Subject استاد صدیقی

Date

سید کیان کشتی پور ۹۷۳۱۰۵۳

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A) $f(A,B,C,D) = (A+C) + ((A'+B+C')D)'$

$\underbrace{(A+C) + AB'C}_{\text{جذب}} + D' = A + C + D' = A(B+B')(C+C')(D+D') + C(A+A')(B+B')(D+D')$

$+ D'(A+A')(B+B')(C+C') = A(BCD + BCD' + BC'D + BC'D' + B'CD + B'CD' + B'C'D + B'C'D')$

$+ C(ABD + ABD' + A'BD + A'BD' + AB'D + AB'D' + A'B'D + A'B'D') +$

$D'(ABC + ABC' + AB'C + AB'C' + A'BC + A'BC' + A'B'C + A'B'C')$

$= ABCD + ABCD' + ABC'D + ABC'D' + AB'CD + AB'CD' + AB'C'D + AB'C'D' +$

$A'BCD + A'BCD' + A'B'CD' + A'BC'D' + A'B'C'D' + A'B'CD$

= Σm(۰,۲,۳,۴,۶,۷,۸,۹,۱۰,۱۱,۱۲,۱۳,۱۴,۱۵)

B) $f(A,B,C,D) = (A \oplus B)' + ((A'+B) + CD)'$

$= (AB' + A'B)' + ((AB')\cdot(C'+D')) = (A'+B)(A+B') + AB'C' + AB'D$

$= A'B' + AB + AB'C' + AB'D = A'B'(C+C')(D+D') + AB(C+C')(D+D')$

$+ AB'C'(D+D') + AB'D(C+C') = A'B'CD + A'B'CD' + A'B'C'D + A'B'C'D' + ABCD$

$+ ABCD' + ABC'D + ABC'D' + AB'C'D + AB'C'D' + AB'CD$

$$C)\ f(A,B,C) = [(B+C) \oplus A'B']'[C \oplus (A+B')]$$

$$[(B+C)'(A'B')' + (B+C)(A'B')][C'(A+B') + C(A+B')']$$

$$= [B'C'(A+B') + BA'B' + A'B'C][AC' + B'C' + A'BC] =$$

$$= (AB'C' + A'B'C)(AC' + B'C' + A'BC) = AB'C'$$

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$$A)\ f(x,y,z) = XYZ' + (xYZ' + X'Z)[(x+Z)Y + XY'Z' + Y'Z]$$

$$\underbrace{XYZ' + (xYZ'[(x+z)Y + XY'Z'}_{\text{(جذب)}XYZ'} + Y'Z]) + [X'Z(x+z)Y + X'Z(XY'Z') + X'ZY'Z]$$

$$= XYZ' + X'ZY + X'ZY' = XYZ' + X'Z(\underbrace{\cancel{Y+Y'}}_{1}) = XYZ' + X'Z$$

$$B)\ f(A,B,C) = (A \oplus C)(B \oplus C) + (A \oplus B)(B \oplus C)$$

$$(A'C + AC')(B'C + BC') + (A'B + AB')(B'C + BC')$$

$$= (B'C + BC')[A'C + AC' + A'B + AB'] = A'B'C + AB'C + ABC' + A'BC'$$

$$= B'C(A + A') + BC'(A + A') = B'C + BC'$$

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C) $f(A,B,C) = \overline{(B+A')(AB+C) + ABA' + A'B'C + (A+B)(A'+C)}$

$= \overline{\underbrace{AB+BC+A'C+ABA'+A'B'C+AC+A'B+BC}_{C}}$

$= \overline{\overbrace{AB+C+\underbrace{A'B'C}_{C}+A'B}^{B}} = \overline{B+C}$

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

$= [AB(A+B) + \bar A+\bar B + \bar A\bar B + A\bar C]' = (AB+A'+\bar B+\bar A\bar B+A\bar C)' (\underbrace{A'+\underbrace{B+\bar B}_{1}+\bar A\bar B+A\bar C}_{1})'$

$= (1)' = 0$

A) $f(A,B,C) = ABC' + A'B'$

A نسبت

$\to \frac{df}{dA} = B' \oplus BC' = B'C' + (B'+C)B = B' + BC' = B' + C'$

B	C	$\frac{df}{dA}$
0	0	1
0	1	1
1	0	1
1	1	1

$\xrightarrow{\text{نسبت } B}$ $\frac{df}{dB} = A' \oplus AC' = AC' + (A'+C)A' = A'+AC' = A'+C'$

A	C	$\frac{df}{dB}$
0	0	1
0	1	1
1	0	1
1	1	0

$\xrightarrow{\text{نسبت } C}$ $\frac{df}{dC} = AB + A'B' \oplus A'B' = (A+B)(AB+A'B') + (A'+B')(A+B)A'B'$

$= (A+B)[AB + A'B' + A'B') = (A+B)(AB+A'B') = AB$

A	B	$\frac{df}{dC}$
0	0	0
0	1	0
1	0	0
1	1	1

مستقل C

وابسته

B) $f(A,B,C) = A'B'(A' + B'C)$

A نسبت به → $\frac{df}{dA} = B' \oplus 0 = B'$ B نسبت به → $\frac{df}{dB} = A' \oplus 0 = A'$

B	C	$\frac{df}{dA}$	
0	0	1	} → A وابسته
0	1	1	
1	0	0	} A مستقل
1	1	0	

A	C	$\frac{df}{dB}$
0	0	1
0	1	1
1	0	0
1	1	0

C نسبت به → $\frac{df}{dC} = \underbrace{A'B'}_{(c=0)} \oplus \underbrace{A'B'(A'+B')}_{(c=1)} = 0$ → C مستقل

A) $f(x,y,z) = x(x \oplus y) + xz(x+y')$

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

$= xy'z + xy'z' + xyz \Rightarrow SOP = \Sigma m(۴,۵,۷) = \Pi M(۰,۱,۲,۳,۶)$

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

B) $f(w,x,y,z) = xy' + \underbrace{y'z' + x'z'}_{\text{Consensus}} = xy' + x'z' = xy'(z+z')(w+w') + x'z'(y+y')(w+w')$

$= xy'zw + xy'zw' + xy'z'w + xy'z'w' + x'z'yw + x'z'yw' + x'z'y'w + x'z'y'w'$

$= \Sigma m(۰,۲,۴,۵,۸,۱۰,۱۲,۱۳)$ → SOP

$POS = \Pi M(1,۳,۶,۷,۹,11,1۴,1۵)$

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$$\left[B'+E'+A'\right]'\left[C'E'+D'A\right]=1$$

با دمورگان

$$\left(AB\underbrace{E)\left(C'}_{0\ (EE'=0)}E'+D'A\right)=1 \Rightarrow \underbrace{ABED'A}_{A}=1 \Rightarrow \begin{cases} A=1 \\ B=1 \\ E=1 \\ D=0 \end{cases}$$

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A	B	C	D	F	G	H
0	0	0	0	1	0	
		0	1	1	0	1
		1	0	0	0	1
		1	1	0	0	1
						1
0	1	0	0	0	0	1
		0	1	0	0	1
		1	0	1	0	1
		1	1	1	0	1
1	0	0	0	0	1	1
		0	1	0	0	1
		1	0	1	0	1
		1	1	1	0	1
1	1	0	0	1	0	0
		0	1	1	0	0
		1	0	0	0	0
		1	1	0	0	0

$$H=A'+B'$$

$$F=\left[(A\oplus B\oplus C)'\right]'=A\oplus B\oplus C$$

$$G=(A'+B').D'.\left((C\oplus D)+(A\oplus B\oplus C)'+A'\right)'$$