BLG231E – Assignment 2

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1.

first canonical form of y;

"true" (1) combinations: 0001   0011   0101   1001   1010   1100   1110   1111

sum of minterms: **F(A, B, C, D) = A'B'C'D + A'B'CD + A'BC'D + AB'C'D + AB'CD' + ABC'D' + ABCD' + ABCD**

second canonical form of y;

"false" (0) combinations :   0000   0010   0100   0110   0111   1000   1011   1101

product of maxterms: **F(A, B, C, D) = (A+B+C+D) (A+B+C'+D) (A+B'+C+D) (A+B'+C'+D) (A+B'+C'+D') (A'+B+C+D) (A'+B+C'+D') (A'+B'+C+D')**

2.

F(A, B, C, D) = A'B'C'D + A'B'CD + A'BC'D + AB'C'D + AB'CD' + ABC'D' + ABCD' + ABCD

A'B'C'D + A'B'CD + A'BC'D + AB'C'D + AB'CD' + ABC'D' + ABCD' + ABCD   (idempotence)

A'B'C'D + A'B'CD + A'BC'D + AB'C'D + AB'CD' + ABC'D' + **ABCD'** + ABCD **+ ABCD'** (distributivity)

A'B'C'D + A'B'CD + A'BC'D + AB'C'D + AB'CD' + ABC'D' + ABCD' + ABC**(D + D')**   (inverse)

A'B'C'D + A'B'CD + A'BC'D + AB'C'D + AB'CD' + ABC'D' + ABCD' + ABC**(1)**   (identity)

A'B'C'D + A'B'CD + A'BC'D + AB'C'D + AB'CD' + ABC'D' + ABCD' + **ABC**   (idempotence)

A'B'C'D + A'B'CD + A'BC'D + AB'C'D + AB'CD' + ABC'D' + ABCD' + ABC **+ ABCD'**   (distributivity)

A'B'C'D + A'B'CD + A'BC'D + AB'C'D + AB'CD' + **ABD'(C' + C)** + ABC + ABCD'   (inverse)

A'B'C'D + A'B'CD + A'BC'D + AB'C'D + AB'CD' + **ABD'(1)** + ABC + ABCD'   (identity)

A'B'C'D + A'B'CD + A'BC'D + AB'C'D + AB'CD' + **ABD'** + ABC + ABCD'   (commutative)

A'B'C'D + A'B'CD + A'BC'D + AB'C'D + AB'CD' + **ABCD'** + ABD' + ABC   (distributivity)

A'B'C'D + A'B'CD + A'BC'D + AB'C'D + **ACD'(B' + B)** + ABD' + ABC   (inverse)

A'B'C'D + A'B'CD + A'BC'D + AB'C'D + **ACD'(1)** + ABD' + ABC   (identity)

A'B'C'D + A'B'CD + A'BC'D + AB'C'D + **ACD'** + ABD' + ABC   (idempotence)

A'B'C'D + A'B'CD + A'BC'D + AB'C'D + ACD' + ABD' + ABC **+ A'B'C'D**   (distributivity)

A'B'D(C' + C) + A'BC'D + AB'C'D + ACD' + ABD' + ABC + A'B'C'D   (inverse)

A'B'D(1) + A'BC'D + AB'C'D + ACD' + ABD' + ABC + A'B'C'D   (identity)

A'B'D + A'BC'D + AB'C'D + ACD' + ABD' + ABC + A'B'C'D   (idempotence)

A'B'D + A'BC'D + AB'C'D + ACD' + ABD' + ABC + **A'B'C'D + A'B'C'D**   (commutative)

A'B'D + **A'B'C'D** + A'BC'D + AB'C'D + ACD' + ABD' + ABC + A'B'C'D   (distributivity)

A'B'D + **A'C'D(B' + B)** + AB'C'D + ACD' + ABD' + ABC + A'B'C'D   (inverse)

A'B'D + **A'C'D(1)** + AB'C'D + ACD' + ABD' + ABC + A'B'C'D   (identity)

A'B'D + **A'C'D** + AB'C'D + ACD' + ABD' + ABC + A'B'C'D   (commutative)

A'B'D + A'C'D + **A'B'C'D + AB'C'D** + ACD' + ABD' + ABC   (distributivity)

A'B'D + A'C'D + **B'C'D(A' + A)** + ACD' + ABD' + ABC   (inverse)

A'B'D + A'C'D + **B'C'D(1)** + ACD' + ABD' + ABC   (identity)

A'B'D + A'C'D + **B'C'D** + ACD' + ABD' + ABC   (commutative)

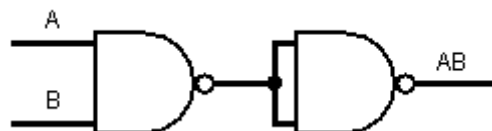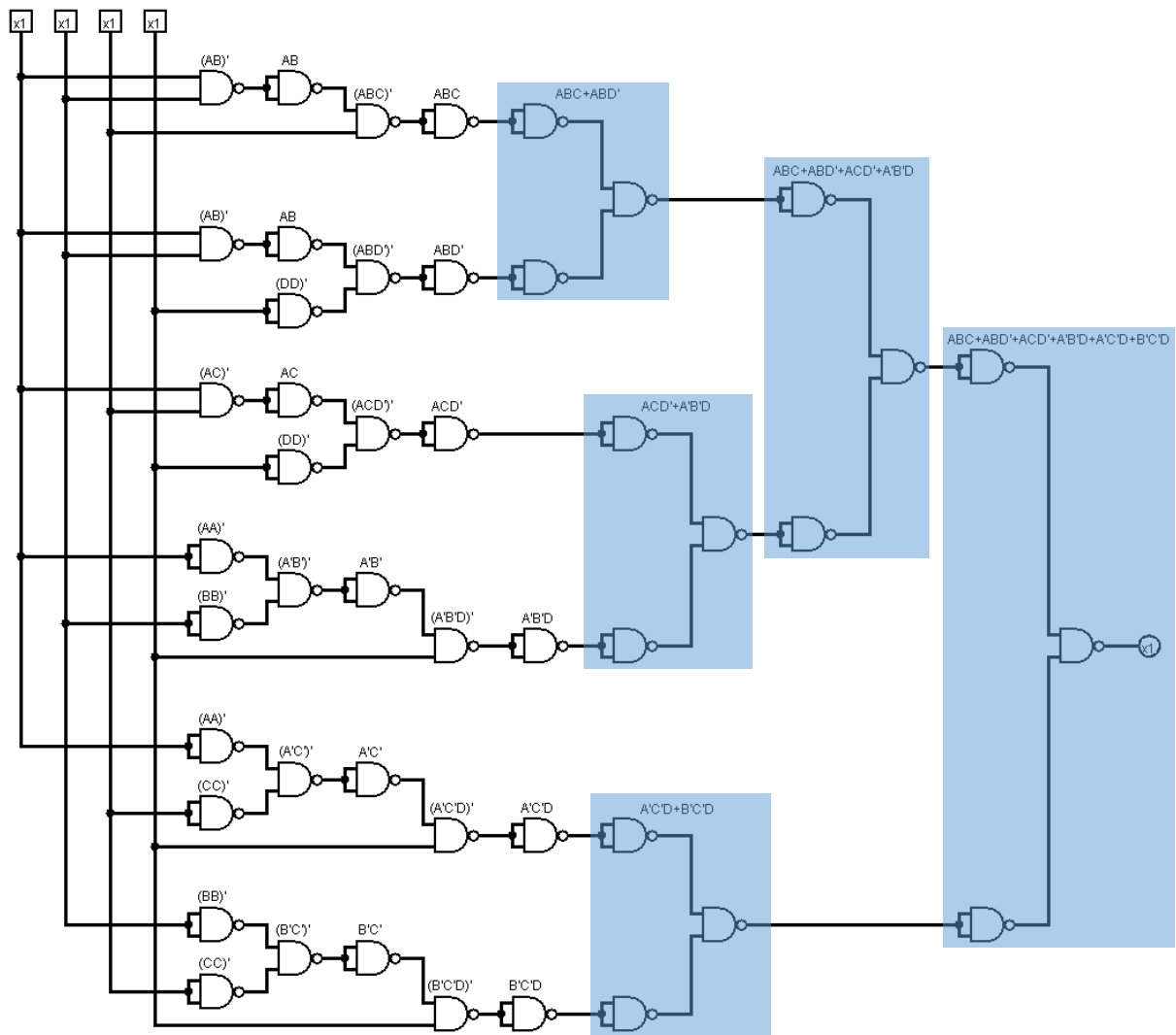**ABC + ABD' + ACD' + A'B'D + A'C'D + B'C'D**   **(final expression)**

3.
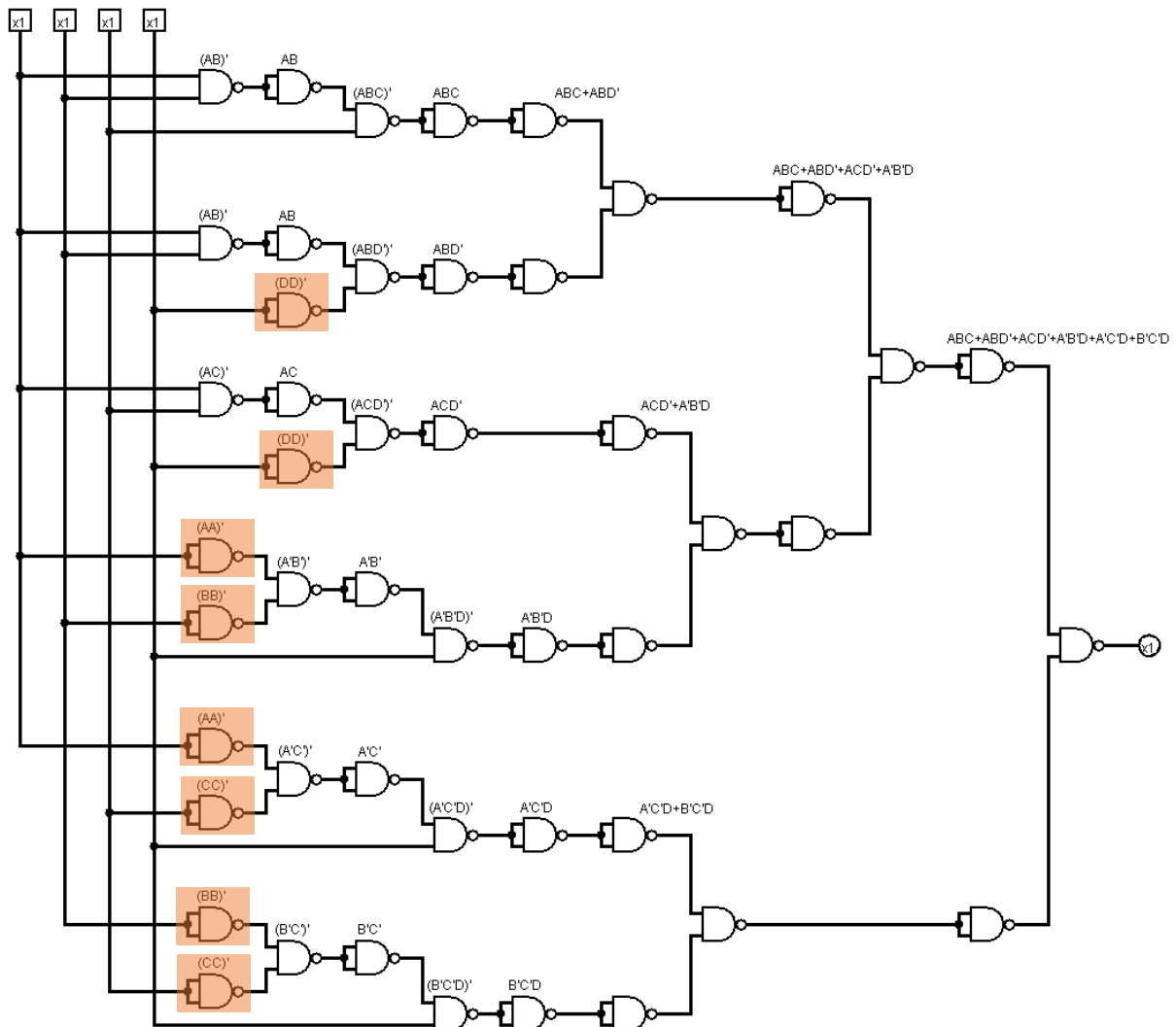
the red filled areas in the circuit work as "NOT gates".
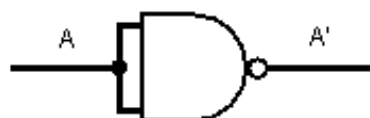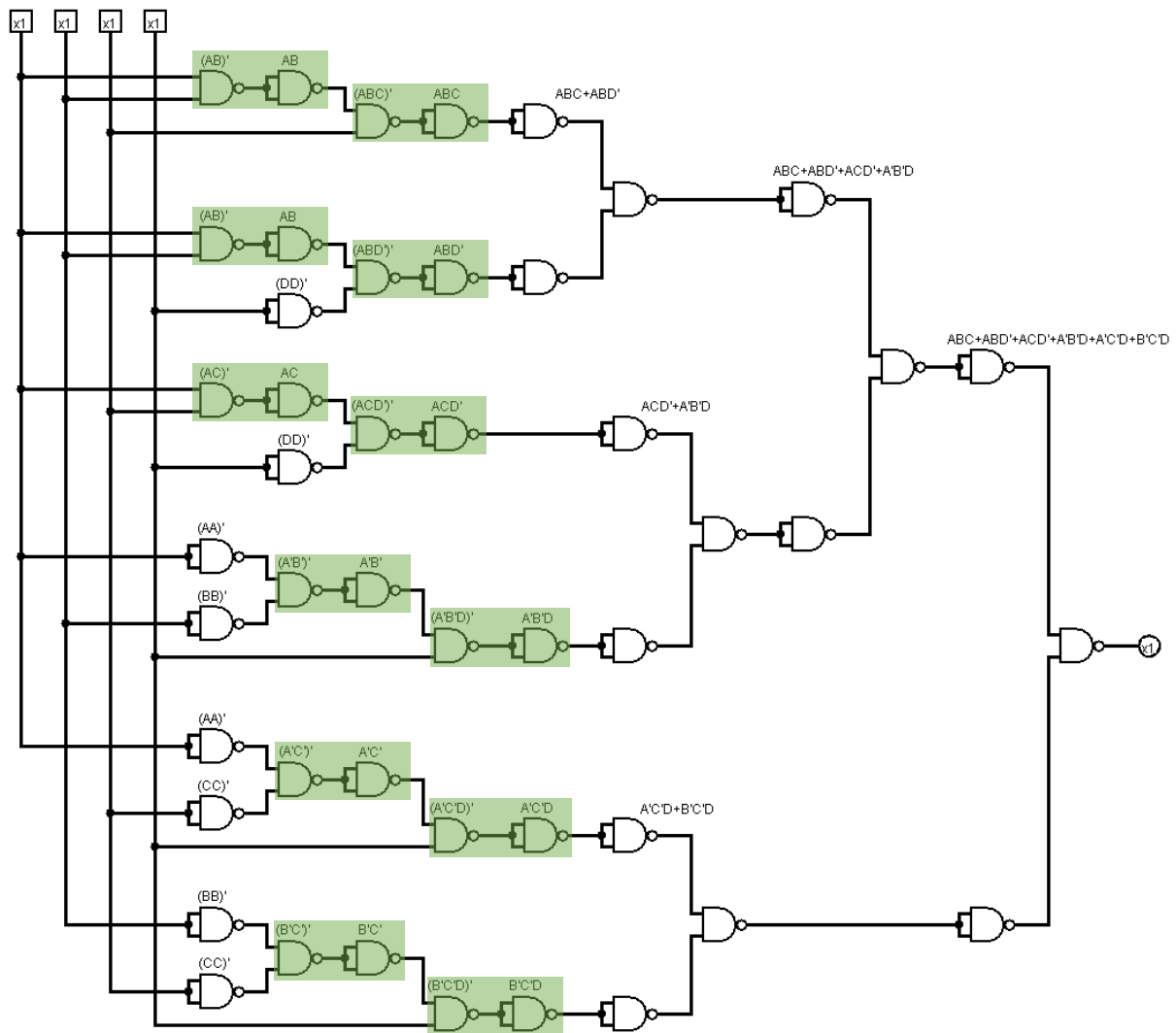
the green filled areas in the circuit work as "AND gates".

blue filled areas in the circuit work as "OR gates".