1) Таблица истинности

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *N* |  |  |  |  |  |  |  |  | *f* |
| 0 | 00000 | 000 | 0 | 00 | 0 | 0 | 000 | 0 | 0 |
| 1 | 00001 | 000 | 0 | 01 | 1 | 1 | 001 | 1 | 0 |
| 2 | 00010 | 000 | 0 | 10 | 2 | 2 | 010 | 2 | 0 |
| 3 | 00011 | 000 | 0 | 11 | 3 | 3 | 011 | 3 | 0 |
| 4 | 00100 | 001 | 1 | 00 | 0 | 1 | 100 | 4 | 0 |
| 5 | 00101 | 001 | 1 | 01 | 1 | 2 | 101 | 5 | 0 |
| 6 | 00110 | 001 | 1 | 10 | 2 | 3 | 110 | 6 | 0 |
| 7 | 00111 | 001 | 1 | 11 | 3 | 4 | 111 | 7 | d |
| 8 | 01000 | 010 | 2 | 00 | 0 | 2 | 000 | 0 | 0 |
| 9 | 01001 | 010 | 2 | 01 | 1 | 3 | 001 | 1 | 0 |
| 10 | 01010 | 010 | 2 | 10 | 2 | 4 | 010 | 2 | 0 |
| 11 | 01011 | 010 | 2 | 11 | 3 | 5 | 011 | 3 | 0 |
| 12 | 01100 | 011 | 3 | 00 | 0 | 3 | 100 | 4 | 0 |
| 13 | 01101 | 011 | 3 | 01 | 1 | 4 | 101 | 5 | 0 |
| 14 | 01110 | 011 | 3 | 10 | 2 | 5 | 110 | 6 | 1 |
| 15 | 01111 | 011 | 3 | 11 | 3 | 6 | 111 | 7 | d |
| 16 | 10000 | 100 | 4 | 00 | 0 | 4 | 000 | 0 | 0 |
| 17 | 10001 | 100 | 4 | 01 | 1 | 5 | 001 | 1 | 1 |
| 18 | 10010 | 100 | 4 | 10 | 2 | 6 | 010 | 2 | 1 |
| 19 | 10011 | 100 | 4 | 11 | 3 | 7 | 011 | 3 | 1 |
| 20 | 10100 | 101 | 5 | 00 | 0 | 5 | 100 | 4 | 1 |
| 21 | 10101 | 101 | 5 | 01 | 1 | 6 | 101 | 5 | 1 |
| 22 | 10110 | 101 | 5 | 10 | 2 | 7 | 110 | 6 | 1 |
| 23 | 10111 | 101 | 5 | 11 | 3 | 8 | 111 | 7 | d |
| 24 | 11000 | 110 | 6 | 00 | 0 | 6 | 000 | 0 | 1 |
| 25 | 11001 | 110 | 6 | 01 | 1 | 7 | 001 | 1 | 1 |
| 26 | 11010 | 110 | 6 | 10 | 2 | 8 | 010 | 2 | 1 |
| 27 | 11011 | 110 | 6 | 11 | 3 | 9 | 011 | 3 | 0 |
| 28 | 11100 | 111 | 7 | 00 | 0 | 7 | 100 | 4 | 1 |
| 29 | 11101 | 111 | 7 | 01 | 1 | 8 | 101 | 5 | 1 |
| 30 | 11110 | 111 | 7 | 10 | 2 | 9 | 110 | 6 | 0 |
| 31 | 11111 | 111 | 7 | 11 | 3 | 10 | 111 | 7 | d |

2) КДНФ и ККНФ

3) Единичное покрытие методом Квайна – Мак-Класки

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *K0* | | | *K*1 | | | | *K*2 | | | *Z* |
| 1 | 10001 | v | 1 | 100X1 | 1-7 | v | 1 | **10XX1** | 1-7 8-14 | 1X010 |
| 2 | 10010 | v | 2 | 10X01 | 1-8 | v | 2 | ~~10XX1~~ | 1-8 7-14 | 110X0 |
| 3 | 10100 | v | 3 | 1X001 | 1-9 | v | 3 | **1XX01** | 1-8 10-15 | 0111X |
| 4 | 11000 | v | 4 | 1001X | 2-7 | v | 4 | ~~1XX01~~ | 1-9 8-15 | 10XX1 |
| 5 | 00111 | v | 5 | 10X10 | 2-9 | v | 5 | **10X1X** | 2-7 9-14 | 1XX01 |
| 6 | 01110 | v | 6 | **1X010** | 2-11 |  | 6 | ~~10X1X~~ | 2-9 7-14 | 10X1X |
| 7 | 10011 | v | 7 | 1010X | 3-8 | v | 7 | **101XX** | 3-8 9-14 | 101XX |
| 8 | 10101 | v | 8 | 101X0 | 3-9 | v | 8 | **1X10X** | 3-8 12-15 | 1X10X |
| 9 | 10110 | v | 9 | 1X100 | 3-12 | v | 9 | ~~101XX~~ | 3-9 8-14 | 11X0X |
| 10 | 11001 | v | 10 | 1100X | 4-10 | v | 10 | ~~1X10X~~ | 3-12 8-15 | XX111 |
| 11 | 11010 | v | 11 | **110X0** | 4-11 |  | 11 | **11X0X** | 4-10 12-15 | 1X1X1 |
| 12 | 11100 | v | 12 | 11X00 | 4-12 | v | 12 | ~~11X0X~~ | 4-12 10-15 |  |
| 13 | 01111 | v | 13 | 0X111 | 5-13 | v | 13 | **XX111** | 5-13 14-16 |  |
| 14 | 10111 | v | 14 | X0111 | 5-14 | v |  | ~~XX111~~ | 5-14 13-16 |  |
| 15 | 11101 | v | 15 | **0111X** | 6-13 |  |  | **1X1X1** | 8-14 15-16 |  |
| 16 | 11111 | v | 16 | 10X11 | 7-14 | v |  |  |  |  |
|  |  |  | 17 | 101X1 | 8-14 | v |  |  |  |  |
|  |  |  | 18 | 1X101 | 8-15 | v |  |  | *K*3 *- ∅* |  |
|  |  |  | 19 | 1011X | 9-14 | v |  |  |  |  |
|  |  |  | 20 | 11X01 | 10-15 | v |  |  |  |  |
|  |  |  | 21 | 1110X | 12-15 | v |  |  |  |  |
|  |  |  | 22 | X1111 | 13-16 | v |  |  |  |  |
|  |  |  | 23 | 1X111 | 14-16 | v |  |  |  |  |
|  |  |  | 24 | 111X1 | 15-16 | v |  |  |  |  |

4) Составление импликантной таблицы единичного покрытия

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
|  | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 |
|  | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
|  | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |
|  | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 |
| A | 1X010 | \* | \* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| B | 110X0 |  | \* | \* |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 0111X |  |  |  | \* | \* |  |  |  |  |  |  |  |  |  |  |  |
| C | 10XX1 |  |  |  |  |  | \* | \* | \* | \* |  |  |  |  |  |  |  |
| D | 1XX01 |  |  |  |  |  | \* |  | \* |  | \* | \* |  |  |  |  |  |
| E | 10X1X | \* |  |  |  |  |  | \* |  | \* |  |  | \* |  |  |  |  |
| F | 101XX |  |  |  |  |  |  |  | \* | \* |  |  | \* | \* |  |  |  |
| G | 1X10X |  |  |  |  |  |  |  | \* |  |  | \* |  | \* | \* |  |  |
| H | 11X0X |  |  | \* |  |  |  |  |  |  | \* | \* |  |  | \* |  |  |
| I | XX111 |  |  |  |  | \* |  |  |  | \* |  |  |  |  |  | \* | \* |
| J | 1X1X1 |  |  |  |  |  |  |  | \* | \* |  | \* |  |  |  |  | \* |

4) Ядро единичного покрытия

5) Метод Петрика для единичного покрытия

Далее рассматриваем только термы минимального ранга (5), которых здесь 4. Только среди них находятся минимальные покрытия.

– минимальные покрытия:

Возьмем

6) Нулевое покрытие методом Квайна – Мак-Класки

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *K0* | | | ***K1*** | | | | ***K3*** | | | | ***K2*** | | | ***Z*** |
| 1 | 00000 | v | 1 | 0000X | 1-2 | v | 1 | 000XX | 1-2 3-8 | v | 1 | **00XXX** | 1-2 3-8 4-8 9-12 | X0000 |
| 2 | 00001 | v | 2 | 000X0 | 1-3 | v | 2 | 00X0X | 1-2 4-8 | v | 2 | ~~00XXX~~ | 1-2 4-8 3-8 9-12 | 11X11 |
| 3 | 00010 | v | 3 | 00X00 | 1-4 | v | 3 | ~~000XX~~ | 1-3 2-7 |  | 3 | ~~00XXX~~ | 1-3 4-9 2-7 8-12 | 1111X |
| 4 | 00100 | v | 4 | 0X000 | 1-5 | v | 4 | 00XX0 | 1-3 4-9 | v | 4 | **0XX0X** | 1-5 2-10 4-8 11-14 | 0X0X1 |
| 5 | 01000 | v | 5 | **X0000** | 1-6 |  | 5 | ~~00X0X~~ | 1-4 2-8 |  | 5 | ~~0XX0X~~ | 1-5 4-11 2-8 10-14 | 00XXX |
| 6 | 10000 | v | 6 | 000X1 | 2-7 | v | 6 | ~~00XX0~~ | 1-4 3-9 |  | 6 |  |  |  |
| 7 | 00011 | v | 7 | 00X01 | 2-8 | v | 7 | 0X00X | 1-5 2-10 | v | 7 |  |  |  |
| 8 | 00101 | v | 8 | 0X001 | 2-10 | v | 8 | 0XX00 | 1-5 4-11 | v | 8 |  |  |  |
| 9 | 00110 | v | 9 | 0001X | 3-8 | v | 9 | 00XX1 | 2-7 8-12 | v | 9 |  |  |  |
| 10 | 01001 | v | 10 | 00X10 | 3-9 | v | 10 | **0X0X1** | 2-7 10-13 |  |  |  |  |  |
| 11 | 01100 | v | 11 | 0010X | 4-8 | v | 11 | ~~00XX1~~ | 2-8 7-12 |  |  |  |  |  |
| 12 | 00111 | v | 12 | 001X0 | 4-9 | v | 12 | 0XX01 | 2-8 10-14 | v |  |  |  |  |
| 13 | 01011 | v | 13 | 0X100 | 4-11 | v | 13 | ~~0X0X1~~ | 2-10 7-13 |  |  |  |  |  |
| 14 | 01101 | v | 14 | 00X11 | 7-12 | v |  | ~~0XX01~~ | 2-10 8-14 |  |  |  |  |  |
| 15 | 01111 | v | 15 | 0X011 | 7-13 | v |  | 00X1X | 3-8 9-12 | v |  |  |  |  |
| 16 | 10111 | v | 16 | 001X1 | 8-12 | v |  | ~~00X1X~~ | 3-9 7-12 |  |  |  |  |  |
| 17 | 11011 | v | 17 | 0X101 | 8-14 | v |  | 001XX | 4-8 9-12 | v |  |  |  |  |
| 18 | 11110 | v | 18 | 0011X | 9-12 | v |  | 0X10X | 4-8 11-14 | v |  |  |  |  |
| 19 | 11111 | v | 19 | 010X1 | 10-13 | v |  | ~~001XX~~ | 4-9 9-12 |  |  |  |  |  |
|  |  |  | 20 | 01X01 | 10-14 | v |  | ~~0X10X~~ | 4-11 8-14 |  |  |  |  |  |
|  |  |  | 21 | 0110X | 11-14 | v |  |  |  |  |  |  |  |  |
|  |  |  | 22 | X1111 | 15-19 |  |  |  |  |  |  |  |  |  |
|  |  |  | 23 | 1X111 | 16-19 |  |  |  |  |  |  |  |  |  |
|  |  |  | 24 | **11X11** | 17-19 |  |  |  |  |  |  |  |  |  |
|  |  |  | 25 | **1111X** | 18-19 |  |  |  |  |  |  |  |  |  |

7) Составление импликантной таблицы нулевого покрытия

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
|  | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
|  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 |
|  | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 |
|  | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 |
|  | X0000 | \* | \* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 11X11 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | \* | \* |  |
|  | 1111X |  |  |  |  |  |  |  |  |  |  |  |  |  |  | \* |  | \* |
| A | 0X0X1 |  |  | \* | \* | \* | \* |  |  |  |  |  |  |  |  |  |  |  |
| B | 00XXX | \* |  | \* | \* |  |  | \* | \* | \* | \* | \* |  |  |  |  |  |  |
| C | 0XX0X | \* |  | \* |  | \* |  |  | \* | \* |  |  | \* | \* | \* |  |  |  |

8) Ядро нулевого покрытия

9) Метод Петрика для единичного покрытия

- минимальное покрытие:

Возьмем

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | *00* | *01* | *11* | *10* |
| *00* | *1* | *1* | *1* | *1* |
| *01* | *1* | *0* | *d* | *1* |
| *11* | *1* | *0* | *d* | *1* |
| *10* | *1* | *1* | *1* | *1* |