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1.Составить таблицы истинности для формул. A → B!D → A ∨ C

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| А | B | C | D | A ∨ C | B!D | A → B!D | A → B!D → A ∨ C |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 |
| 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 |
| 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 |
| 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 |
| 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 |
| 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 |
| 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 |
| 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 |

2. Установить эквивалентность формул с помощью таблиц истинности.

(!A → B) ∧ (A → !B)

(!B → A) ∧ (B → !A)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| A | B | (!A → B) | (A → !B) | (!B → A) | (B → !A) | (!A → B) ∧ (A → !B) | (!B → A) ∧ (B → !A) |
| 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 |

3. Записать формулы в ДНФ и СДНФ. (A ↔ B) → !C =

(AB ∨ !A!B) → !C =

!(AB ∨ !A!B) ∨ !C =

(!A ∨ !B ∧ A ∨ B) ∨ !C =

!A ∨ !BA ∨ B ∨ !C

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| A | B | C | !A | !B | !BA | !A ∨ !BA | !A ∨ !BA ∨ B | f |
| 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 |
| 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 |
| 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 |
| 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 |

СДНФ: !A!B!C ∨ !A!BC ∨ !AB!C ∨ !ABC ∨ A!B!C ∨ A!BC ∨ AB!C ∨ ABC

4. Упростить формулу: (x ∨ y) → y!z ⊕ (z ∨ !xy ↔ (x ∨ z)) =

!(x ∨ y) ∨ y!z ⊕ (z ∨ !xy(x ∨ z) ∨ !(!xy)!(x ∨ z)) =

!x!y ∨ y!z ⊕ (z ∨ ~~!xyx~~ ∨ !xyz) ∨ (x ∨ !y)(!x!z)) =

!x!y ∨ y!z ⊕ (z ∨ !xyz) ∨ ( ~~!x!zx~~ ∨ !x!z!y) =

(!x!y ∨ y!z) ⊕ (z ∨ !xyz ∨ !x!z!y) =

(!x!y ∨ y!z)!(z ∨ !xyz ∨ !x!z!y) ∨ !(!x!y ∨ y!z)(z ∨ !xyz ∨ !x!z!y) =

(!x!y ∨ y!z)(~~!zx~~ ∨ !y ∨ !zx ∨ z ∨ y) ∨ (x ∨ ~~y!y~~ ∨ z)(z ∨ !xyz ∨ !x!z!y) =

(!x!y ∨ y!z)(!zx ∨ z ∨ 1) ∨ (x ∨ z)(z ∨ !xyz ∨ !x!z!y) =

!x!yz ∨ ~~!x!y~~ ∨ xy!z ∨ !x!y ∨ xz ∨ z ∨ !xyz =

!x!yz ∨ xy!z ∨ !x!y ∨ xz ∨ z ∨ !xyz

5. Построить полином Жегалкина для функций: x!y → (!y → x)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| x | y | !y | !y → x | x!y | x!y → (!y → x) |
| 0 | 0 | 1 | 0 | 1 | 0 |
| 0 | 1 | 0 | 1 | 0 | 1 |
| 1 | 0 | 1 | 1 | 1 | 1 |
| 1 | 1 | 0 | 1 | 1 | 1 |

x!y → (!y → x) = a0 ⊕ a12xy ⊕ a1x ⊕ a2y

f(0, 0) = a0 = 0

f(0, 1) = a0 ⊕ a2 = 1; a2 = 0

f(1, 0) = a0 ⊕ a1 = 1; a1 = 0

f(1, 1) = a0 ⊕ a12xy ⊕ a1x ⊕ a2y = 1; a12xy = 1

итог: 1