

Subject : Digital Logic Minimization

DPP-02

1. For the given Boolean function $f(A, B, C) =$

$$\sum_m(0,1,5,6)$$

Simplified output will be

- (a) $\bar{A}\bar{B} + \bar{B}\bar{C} + \bar{A}\bar{B}\bar{C}$
- (b) $\bar{A}\bar{B} + \bar{B}\bar{C} + \bar{A}\bar{B}\bar{C}$
- (c) $\bar{A}\bar{B} + \bar{B}\bar{C} + \bar{A}\bar{B}\bar{C}$
- (d) $\bar{A}\bar{B} + \bar{B}\bar{C} + \bar{A}\bar{B}\bar{C}$

2. For the given Boolean function $f(A, B, C) =$

$$\sum_m(1,3,6,7) + \sum d(0,2)$$

- (a) $A + B$
- (b) $B + C$
- (c) $\bar{A} + B$
- (d) $\bar{A}C + AB$

3. What is the other canonical form of the given function

$$f(A, B, C) = \sum_m(0,1,2,3,4,5,6,7)$$

- (a) $f(A, B, C) = \prod_M(0,1,2,3,4,5,6,7)$
- (b) $f(A, B, C) = \prod_M(0, 2, 4, 7)$
- (c) $f(A, B, C) = \prod_M(1,2,4,7)$
- (d) Does not exist

4. The product of all the maxterms of a given Boolean function is always equal to _____?

- (a) 0
- (b) 1
- (c) 2
- (d) Complement of the function

5. The simplified SOP form of the k-map is

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

- (a) $\bar{x}\bar{z} + \bar{w}\bar{x}\bar{y}$
- (b) \bar{x}
- (c) $\bar{w}\bar{x} + wx$
- (d) $\bar{x}\bar{z}$

6. The Boolean function $f(A, B, C, D) =$

$$\sum_m(5,7,9,11,13,15)$$

- (a) A
- (b) C
- (c) B
- (d) B and C

7. The simplified Boolean function is

A	BC			
	00	01	11	10
0	1	0	1	0
1	0	1	0	1

- (a) $A \oplus B \oplus C$
- (b) $A \oplus B \odot C$
- (c) $A \odot B \odot C$
- (d) $A \odot B \oplus C$

8. The simplified Boolean expression $f(w, x, y, z) = \sum_m(0, 2, 5, 9, 15) + \sum_d(6, 7, 8, 10, 12, 13)$
- (a) $\bar{x}\bar{z} + w\bar{y} + xz$ (b) $\bar{x}\bar{z} + w\bar{y} + x\bar{z}$
- (c) $x\bar{z} + w\bar{y} + \bar{x}z$ (d) $\bar{x}\bar{z} + \bar{w}\bar{y} + xz$

9. The minimum number of NAND gate required to simplify k-map

A \ BC	BC			
	00	01	11	10
0	1	1	0	0
1	0	0	1	1

- (a) 4 (b) 5
- (b) 3 (d) 9

10. The simplified expression of k-map is independent of variables

A \ BC	BC			
	00	01	11	10
0	1	1	1	1
1	1	1	1	1

- (a) A (b) B
- (c) C (d) A, B and C

Answer Key

1. (b)
2. (c)
3. (d)
4. (a)
5. (b)
6. (b)

7. (b, d)
8. (a)
9. (b)
10. (d)



Hints and Solutions

1. (b)

Given: $f(A, B, C) = \sum_m(0,1,5,6)$

3 variable k-map

BC \ A	00	01	11	10
0	1	1	0	0
1	0	1	0	1

Group-I: (0,1) and (1,1) are grouped together.
Group-II: (0,1) and (1,1) are grouped together.
Group-III: (1,1) and (1,0) are grouped together.

The simplified output expression $f(A, B, C) = \bar{A}\bar{B} + \bar{B}C + ABC$

2. (c)

Given: $f(A, B, C) = \sum_m(1,3,6,7) + \sum_d(0,2)$

3-variable k-map

BC \ A	00	01	11	10
0	x	1	1	x
1	0	0	1	1

Group-I: (0,1) and (1,1) are grouped together.
Group-II: (1,1) and (1,0) are grouped together.

$\therefore f(A, B, C) = \bar{A} + B$

3. (d)

Given: $f(A, B, C) = \sum_m(0,1,2,3,4,5,6,7)$

In these functions are min terms are covering.

The relation between min terms and max terms is

$x_j = \bar{x}_j$

\therefore Hence max term does not exist

4. (a)

The product of all the max terms is always zero.

5. (b)

Given: k-map

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

$f(w, x, y, z) = \bar{x}$

6. (b)

k-map of 4-variables

CD \ AB	00	01	11	10
00	0	0	0	0
01	0	1	1	0
11	0	1	1	0
10	0	1	1	0

$f(A, B, C, D) = BD + AD$

\therefore function is independent of C.

7. (b, d)

A \ BC	00		01		11		10	
	0	1	0	1	0	1	0	1
0	1	0	1	0	1	0	1	0
1	0	1	0	1	0	1	0	1

$$f(A, B, C) = \bar{A}\bar{B}\bar{C} + \bar{A}BC + A\bar{B}\bar{C} + ABC$$

$$f(A, B, C) = \bar{A}(B \odot C) + A(B \oplus C)$$

$$f(A, B, C) = \bar{A}(\overline{B \odot C}) + A(B \oplus C)$$

$$f(A, B, C) = \bar{A}(B \odot C) + A(\overline{B \oplus C})$$

$$f(A, B, C) = A \oplus B \odot C \text{ or } A \odot B \oplus C$$

8. (a)

wx \ yz	00		01		11		10	
	0	1	0	1	0	1	0	1
00	1	0	0	1	0	1	0	1
01	0	1	×	×	×	×	×	×
11	×	×	1	0	×	×	×	×
10	×	1	0	×	×	×	×	×

$$f(w, x, y, z) = \bar{x}\bar{z} + w\bar{y} + xz$$

9. (b)

A \ BC	00		01		11		10	
	0	1	0	1	0	1	0	1
0	1	1	0	0	1	1	0	0
1	0	0	1	1	0	0	1	1

$$f(A, B, C) = \bar{A}\bar{B} + AB$$

$$f(A, B, C) = A \odot B$$

Hence 5 NAND gate required

10. (d)

A \ BC	00		01		11		10	
	0	1	0	1	0	1	0	1
0	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1

$$f(A, B, C) = 1$$

Hence independent of A, B and C.

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