Problema 9.3.7.

Simplificaţi următoarele funcţii booleene de patru variabile utilizând diagrama Karnaugh:

1. *f*(*x*1*,x*2*,x*3*,x*4)*=* *x*1*x*2 ∨ *x*1¯*x*2¯*x*3*x*4 ∨ ¯*x*1¯*x*2*x*4 ∨ ¯*x*1*x*3 ∨ *x*2*x*3;

*m*15 *m*13 *m*14 *m*12

*x*1*x*2= *x*1*x*2*x*3*x*4∨ *x*1*x*2¯*x*3*x*4 ∨ *x*1*x*2*x*3¯*x*4∨ *x*1*x*2¯*x*3¯*x*4

*m*9

*x*1¯*x*2¯*x*3*x*4

*m*3 *m*1

¯*x*1¯*x*2*x*4=¯*x*1¯*x*2*x*3*x*4∨¯*x*1¯*x*2¯*x*3*x*4

*m*7 *m*3 *m*6 *m*2

¯*x*1*x*3=¯*x*1*x*2*x*3*x*4∨¯*x*1¯*x*2*x*3*x*4∨¯*x*1*x*2*x*3¯*x*4∨¯*x*1¯*x*2*x*3¯*x*4

*m*15 *m*7 *m*14 *m*6

*x*2*x*3= *x*1*x*2*x*3*x*4∨¯*x*1*x*2*x*3*x*4∨ *x*1*x*2*x*3¯*x*4∨¯*x*1*x*2*x*3¯*x*4

Factorizarea:

Diagrama Karnaugh:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *x*3*x*4  *x*1*x*2 | 00 | 01 | 11 | 10 |
| 00 |  | *m*1 | *m*3 | *m*2 |
| 01 |  |  | *m*7 | *m*6 |
| 11 | *m*12 | *m*13 | *m*15 | *m*14 |
| 10 |  | *m*9 |  |  |

*max*1= *m*12∨ *m*13∨ *m*14∨ *m*15 = *x*1*x*2

*max*2= *m*3∨ *m*2∨ *m*7∨ *m*6 =¯*x*1*x*3

*max*3= *m*1∨ *m*9 =¯*x*2¯*x*3*x*4

*max*4= *m*1∨ *m*3 =¯*x*1¯*x*2*x*4

*max*5= *m*9∨ *m*13 = *x*1¯*x*3*x*4

*max*6= *m*15∨ *m*14∨ *m*7∨ *m*6 = *x*2*x*3

M(*f* ) = { *max*1, *max*2, *max*3, *max*4, *max*5, *max*6}

Mulțimea monoamelor centrale

C(*f* ) = { *max*1, *max*2 }

M(*f* ) ≠ C(*f* ) , C(*f* ) ≠ ∅ ⇒ cazul II *g* (*x*1*,x*2*,x*3*,x*4)= *max*1∨ *max*2

*h* (*x*1*,x*2*,x*3*,x*4)= *max*3

este o singură formă simplificată:

*f*‘(*x*1*,x*2*,x*3*,x*4)*= g* (*x*1*,x*2*,x*3*,x*4) ∨ *h* (*x*1*,x*2*,x*3*,x*4)= *max*1∨ *max*2∨ *max*3 = *x*1*x*2∨¯*x*1*x*3∨¯*x*2¯*x*3*x*4

Problema 9.3.3.

Simplificaţi următoarele funcţii booleene de trei variabile, date prin mintermii expresiilor, utilizând diagrame Karnaugh:

1. *f*2(*x*1*,x*2*,x*3)*=* *m*1 ∨ *m*2 ∨ *m*4 ∨ *m*5 ∨ *m*6 ∨ *m*7;

Factorizarea:

Diagrama Karnaugh:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *x*2*x*3  *x*1 | 00 | 01 | 11 | 10 |
| 0 |  | *m*1 |  | *m*2 |
| 1 | *m*4 | *m*5 | *m*7 | *m*6 |

*max*1= *m*1∨ *m*5 = *x*20 *x*31=¯*x*2*x*3

*max*2= *m*2∨ *m*6 = *x*21 *x*30=*x*2¯*x*3

*max*3= *m*4∨ *m*5∨ *m*7 ∨ *m*6 = *x*11=*x*1

M(*f* ) = { *max*1, *max*2, *max*3 }

Mulțimea monoamelor centrale

C(*f* ) = { *max*1, *max*2, *max*3 }

M(*f* ) = C(*f* ) ⇒ cazul I

*f*‘(*x*1*,x*2*,x*3)*= max*1∨ *max*2∨ *max*3=¯*x*2*x*3∨ *x*2¯*x*3∨ *x*1

Problema 9.3.7.

Simplificaţi următoarele funcţii booleene de patru variabile utilizând diagrama Karnaugh:

1. *f*(*x*1*,x*2*,x*3*,x*4)*=* *x*1*x*2 ∨ *x*1¯*x*2¯*x*3*x*4 ∨ ¯*x*1¯*x*2*x*4 ∨ ¯*x*1*x*3 ∨ *x*2*x*3;

*m*15 *m*13 *m*14 *m*12

*x*1*x*2= *x*1*x*2*x*3*x*4∨ *x*1*x*2¯*x*3*x*4 ∨ *x*1*x*2*x*3¯*x*4∨ *x*1*x*2¯*x*3¯*x*4

*m*9

*x*1¯*x*2¯*x*3*x*4

*m*3 *m*1

¯*x*1¯*x*2*x*4=¯*x*1¯*x*2*x*3*x*4∨¯*x*1¯*x*2¯*x*3*x*4

*m*7 *m*3 *m*6 *m*2

¯*x*1*x*3=¯*x*1*x*2*x*3*x*4∨¯*x*1¯*x*2*x*3*x*4∨¯*x*1*x*2*x*3¯*x*4∨¯*x*1¯*x*2*x*3¯*x*4

*m*15 *m*7 *m*14 *m*6

*x*2*x*3= *x*1*x*2*x*3*x*4∨¯*x*1*x*2*x*3*x*4∨ *x*1*x*2*x*3¯*x*4∨¯*x*1*x*2*x*3¯*x*4

Factorizarea:

Diagrama Karnaugh:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *x*3*x*4  *x*1*x*2 | 00 | 01 | 11 | 10 |
| 00 |  | *m*1 | *m*3 | *m*2 |
| 01 |  |  | *m*7 | *m*6 |
| 11 | *m*12 | *m*13 | *m*15 | *m*14 |
| 10 |  | *m*9 |  |  |

*max*1= *m*12∨ *m*13∨ *m*14∨ *m*15 = *x*1*x*2

*max*2= *m*3∨ *m*2∨ *m*7∨ *m*6 =¯*x*1*x*3

*max*3= *m*1∨ *m*9 =¯*x*2¯*x*3*x*4

*max*4= *m*1∨ *m*3 =¯*x*1¯*x*2*x*4

*max*5= *m*9∨ *m*13 = *x*1¯*x*3*x*4

*max*6= *m*15∨ *m*14∨ *m*7∨ *m*6 = *x*2*x*3

M(*f* ) = { *max*1, *max*2, *max*3, *max*4, *max*5, *max*6}

Mulțimea monoamelor centrale

C(*f* ) = { *max*1, *max*2 }

M(*f* ) ≠ C(*f* ) , C(*f* ) ≠ ∅ ⇒ cazul II *g* (*x*1*,x*2*,x*3*,x*4)= *max*1∨ *max*2

*h* (*x*1*,x*2*,x*3*,x*4)= *max*3

este o singură formă simplificată:

*f*‘(*x*1*,x*2*,x*3*,x*4)*= g* (*x*1*,x*2*,x*3*,x*4) ∨ *h* (*x*1*,x*2*,x*3*,x*4)= *max*1∨ *max*2∨ *max*3 = *x*1*x*2∨¯*x*1*x*3∨¯*x*2¯*x*3*x*4