

Lec 08 Assignment

② (a) $x y + x' y' z' + x' y z'$

$$= x y + x' z' (y' + y)$$

$$= x y + x' z' (1)$$

$$= x y + x' z'$$

$x \backslash yz$	00	01	11	10
0	1	0	0	1
1	0	0	1	1

(b) $x' y' + y z + x' y z'$

$$x' y' + y z + x' y z'$$

$$x' y' + y (z + x' z')$$

$x \backslash yz$	00	01	11	10
0	1	1	1	1
1	0	0	1	0

(c) $x' y + y z' + y' z'$

$$x' y + z' (y + y')$$

$$x' y + z' (1)$$

$$x' y + z'$$

$x \backslash yz$	00	01	11	10
0	1	1	1	1
1	1	0	0	1

(d) $x' y z + x y' z' + x y' z$

$$\Rightarrow x' y z + x y' (z' + z)$$

$$\Rightarrow x' y z + x y' (1)$$

$$= x' y z + x y'$$

$x \backslash yz$	00	01	11	10
0	0	0	1	0
1	1	1	0	0

③ 4-variable K-map

AB \ CD	00	01	11	10
00	m ₀	m ₁	m ₃	m ₂
01	m ₄	m ₅	m ₇	m ₆
11	m ₁₂	m ₁₃	m ₁₅	m ₁₄
10	m ₈	m ₉	m ₁₁	m ₁₀

$$(a) F(A, B, C, D) = \sum (4, 6, 7, 15)$$

$$= m_4 + m_6 + m_7 + m_{15}$$

$$\Rightarrow \bar{A}\bar{B}C'D + \bar{A}BCD + \bar{A}BCD' + ABCD$$

$$\Rightarrow \bar{A}\bar{B}[C'D + CD] + BC[A'D + AD]$$

$$\Rightarrow \bar{A}\bar{B}(1) + BC(1)$$

$$\Rightarrow \underline{\bar{A}\bar{B} + BC}$$

AB \ CD	00	01	11	10
00	0	0	0	0
01	<u>1</u>	0	1	<u>1</u>
11	0	0	1	0
10	0	0	0	0

$$(b) F(A, B, C, D) = \sum (3, 7, 11, 13, 14, 15)$$

$$\Rightarrow m_3 + m_7 + m_{11} + m_{13} + m_{14} + m_{15}$$

$$\Rightarrow \bar{A}\bar{B}CD + \bar{A}BCD + \underline{\bar{A}BCD} + \underline{ABC\bar{D}} + \underline{ABC\bar{D}'} + \underline{ABCD}$$

$$\Rightarrow \underline{ABC(D' + D)} + \underline{AD(\bar{B}C + BC')} + \bar{A}CD(\bar{B} + B)$$

$$\Rightarrow ABC(1) + \bar{A}CD(1) + AD(\bar{B}C + BC')$$

$$\Rightarrow ABC + \bar{A}CD + AD(\bar{B}C + BC')$$

$$\Rightarrow C(AB + \bar{A}D) + AD(\bar{B}C + BC')$$

AB \ CD	00	01	11	10
00	0	0	<u>1</u>	0
01	0	0	<u>1</u>	0
11	<u>0</u>	<u>1</u>	<u>1</u>	<u>1</u>
10	<u>0</u>	<u>0</u>	<u>1</u>	<u>0</u>

$$(c) F(w, x, y, z) = \sum (2, 3, 12, 13, 14, 15)$$

$$\Rightarrow m_2 + m_3 + m_{12} + m_{13} + m_{14} + m_{15}$$

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

$$\Rightarrow \underline{A'B'CD'} + \underline{A'B'CD} + \underline{ABC'D'} + \underline{ABC'D} + \underline{ABCD'} + \underline{ABCD}$$

$$m_2 = A'B'CD' \quad | \quad m_{13} = ABC'D'$$

$$\Rightarrow A'B'C[D' + D] + \underline{ABD'[C' + C]} + \underline{ABD[C' + C]}$$

$$m_3 = A'B'CD \quad | \quad m_{14} = ABC'D'$$

$$\Rightarrow A'B'C(1) + ABD'(1) + ABD(1)$$

$$m_{12} = ABC'D' \quad | \quad m_{15} = ABCD$$

$$\Rightarrow A'B'C + ABD' + ABD$$

$$\Rightarrow A'B'C + AB(D' + D)$$

$$\Rightarrow A'B'C + AB(1)$$

$$\Rightarrow A'B'C + AB$$

$$(d) F(w, x, y, z) = \sum (11, 12, 13, 14, 15)$$

$$= m_{11} + m_{12} + m_{13} + m_{14} + m_{15}$$

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

$$\Rightarrow A'B'CD + ABC'D' + ABC'D + ABCD' + ABCD$$

$$m_{11} = A'B'CD \quad | \quad m_{14} = ABCD'$$

$$\Rightarrow A'B'CD + ABC'[D' + D] + ABC[D' + D]$$

$$m_{12} = ABC'D' \quad | \quad m_{15} = ABCD$$

$$\Rightarrow A'B'CD + ABC'(1) + ABC(1)$$

$$\Rightarrow A'B'CD + AB[C' + C]$$

$$\Rightarrow A'B'CD + AB(1)$$

$$\Rightarrow A'B'CD + AB$$

$$\Rightarrow A[B'CD + B]$$

$$f(x, y, z) = \sum (8, 10, 12, 13, 14)$$

$$= m_8 + m_{10} + m_{12} + m_{13} + m_{14}$$

$$\Rightarrow \underline{A'B'C'D'} + \underline{A'B'CD'} + \underline{ABC'D'} + \underline{ABC'D} + \underline{ABCD'}$$

$$\Rightarrow \underline{A'B'D'[C'+C]} + \underline{ABD'[C'+C]} + ABC'D$$

$$\Rightarrow A'B'D'(1) + ABD'(1) + ABC'D$$

$$\Rightarrow A'B'D' + ABD' + ABC'D$$

$$\Rightarrow AD'[B'+B] + ABC'D$$

$$\Rightarrow AD'(1) + ABC'D$$

$$\Rightarrow \underline{AD' + ABC'D}$$

or

$$\underline{A[D' + BC'D]}$$

AB \ CD	00	01	11	10
00	0	0	0	0
01	0	0	0	0
11	1 ₁₂	1 ₁₃	0	1 ₁₄
10	1 ₈	0	0	1 ₁₀

$$m_8 = A'B'C'D'$$

$$m_{10} = A'B'CD'$$

$$m_{12} = ABC'D'$$

$$m_{13} = ABC'D$$

$$m_{14} = ABC'D'$$

Extra
question

$$(a) \ x y + y z + x y' z$$

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

$$\sum m(3, 5, 7, 6) \text{ or } m_3 + m_5 + m_7 + m_6$$

3-Variable k-map

x \ yz	00	01	11	10
0	m ₀	m ₁	m ₃	m ₂
1	m ₄	m ₅	m ₇	m ₆

$$(b) \ C'D + ABC' + ABD' + A'B'D$$

4-variable k-map

w \ x yz	00	01	11	10
00	m ₀	m ₁	m ₃	m ₂
01	m ₄	m ₅	m ₇	m ₆
11	m ₁₂	m ₁₃	m ₁₅	m ₁₄
10	m ₈	m ₉	m ₁₁	m ₁₀