI	0	3	5	11	13	1	4	12
$\overline{A}\overline{C}$	P								
$B\overline{C}$	Q								
$\overline{A}\overline{B}D$	R								
$\overline{B}CD$	S								

Prime Implicant Table

	MT / PI	0	3	5	11	13	1	4	12
$\overline{A}\overline{C}$	P	√		√			√	√	
$B\overline{C}$	Q								
$\overline{A}\overline{B}D$	R								
$\overline{B}CD$	S								

Prime Implicant Table

	MT / PI	0	3	5	11	13	1	4	12
$\overline{A}\overline{C}$	P	√		√			√	√	
$B\overline{C}$	Q			√		√		√	√
$\overline{A}\overline{B}D$	R		√				√		
$\overline{B}CD$	S		√		√				

$$Z = P + Q + S$$

Prime Implicant Table

	MT / PI	0	3	5	11	13	1	4	12
$\bar{A}\bar{C}$	P	√		√			√	√	
$B\bar{C}$	Q			√		√		√	√
$\bar{A}\bar{B}D$	R		√				√		
$\bar{B}CD$	S		√		√				

Z = P + Q+ S

$$Z = \bar{A}\bar{C} + B\bar{C} + \bar{B}CD$$

using K – Maps

Z = f (A, B, C, D)

Z= 1 for the minterms (0, 3, 5, 11, 13)

Z = don’t care for the minterms (1, 4, 12)

Z = 0 for the remaining minterms

using K – Maps

Z = f (A, B, C, D)

Z= 1 for the minterms (0, 3, 5, 11, 13)

Z = don't care for the minterms (1, 4, 12)

Z = 0 for the remaining minterms

X: AB \ CD	00	01	11	10
00	0	1	3	2
01	4	5	7	6
11	12	13	15	14
10	8	9	11	10

using K – Maps

Z = f (A, B, C, D)

Z= 1 for the minterms (0, 3, 5, 11, 13)

Z = don't care for the minterms (1, 4, 12)

Z = 0 for the remaining minterms

X / AB \ CD	00	01	11	10
00	0 1	1 X	3 1	2
01	4 X	5 1	7	6
11	12 X	13 1	15	14
10	8	9	11 1	10

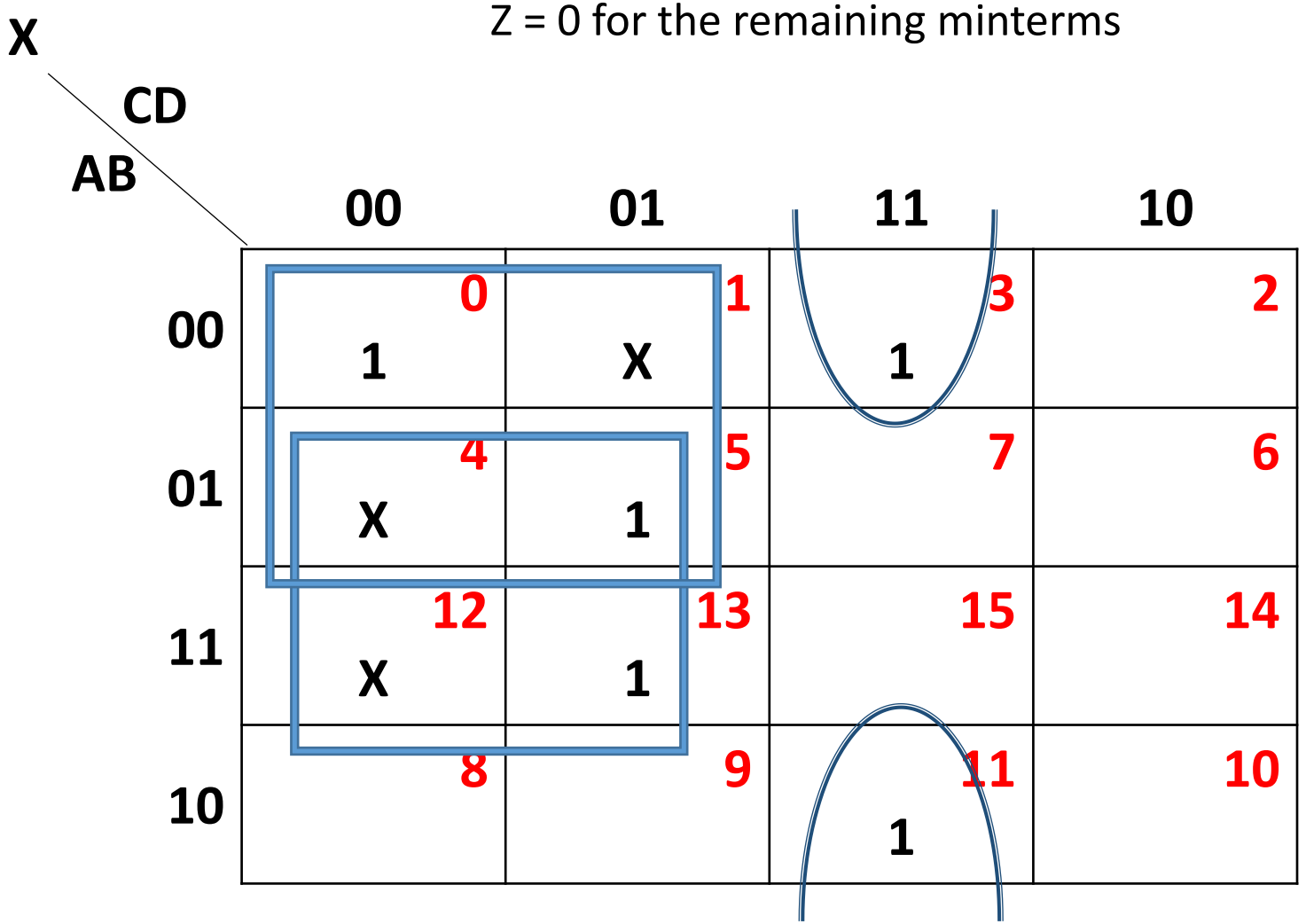
using K – Maps

Z = f (A, B, C, D)

Z= 1 for the minterms (0, 3, 5, 11, 13)

Z = don't care for the minterms (1, 4, 12)

Z = 0 for the remaining minterms



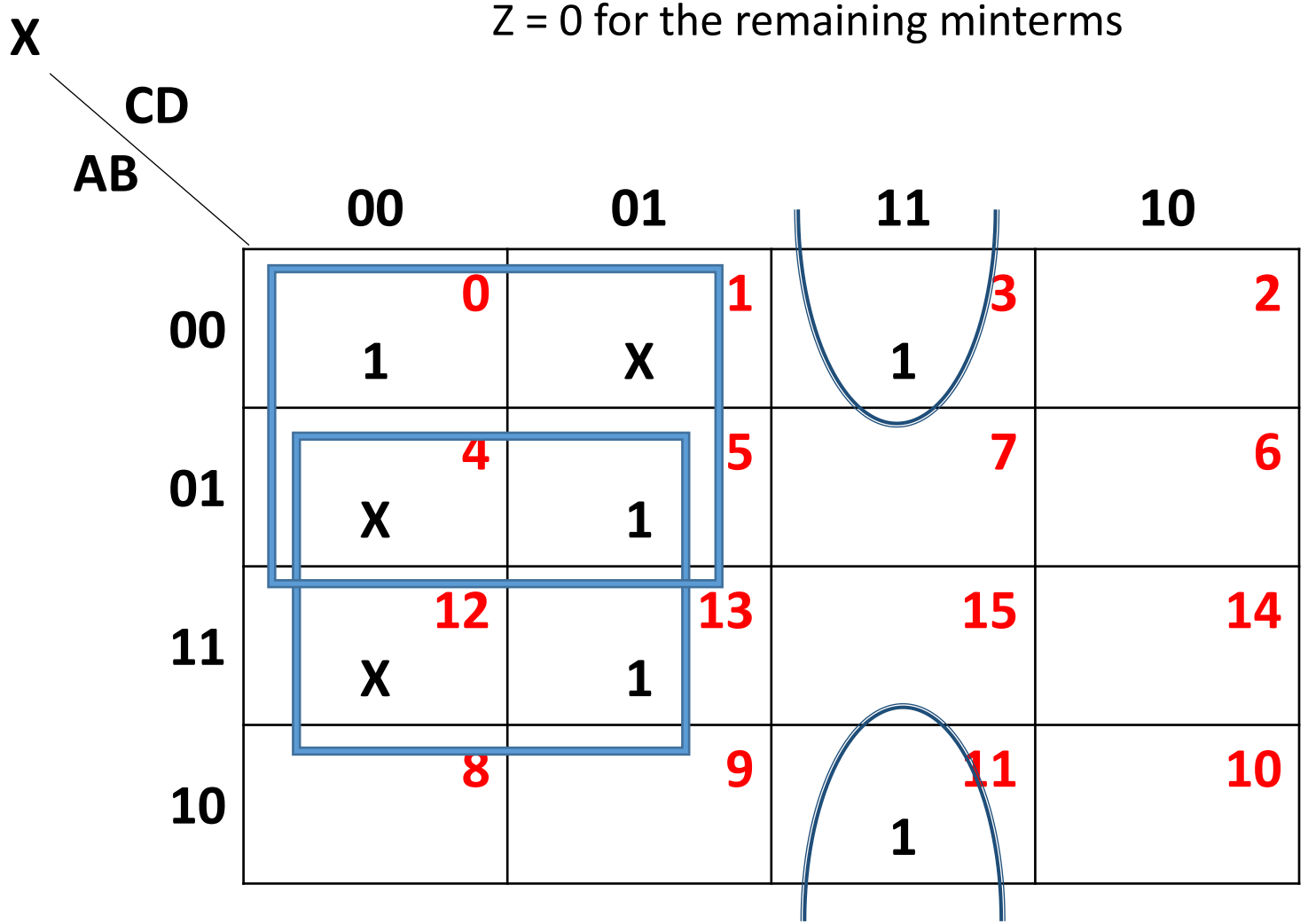
using K – Maps

Z = f (A, B, C, D)

Z= 1 for the minterms (0, 3, 5, 11, 13)

Z = don't care for the minterms (1, 4, 12)

Z = 0 for the remaining minterms



$$Z = \bar{A}\bar{C} + B\bar{C} + \bar{B}CD$$

Exercise - 01

- Z = f (A, B, C, D)
  - Z= 1 for the minterms (0, 2, 5, 11, 13, 15)
  - Z = don’t care for the minterms (7, 8 ,10)
  - Z = 0 for the remaining minterms

- Simplify Z using:
  - K – Map method
  - Tabular method

Exercise - 02

- Z = f (A, B, C, D)
  - Z= 1 for the minterms (3, 6, 8, 12, 13, 14)
  - Z = don’t care for the minterms (2, 7, 9)
  - Z = 0 for the remaining minterms

- Simplify Z using:
  - K – Map method
  - Tabular method

NIBM POWERING GREAT MINDS

Step 1

Z = f (A, B, C, D)

Z= 1 for the minterms (3, 6, 8, 12, 13,14)

Z = don't care for the minterms (2,7,9)

Z = 0 for the remaining minterms

	col1		col2		Col3		col4
MT	ABCD	MT	ABCD	MT	ABCD	MT	ABCD
3	0011	**8**	1000	8,12	1_00	8,9,12,13	1_0_
6	0110	**2**	0010	8,9	100_	2,3,6,7	0_1_
8	1000	**3**	0011	2,3	001_		
12	1100	**6**	0110	2,6	0_10		
13	1101	**12**	1100	3,7	0_11		
14	1110	**9**	1001	6,14	_110		
2	0010	**13**	1101	6,7	011_		
7	0111	**14**	1110	12,13	110_		
9	1001	**7**	0111	12,14	11_0		
				9,13	1_01		

A	B	C	D	
0	0	0	0	m0
0	0	0	1	m1
0	0	1	0	m2
0	0	1	1	m3
0	1	0	0	m4
0	1	0	1	m5
0	1	1	0	m6
0	1	1	1	m7
1	0	0	0	m8
1	0	0	1	m9
1	0	1	0	m10
1	0	1	1	m11
1	1	0	0	m12
1	1	0	1	m13
1	1	1	0	m14
1	1	1	1	m15

MT PI	3	6	8	12	13	14	2	7	9
P			√	√	√				√
Q	√	√					√	√	
R		√				√			
S				√		√			

A’C+AC’+BCD’

Exercise - 03

- Z = f (A, B, C, D)
  - Z= 1 for the minterms (7, 8, 9, 10, 14, 15)
  - Z = don’t care for the minterms (6, 12)
  - Z = 0 for the remaining minterms

- Simplify Z using:
  - K – Map method
  - Tabular method