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

(c) $A\bar{B}+\bar{B}\bar{C}+\bar{A}\bar{B}C$

(d) $\bar{A}\bar{B}+\bar{B}\bar{C}+AB\bar{C}$

**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) $\bar{A}+B$

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

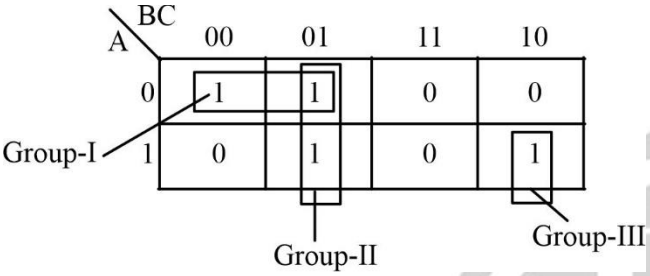
1. **(b)**
2. **(c)**
3. **(d)**
4. **(a)**
5. **(b)**
6. **(b)**
7. **(b, d)**
8. **(a)**
9. **(b)**
10. **(d)**

# Hints and Solutions

**1.** **(b)**

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

3 variable k-map



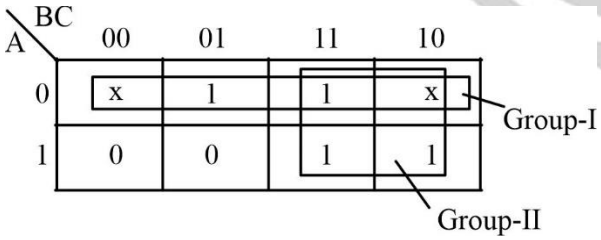

The simplified output expression f (A, B, C) =

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

**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

$x_j=\bar{x}_j$

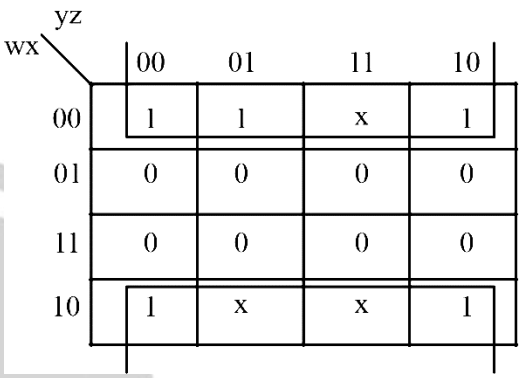
$\therefore$ Hence max term does not exist

**4.** **(a)**

The product of all the max terms is always zero.

**5.** **(b)**

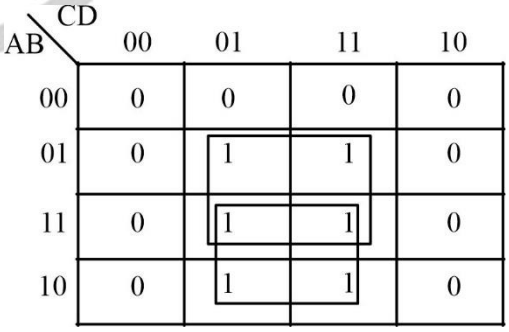
Given: k-map




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

**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.