Kelsey Cameron
PID: k3593775
NID: ke110861

① @ $a'bc'd + (a' + bc)(a + c'd) + bc'd + a'bc'$ Given

$a'bc'd + a'cd' + abc + bc'd + a'bc'$ Rule #2

$bc'd(a + 1) + a'cd' + abc + a'bc'$ Distributive

$bc'd + a'cd + abc + a'bc$ Identity

$\boxed{bc'd + a'cd' + abc}$ Consensus

① (b) $(A+B+C')(A'+B'+D)(C+A'+D')(C'+A+D)$ Given

$[A(B'+D) + A'(B+C)][C(A+D) + C'(A'+D')]$ Rule #2

$(AB' + AD + A'B + AC)(CA + CD + C'A' + C'D')$ Distributive

$AB'C + AB'CD + AB'C'D' + ACD$ Distributive
$+ A'BCD' + A'BC' + A'BC'D'$
$+ A'CD + AB'D'$

$AB'C + ACD + A'BC' + A'CD + AB'D'$ Consensus

$AB'C + CD(A + A') + A'BC' + AB'D$ Distributive

$AB'C + CD + A'BC' + AB'D$ Consensus

$\boxed{A'BC' + AB'D + CD}$

② a) $DB + DCA + (BC \oplus A)$ Given

$DB + DCA + (BC)'A + A'BC$ Def of $\oplus$

$DB + DCA + (B'+C')A + A'BC$ De Morgan's

$DB + DCA + AB' + AC' + A'BC$ Distributive

$\boxed{DB + A'B' + AC' + A'BC}$ Consensus

② b) $A' \oplus B \oplus C$ Given

$(A''B + B'A) \oplus C$ Def of $\oplus$

$(AB + AB') \oplus C$ Double Negation

$C'(AB+AB') + C(AB+AB')'$ Def of $\oplus$

$C'(AB+AB') + C[(A'+B')(A'+B)]$ De Morgan's

$ABC' + AB'C' + C(A' + BA' + B'A')$ Distributive

$ABC' + AB'C' + A'C + A'BC + A'B'C$ Distributive

$\boxed{ABC' + AB'C' + A'B'C}$ Consensus

② c) $AC + A'BD' + A'BE + A'C'$ Given

$AC + A'BD' + A'BE + A'C'$

$AC + A'(BD' + BE + C')$ Distributive

$(A'+C)(A + BD' + BE + C')$ Rule # 2

$(A'+C)(B + A + BD' + C')(E + A + BD' + C')$ Distributive

$(A'+C)(B+A+C')(A+B+C'+D')$ Distributive

$(A+B+C'+E)(A+C'+D'+E)$

Absorption

$\boxed{(A'+C)(B+A+C')(A+B+C'+E)(A+C'+D'+E)}$

(3) (A) $D'B' + (D \oplus CA)$ — Given

$D'B' + D'(CA) + D(C'+A')$ — Def of $\oplus$

$D'B' + A'CD' + C'D + A'D$ — Distributive

$D'(B'+AC) + D(A'+C')$ — Distributive

$(D+B'+AC)(D'+A'+C')$ — Rule #2

$\boxed{(A+B'+D)(B'+C+D)(A'+C'+D')}$ — Rule #1

(3) (B) $CB + (A \oplus B')C' + A'B$ — Given

$CB + (AB + A'B')C' + A'B$ — Def of $\oplus$

$CB + ABC' + A'B'C' + A'B$ — Distributive

$CB + ABC' + A'B'C' + A'B + AC'$ — Consensus

$CB + A'B'C' + A'B + AC'$ — Consensus

$B(A'+C) + C'(A'B+A)$ — Distributive

$(B+C')(B+A'B+A)(A'+C+C')(A'+C+A'B+A)$ — Rule #1

$(B+C')(B+A'B+A)$ — Complementarity

$(B+C')(B+A)$ — Absorption

$\boxed{B(A+C')}$ — Distributive

(4) (a) $A'D'(B+C') + (B'+C)A'D + (B+C')(B'+C)$ Given

$D'(A'(B+C') + D(A(B'+C)) + (B+C')(B'+C)$ Commutative

$A'BD' + A'C'D' + A'B'D + A'CD + BC + B'C'$ Rule #2

$A'D'(B+B') + A'C'D' + A'CD + BC + B'C'$ Distributive

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

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

$\boxed{A' \equiv CD + B \oplus C}$

(4) (B) $A'B' + A'C' + B'D' + B'C + DC$ Given

$A'C' + B'D' + DC$ Consensus

$A'C' + B'D' + DC + DC'$ Consensus

$A'C' + B'D' + D(C+C')$ Distribute

$\boxed{A'C' + B'D' + D}$

(4) (C) $CB + BA + B'A'$

$\boxed{CB + A \equiv B}$

(5) $(A \oplus BC) + BDA' + (D \equiv B'A')$ Given

$A(B'+C') + A'BC + BDA' + (D \equiv B'A')$ Def of $\oplus$

$A(B'+C') + A'BC + BDA' + A'B'D + D'(A+B)$ Def of $\equiv$

$AB' + AC' + A'BC + BDA' + A'B'D + AD' + BD'$ Distribution

$\boxed{AB' + AC' + A'BC + A'BD + AD'}$ Consensus

⑥ ⓐ $xy' + x'z + yz' = x'y + xz' + zy'$

$xy' + x'z + yz' + x'y + xz' + zy'$ Consensus (Each Redundant term = 0)

$x'y + xz' + zy' = x'y + xz' + zy'$ Consensus

Yes.

⑥ ⓑ $AB' + CA' + BC' = CB' + AC' + A'B$

$AB' + CA' + BC' + CB' + AC' + A'B$ Consensus (Each Redundant term = 0)

$CB' + AC' + A'B = CB' + AC' + A'B$ Consensus

Yes

(7) (c) $ab'cd'e + acd + acf'gh' + abcd'e + acde' + e'h$ Given

$acd'e(b'+b) + acd(1+e') + acf'gh' + e'h$ Distributive

$acd'e + acd + acf'gh' + e'h + acde$ Consensus

$acd'e + acde + acf'gh' + e'h$ Consensus

$ace(d+d') + acf'gh' + e'h$ Distributive

$ace + acf'gh' + e'h + acf'gh + e'h'$ Consensus

$ace + acf'gh' + acf'gh + e'h + e'h'$ Consensus

$ace + acf'g(h+h') + e'(h+h')$ Distributive

$ace + acf'g + e' + ace'$ Consensus

$ac(e+e') + acf'g + e'$ Identity

$ac + acf'g + e'$ Consensus

$\boxed{acf'g + e'}$

(7) (d) $I + I'(J'+K) + K'J$ Given

$I + I'J' + I'K + K'J$ Distributive

$I + K'J + I'(K+J')$ Distributive

$K'J + (I+I')(I+K+J')$ Rule #1

$I + K + J' + K'J$ Identity

$I + J' + (K+K')(K+J)$ Rule #1

$I + J' + J + K$ Complementarity

$\boxed{1}$ Identity

⑦ (e) $DA'C' + [(B'C + A' + D')(C'A + B + D)]' + C'D'B'$

$DA'C' + C'D'B' + [D'(C'A + B) + D(B'C + A')]'$ Rule #2

$DA'C' + C'D'B' + (AC'D' + BD' + B'CD + A'D)'$ Distributive

$DA'C' + C'D'B' + (A' + C + D)(B' + D)(B + C' + D')(A + D')$ De Morgan's

$DA'C' + C'D'B' + (A'D' + A(C + D))(BD + B'(C' + D'))$ Rule #2

$DA'C' + C'D'B' + (A'D' + AC + AD)(BD + B'C' + B'D')$ Distributive

$DA'C' + C'D'B' + A'B'C'D' + A'B'D' + ABCD$ Distributive

$+ AB'CD' + ABD + AB'C'D$ Consensus

$A'B'D'(C' + C + 1) + ABD(C + 1)$ Complementarity

$+ AB'C'D + A'C'D + B'C'D'$

$A'B'D' + ABD + AB'C'D + A'C'D + B'C'D$

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

$A'B'D + ABD + B'C'D + AC'D$ Consensus

$\boxed{ABD + B'C'D}$

(7) (f)

$$EFB'A' + B'FE + A'BDC + A'DC'B + EFA'D + E'CDG$$

$$B'FE(A' + 1) + A'BD(C + C') + EFA'D + E'CDG$$ Distributive

$$B'FE + A'BD + EFA'D + E'CDG$$ Complement +

$$\boxed{B'FE + A'BD + E'DCG}$$ Consensus

Prove $= w'x'y' + w'yz + wx + wy'$

(8) (a) $(w' + x + y')(w + x' + y)(w + y' + z)$ Given

$[w'(x' + y) + w(x + y')](w + y' + z)$ Rule #2

$(w'x' + w'y + wx + wy')(w + y' + z)$ Distribution

$\{w'x'y' + w'x'z + w'yz + wx\}$ Distributive
$\{+wxy' + wxz + wy' + wy'z\}$

Consensus

$w'x'y' + w'yz + wx + wy'$ ✓

(8) (b)

Prove:

$(x' + y')(x \oplus z) + (x + y)(x \oplus z) = xz' + x'zy' + y(z \oplus x)$

$(x' + y')(xz' + x'z) + (x + y)(xz' + x'z)$ Def of $\oplus$

$x'z + xy'z' + x'y'z + xz' + xyz' + x'yz$ Distribute

$xz' + x'y'z + xyz' + x'yz$ Consensus

$xz' + x'zy' + y(xz' + x'z)$ Distribute

$xz' + x'zy' + y(z \oplus x)$ ✓

(8) (C)

Prove:

$B'D'A + D'C'B' + CDB + CBA = (D + A + B')(C + B')(D' + B)(A + B + C')$

$(D + A + B')(C + B')(D' + B)(A + B + C')$ Given

$(D + A + B')(D' + B)(C + B')(A + B + C')$ Distribute

$(BD + AD' + AB + B'D')(AC + BC + AB' + B'C')$ Distribute

$ABCD + BCD + ACD' + ABCD' + AB'D' + AB'C'D'$ Distribute
$+ ABC + AB'CD' + AB'D' + B'C'D'$

$B'D'A + D'C'B' + CDB + CBA$ ✓ Consensus