Branch:CS & IT Hinglish

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) $A\overline{B}+B\overline{C}+AB\overline{C}$

(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) = $\sum_m(1,3,6,7)+\sum d(0,2)$ simplified output will be

(a) A + B

(b) B + C

(c) $\overline{A}+B$

(d) $\overline{A}C+AB$

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) = Π_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	x	1
01	0	0	0	0
11	0	0	0	0
10	1	x	x	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

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	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	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

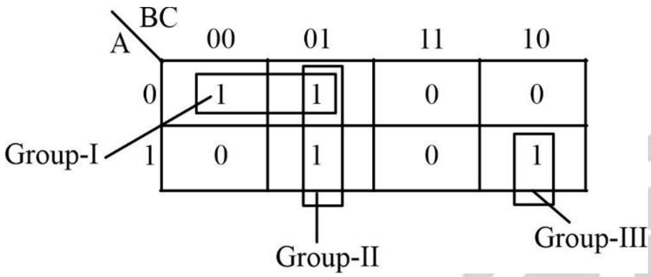
1. **(b)**
2. **(c)**
3. **(d)**
4. **(a)**
5. **(b)**
6. **(b)**
7. **(b, d)**
8. **(a)**
9. **(b)**
10. **(d)**

Hints and Solutions

1. **(b)**

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

3 variable k-map



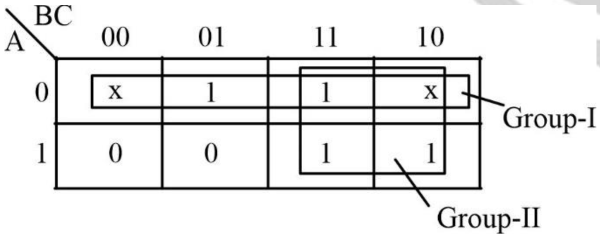
The simplified output expression f (A, B, C) =

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

2. **(c)**

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

3-variable k-map



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

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

$x_j=\bar{x}_j$

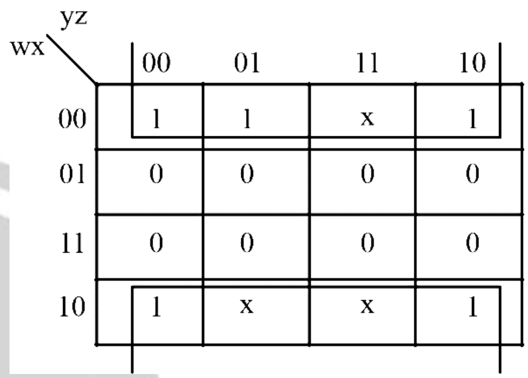
$\therefore$ Hence max term does not exist

4. **(a)**

The product of all the max terms is always zero.

5. **(b)**

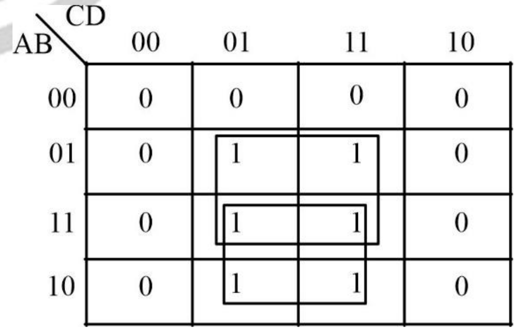
Given: k-map



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

6. **(b)**

k-map of 4-variables



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

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

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

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

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

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

8. (a)

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

f(A, B, C) = 1

Hence independent of A, B and C.