4\_2

1. 

f(A,B,C,D) = Af(1,B,C,D) + !Af(0,B,C,D)

Af(1,B,C,D) = !C+BD;

!Af(0,B,C,D) = !C + !B + BD;

A!C + ABD + !A!C + !A!B + !ABD

Bf(A,1,C,D) = A!C + AD + !A!C + !AD

!Bf(A,0,C,D) = A!C + !A!C + !A

AB!C + ABD + !AB!C + !ABD + A!B!C + !A!B!C +!A!B

Cf(A,B,1,D) = ABD + !ABD + !A!B

!Cf(A,B,0,D) = AB + ABD + !AB + !ABD + A!B + !A!B + !A!B

ABCD + !ABCD + !A!BC + AB!C + AB!CD + !AB!C + !AB!CD + A!B!C + !A!B!C

Df(A,B,C,1) = ABC + !ABC + !A!BC + AB!C + AB!C + !AB!C + !AB!C + A!B!C + !A!B!C

!Df(A,B,C,0)= !A!BC + AB!C + !AB!C + A!B!C + !A!B!C

ABCD + !ABCD + !A!BCD + AB!CD + !AB!CD + A!B!CD + !A!B!CD + !A!BC!D + AB!C!D + !AB!C!D + A!B!C!D + !A!B!C!D

F(A,B,C,D) = {0, 1, 2, 3, 4, 5, 7, 8, 9, 12, 13, 15}

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A | B | C | D | F |
| 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 1 |
| 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 1 | 0 | 0 |
| 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 | 1 |

1. f(A, B, C, D)=(A+B)\*(C+!D)

A + f(C+!D); !A + f(C+!D);

= (A + C + !D)(!A + C + !D)(A + B)

B + f(A + C + !D)(!A + C + !D); !B + f(A + C + !D)(!A + C + !D)

=(A + B + C +!D)(!A + B + C + !D)(A + !B + C + !D)(!A + !B + C + !D)(A + B)

C + f(A + B); !C + f(A + B)

=(A + B + C)(A + B + !C)(A + B + C +!D)(!A + B + C + !D)(A + !B + C + !D)(!A + !B + C + !D)

D + f(A+ B + C)(A + B + !C); !D + f(A+ B + C)(A + B + !C);

=(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)

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) ={4;6;7;8;10;11;12;14;15}

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A | B | C | D | F |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 | 0 |
| 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 1 | 1 | 0 |
| 0 | 1 | 0 | 0 | 1 |
| 0 | 1 | 0 | 1 | 0 |
| 0 | 1 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 1 | 0 |
| 1 | 0 | 1 | 0 | 1 |
| 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 0 | 1 | 0 |
| 1 | 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 | 1 |

3) Задание содержит функцию, представленную в СДНФ, т. е. набором номеров минтермов. Методом Квайна найдите ее сокращенную форму ДНФ. В ответе укажите число простых импликант, из которых состоит сокращенная форма, и число вхождений переменных. Результат проверьте с помощью таблицы истинности.





а) !A!B!CD + !A!BCD + !ABCD + A!B!C!D + A!B!CD + A!BC!D + A!BCD + AB!C!D + ABC!D + ABCD

!A!BD; !B!CD;

!ACD; !BCD;

BCD;

A!B!C; A!B!D; A!C!D;

A!BD;

A!BC; AC!D;

ACD;

AB!D;

ABC;

!BD; !BD; CD; CD; A!B; A!B; A!D; AC; AC; AB!D;

F = !BD + CD + A!B + A!D + AC + AB!D

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A | B | C | D | F |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 0 |
| 0 | 1 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 1 | 0 | 1 |
| 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 0 | 1 | 0 |
| 1 | 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 | 1 |

В данном примере сокращенная ДНФ состоит из 6 простых импликант и 13 букв.

Ответ: 6; 13

Б) !A!B!C!D + !A!B!CD + !AB!C!D + !ABCD + A!BC!D + AB!CD + ABCD

!A!B!C; !A!C!D;

-

-

BCD;

-

ABD

F = !A!B!C + !A!C!D + BCD + ABD + A!BC!D

В данном примере сокращенная ДНФ состоит из 5 простых импликант и 16 букв.

Ответ: 5; 16

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A | B | C | D | F |
| 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 1 | 1 | 0 |
| 0 | 1 | 0 | 0 | 1 |
| 0 | 1 | 0 | 1 | 0 |
| 0 | 1 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 1 | 0 |
| 1 | 0 | 1 | 0 | 1 |
| 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 0 | 0 | 0 |
| 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 | 1 |

Таблицы истинности совпадают, соответственно задача решена верно