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CMPE212  
HW3

①  $f(A, B, C, D, E) = \bar{B}\bar{C}D + \bar{A}B\bar{C}E + AB\bar{D} + A\bar{E}$

AB \ CDE	000	001	011	010	100	101	111	110
	00	01	11	10	00	01	11	10
00			1	1				
01		1	1					
11	1	1		1	1	1		1
10	1		1		1			1

$\rightarrow \bar{B}\bar{C}D + \bar{A}B\bar{C}E + AB\bar{D} + A\bar{E}$

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

$\equiv \bar{B}\bar{C}D + \bar{A}B\bar{C}E + AB\bar{D} + A\bar{E}$

$\equiv \bar{B}\bar{C}D + \bar{A}B\bar{C}E + AB\bar{D} + A\bar{E}$

② a)  $f(A, B, C) = \sum m(0, 1, 5, 7)$

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

$\sum m(0, 1, 5, 7) = m_0 + m_1 + m_5 + m_7$

$\equiv 000 + 001 + 101 + 111$

$\equiv \bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + A\bar{B}C + ABC$

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

b)  $f(A, B, C, D) = \sum m(0, 1, 2, 6, 8, 9, 10, 12, 13, 15)$

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

$\sum m(0, 1, 2, 6, 8, 9, 10, 12, 13, 15)$

$\equiv 0000 + 0001 + 0010 + 0110 + 1000$

$+ 1001 + 1010 + 1100 + 1101 + 1111$

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



$$c) f(A, B, C, D, E) = \sum m(1, 3, 4, 6, 9, 11, 13, 15, 18, 25, 26, 27, 29, 30)$$

AB \ CDE								
	000	001	011	010	100	101	111	110
00		1	1		1			1
01		1	1			1	1	
11		1	1	1		1		1
10				1				

$$\sum m(1, 3, 4, 6, 9, 11, 13, 15, 18, 25, 26, 27, 29, 30)$$

$$\rightarrow m_1 + m_3 + m_4 + m_6 + m_9 + m_{11} + m_{13} + m_{15} + m_{18} + m_{25} + m_{26} + m_{27} + m_{29} + m_{30}$$

$$\equiv 00001 + 00011 + 00100 + 00110 + 01001 + 01011$$

$$+ 01101 + 01111 + 10010 + 10011 + 10101 + 10111 + 11101 + 11110$$

$$\rightarrow \bar{A}\bar{B}\bar{C}\bar{D}E + \bar{A}\bar{B}\bar{C}DE + \bar{A}\bar{B}C\bar{D}E + \bar{A}\bar{B}CDE + \bar{A}B\bar{C}\bar{D}E + \bar{A}B\bar{C}DE + \bar{A}BC\bar{D}E + \bar{A}BCDE + A\bar{B}\bar{C}\bar{D}E + A\bar{B}\bar{C}DE + AB\bar{C}\bar{D}E + AB\bar{C}DE + ABC\bar{D}E + ABCDE$$

$$\rightarrow f(A, B, C, D, E) = \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}E + B\bar{D}E + \bar{A}\bar{B}C\bar{E} + AB\bar{C}\bar{D} + A\bar{C}\bar{D}\bar{E} + AB\bar{D}\bar{E}$$

$$\therefore f(A, B, C, D, E) = \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}E + B\bar{D}E + \bar{A}\bar{B}C\bar{E} + AB\bar{C}\bar{D} + A\bar{C}\bar{D}\bar{E} + AB\bar{D}\bar{E}$$

$$③ a) f(A, B, C, D) = \sum m(1, 5, 6, 7) + d(2, 9, 11)$$

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

$$\sum m(1, 5, 6, 7) + d(2, 9, 11)$$

$$= 0001 + 0101 + 0110 + 0111$$

$$+ 0010 + 1001 + 1011$$

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

b)  $f(A, B, C, D, E) = \sum m(5, 6, 13, 15, 18, 26, 27, 31) + d(4, 9, 11, 23, 28)$

AB \ CDE	000 001 011 010				100 101 111 110			
	00	01	11	10	00	01	11	10
00					d	1	1	1
01		d	d			1	1	1
11			1	1	d		1	
10				1			d	

$\rightarrow \sum m(5, 6, 13, 15, 18, 26, 27, 31)$

$\Rightarrow 00101 + 00110 + 01101 + 01111 + 10010 + 10100 + 10111 + 11111$

$\rightarrow d(4, 9, 11, 23, 28)$

$\Rightarrow 00100 + 01001 + 01011 + 10111 + 11100$

$\therefore f(A, B, C, D, E) = \bar{A}\bar{B}C\bar{E} + AB\bar{C}D + A\bar{C}D\bar{E} + ACDE + \bar{A}BE + \bar{A}C\bar{D}E$

④ i) b)  $f(A, B, C, D) = (C + \bar{B})(A + \bar{D})(\bar{A} + C)$

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

$\rightarrow (0100)(1100)(1000)(0001)(0101)(1101)(1001)(0011)(0110)(0010)$

$\rightarrow M_4 \cdot M_{12} \cdot M_8 \cdot M_1 \cdot M_5 \cdot M_{13} \cdot M_9 + M_3 \cdot M_7 \cdot M_2$

$\rightarrow \prod M(1, 2, 3, 4, 5, 7, 8, 12, 13)$

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

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

$= (x10x)(0xx1)(1x0x)$



i) a)  $f(A, B, C, D) = (C + \bar{B})(A + \bar{D})(\bar{A} + C)$

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

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

$\rightarrow (1000) + (0011) + (0010) + (0111) + (0110) + (1110) + (1011) + (1010)$

$\rightarrow m_8 + m_3 + m_2 + m_7 + m_6 + m_{12} + m_{11} + m_{10}$

$\rightarrow \sum m(2, 3, 6, 7, 8, 10, 11, 12)$  □

ii) a)  $f(A, B, C, D) = A\bar{B}D + \bar{A}C + B\bar{C}\bar{D}$

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

$\rightarrow (0011) + (0010) + (0100) + (0111) + (0110)$

$+ (1100) + (1001) + (1011)$

$\rightarrow m_3 + m_2 + m_4 + m_7 + m_6 + m_{12} + m_9 + m_{11}$

$\rightarrow \sum m(2, 3, 4, 6, 7, 9, 11)$  □

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

$\equiv 10 \times 1 + 0 \times 1 \times + \times 100$

ii) b)  $f(A, B, C, D) = A\bar{B}C + \bar{A}C + B\bar{C}\bar{D}$

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

$= (010 \times)(1 \times 0 \times)(\times 011)$

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

$\rightarrow (0011) (0100) (0101) (1100) (1101)$

$(1000) (1001) (1011)$

$\rightarrow M_3 \cdot M_4 \cdot M_5 \cdot M_{12} \cdot M_{13} \cdot M_8 \cdot M_9 \cdot M_{11}$

$\rightarrow \prod M(3, 4, 5, 8, 9, 11, 12)$  □