## **Branch: CS & IT**

# **Subject: Minimization**

**Topic: K-Map Basic** 

DPP-02

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

$$\sum_{m} (0,1,5,6)$$

Simplified output will be

- (a)  $A\bar{B} + B\bar{C} + AB\bar{C}$
- (b)  $\overline{A}\overline{B} + \overline{B}\overline{C} + AB\overline{C}$
- (c)  $A\overline{B} + \overline{B}\overline{C} + \overline{A}\overline{B}C$
- (d)  $\overline{A}\overline{B} + \overline{B}\overline{C} + AB\overline{C}$
- 2. For the given Boolean function f(A, B, C) =

 $\sum_{m} (1,3,6,7) + \sum_{m} d(0,2)$  simplified output will be

- (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)  $f(A,B,C) = \Pi_M(0,1,2,3,4,5,6,7)$
- (b)  $f(A, B, C) = \Pi_M(0, 2, 4, 7)$
- (c)  $f(A,B,C) = \Pi_M(1,2,4,7)$
- (d) Does not exist
- **4.** The product of all the maxterms of a givne 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

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

- (a)  $\overline{x} \overline{z} + \overline{w} \overline{x} \overline{y}$
- (b)  $\overline{x}$
- (c)  $\overline{w} \overline{x} + w x$
- (d)  $\overline{x}\overline{z}$
- **6.** The Boolean function f(A, B, C, D) =

 $\sum_{m}$  (5,7,9,11,13,15) is independent of variables

- (a) A
- (b) C
- (c) B
- (d) B and C
- 7. The simplified Boolean function is

AB	C 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)  $A \odot B \oplus C$

- The simplified Boolean expression f(w, x, y, z) = $\sum\nolimits_{m}\! \left(0,2,5,9,15\right) \! + \! \sum\nolimits_{d}\! \left(6,7,8,10,12,13\right)$ 
  - (a)  $\overline{x}\overline{z} + w\overline{y} + xz$  (b)  $\overline{x}\overline{z} + w\overline{y} + x\overline{z}$

  - (c)  $x \overline{z} + w \overline{y} + \overline{x} z$  (d)  $\overline{x} \overline{z} + \overline{w} \overline{y} + x z$
- The minimum number of NAND gate required to simplify k-map

A	C 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

ABO	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)

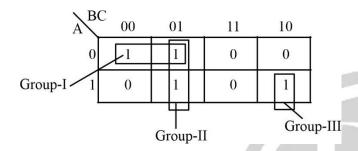


### **Hints and Solutions**

#### 1. (b)

Given: 
$$f(A, B, C) = \sum_{m} (0,1,5,6)$$

3 variable k-map



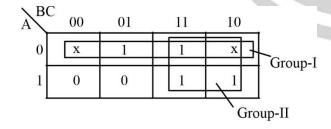
The simplified output expression f(A, B, C) =

$$\bar{A}\bar{B} + \bar{B}C + AB\bar{C}$$

#### 2. (c)

Given: f (A, B, C) = 
$$\sum_{m} (1,3,6,7) + \sum_{d} (0,2)$$

3-variable k-map



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

#### 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

$$x_j = \overline{x}_j$$

: 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	х	1	
01	0	0	0	0	
11	0	0	0	0	
10	1	Х	Х	1	

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

#### **6. (b)**

k-map of 4-variables

$\setminus C$	D			
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)

$A^{B}$	C 00	01	11	10
0		0	( <u>-</u> )	0
1	0	1	0	1

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

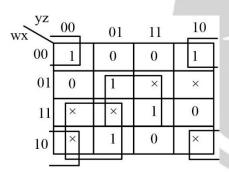
$$f(A,B,C) = \overline{A}(B \odot C) + A(B \oplus C)$$

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

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

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

8. (a)



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

**9. (b)** 

ABO	00	01	11	10
0	1	1	0	0
1	0	0	1	1

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

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

Hence 5 NAND gate required

10. (d)

ABO	00	01	11	10	
0	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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