

Tutorial-6

$$\begin{aligned}
 \text{(i)} \quad & ((AB)' + A' + AB)' \\
 &= (\overline{A+B+A+AB}) \\
 &= (\overline{A+B+AB})' \\
 &= (A \cdot B)(A' + B') = 0
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii)} \quad & (B+BC)(B+B'C)(B+D) \\
 &= B(1+C)(B+B'C)(B+D) \\
 &= B(B+B'C)(B+D) \\
 &= B(B+B')(B+C)(B+D) \\
 &= B(B+C)(B+D) \\
 &= (BB+BC)(B+D) \\
 &= (B+BC)(B+D) = B
 \end{aligned}$$

$$\begin{aligned}
 \text{(iii)} \quad & (X+Y)(X+\overline{Y})(\overline{X}+Z) \\
 &= (X+Y\overline{Y})(\overline{X}+Z) \\
 &= X(\overline{X}+Z) = XZ
 \end{aligned}$$

$$\begin{aligned}
 \text{(iv)} \quad & ABC + A'B + ABC' \\
 &= AB(C+C') + A'B \\
 &= AB + A'B = B
 \end{aligned}$$

$$\begin{aligned}
 (V) \quad & ABCD + ABC\bar{D} + AB\bar{C}D + ABCDE + ABC\bar{D}E + ABC\bar{D}\bar{E} \\
 &= ABCD(1+E) + ABC\bar{D} + ABC\bar{D}(1+\bar{E}) + ABC\bar{D}(1+E) \\
 &= ABCD + ABC\bar{D} + ABC\bar{D} + ABC\bar{D} \\
 &= \cancel{ABD} ABD(C+\bar{C}) + ABD(C+\bar{C}) \\
 &= AB(D+\bar{D}) = AB
 \end{aligned}$$

$$\begin{aligned}
 2a \quad & F(A, B, C) = \sum m(1, 2, 4, 6, 7) \\
 & \bar{F} = \sum m(0, 3, 5) \\
 & F = A'B'C' + A'BC + AB'C
 \end{aligned}$$

$$\begin{aligned}
 2b \quad & f = \sum m(0, 2, 6, 11, 13, 14) \\
 & (ABCD) \\
 & = \sum m(1, 3, 4, 5, 7, 8, 9, 10, 12, 15) \\
 & = A'B'C'D + A'B'CD + A'BC'D + A'BCD \\
 & + A'BC'D + A'BC'D + A'BC'D + A'BC'D + ABCD
 \end{aligned}$$

$$\begin{aligned}
 2c \quad & F(x, y, z) = \prod M(0, 3, 6, 7) \\
 & \bar{F} = \sum m(0, 3, 6, 7) \\
 & F = \bar{x}y\bar{z} + x'y\bar{z} + x\bar{y}z' + xy\bar{z}
 \end{aligned}$$

$$\begin{aligned}
 3(a) \quad & \cancel{F} F = \sum m(2, 3, 6, 7) \\
 & F = x\bar{y}z' + x'y\bar{z} + x\bar{y}z' + xy\bar{z}
 \end{aligned}$$

3b $F = \sum m(0, 1, 4, 5)$
 $= x'y'z' + x'yz' + xy'z' + xy'z$

3c $F = x'yz' + x'yz + xy'z' + xy'z$
 $= x'y(z' + z) + xy(z' + z)$
 $= x'y + xy$
 $= y(x + x) \Rightarrow F = y$

4. (a) $f = \prod M(0, 4, 5, 6, 7, 10, 14)$

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

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

(b) $F = \sum m(2, 8, 9, 10, 11, 12, 14)$

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

$$= AD' + AB' + B'CD'$$

5. There are 2 answers.

(1)

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

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

(2)

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

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