Министерство образования и науки РФ

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«Санкт-Петербургский национальный исследовательский университет

информационных технологий, механики и оптики»

**факультет программной инженерии и компьютерной техники**

**КУРСОВАЯ РАБОТА**

по дисциплине

‘Дискретная Математика’

Часть 2

Вариант №20

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Оглавление

[Функция 2](#_Toc97829571)

[Таблица истинности 3](#_Toc97829572)

[Представление булевой функции в аналитическом виде 4](#_Toc97829573)

[Минимизация булевой функции методом Квайна–Мак-Класки 4](#_Toc97829574)

[Нахождение простых импликант (максимальных кубов) 4](#_Toc97829575)

[Составление импликационной таблицы 5](#_Toc97829576)

[Определение минимального покрытия 6](#_Toc97829577)

# Задание

Построить комбинационную схему реализующую функцию C = (A – 1)mod57, где A=(a1, a2, a3, a4, a5, a6), C = (c1, c2, c3, c4, c5, c6)

# Таблица истинности

Переполнение

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| № | a1 | a2 | a3 | a4 | a5 | a6 | c1 | c2 | c3 | c4 | c5 | c6 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 3 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| 4 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| 5 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 6 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 7 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 |
| 8 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 9 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| 10 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 11 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 |
| 12 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 13 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| 14 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 15 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 |
| 16 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| 17 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| 18 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 19 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 |
| 20 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |
| 21 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 22 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 |
| 23 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 |
| 24 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 |
| 25 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 |
| 26 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 |
| 27 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 |
| 28 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 |
| 29 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 |
| 30 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 |
| 31 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 |
| 32 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 |
| 33 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 34 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 35 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 36 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 |
| 37 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 |
| 38 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 |
| 39 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 |
| 40 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 |
| 41 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 |
| 42 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 |
| 43 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 |
| 44 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 |
| 45 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 |
| 46 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 |
| 47 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 |
| 48 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 |
| 49 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 50 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 |
| 51 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 |
| 52 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| 53 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 |
| 54 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 |
| 55 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 |
| 56 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| 57 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 |
| 58 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 59 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 60 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 61 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 |
| 62 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 63 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 |

# Минимизация булевых функций на картах Карно

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | a5a6 | | | |  |  |  | a5a6 | | | |
|  |  | 00 | 01 | 11 | 10 |  |  |  | 00 | 01 | 11 | 10 |
| a3a4 | 00 |  |  |  |  |  | a3a4 | 00 |  |  |  |  |
| 01 |  |  |  |  |  | 01 |  |  |  |  |
| 11 |  |  |  |  |  | 11 |  |  |  |  |
| 10 |  |  |  |  |  | 10 |  |  |  |  |
|  |  | a1a2 = 00 | | | |  |  |  | a1a2 = 01 | | | |
|  |  | a5a6 | | | |  |  |  | a5a6 | | | |
|  |  | 00 | 01 | 11 | 10 |  |  |  | 00 | 01 | 11 | 10 |
| a3a4 | 00 |  | 1 | 1 | 1 |  | a3a4 | 00 | 1 | 1 | 1 | 1 |
| 01 | 1 | 1 | 1 | 1 |  | 01 | 1 | 1 | 1 | 1 |
| 11 | 1 | 1 | 1 | 1 |  | 11 |  |  |  |  |
| 10 | 1 | 1 | 1 | 1 |  | 10 | 1 | 1 |  |  |
|  |  | a1a2 = 10 | | | |  |  |  | a1a2 = 11 | | | |

C1 =

1XX0X

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | a5a6 | | | |  |  |  | a5a6 | | | |
|  |  | 00 | 01 | 11 | 10 |  |  |  | 00 | 01 | 11 | 10 |
| a3a4 | 00 |  |  |  |  |  | a3a4 | 00 |  | 1 | 1 | 1 |
| 01 |  |  |  |  |  | 01 | 1 | 1 | 1 | 1 |
| 11 |  |  |  |  |  | 11 | 1 | 1 | 1 | 1 |
| 10 |  |  |  |  |  | 10 | 1 | 1 | 1 | 1 |
|  |  | a1a2 = 00 | | | |  |  |  | a1a2 = 01 | | | |
|  |  | a5a6 | | | |  |  |  | a5a6 | | | |
|  |  | 00 | 01 | 11 | 10 |  |  |  | 00 | 01 | 11 | 10 |
| a3a4 | 00 | 1 |  |  |  |  | a3a4 | 00 |  | 1 | 1 | 1 |
| 01 |  |  |  |  |  | 01 | 1 | 1 | 1 | 1 |
| 11 |  |  |  |  |  | 11 |  |  |  |  |
| 10 |  |  |  |  |  | 10 | 1 | 1 |  |  |
|  |  | a1a2 = 10 | | | |  |  |  | a1a2 = 11 | | | |

С2

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | a5a6 | | | |  |  |  | a5a6 | | | |
|  |  | 00 | 01 | 11 | 10 |  |  |  | 00 | 01 | 11 | 10 |
| a3a4 | 00 |  |  |  |  |  | a3a4 | 00 | 1 |  |  |  |
| 01 |  |  |  |  |  | 01 |  |  |  |  |
| 11 | 1 | 1 | 1 | 1 |  | 11 | 1 | 1 | 1 | 1 |
| 10 |  | 1 | 1 | 1 |  | 10 |  | 1 | 1 | 1 |
|  |  | a1a2 = 00 | | | |  |  |  | a1a2 = 01 | | | |
|  |  | a5a6 | | | |  |  |  | a5a6 | | | |
|  |  | 00 | 01 | 11 | 10 |  |  |  | 00 | 01 | 11 | 10 |
| a3a4 | 00 | 1 |  |  |  |  | a3a4 | 00 | 1 |  |  |  |
| 01 |  |  |  |  |  | 01 |  |  |  |  |
| 11 | 1 | 1 | 1 | 1 |  | 11 |  |  |  |  |
| 10 |  | 1 | 1 | 1 |  | 10 |  | 1 |  |  |
|  |  | a1a2 = 10 | | | |  |  |  | a1a2 = 11 | | | |

С3

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | a5a6 | | | |  |  |  | a5a6 | | | |
|  |  | 00 | 01 | 11 | 10 |  |  |  | 00 | 01 | 11 | 10 |
| a3a4 | 00 | 1 |  |  |  |  | a3a4 | 00 | 1 |  |  |  |
| 01 |  | 1 | 1 | 1 |  | 01 |  | 1 | 1 | 1 |
| 11 |  | 1 | 1 | 1 |  | 11 |  | 1 | 1 | 1 |
| 10 | 1 |  |  |  |  | 10 | 1 |  |  |  |
|  |  | a1a2 = 00 | | | |  |  |  | a1a2 = 01 | | | |
|  |  | a5a6 | | | |  |  |  | a5a6 | | | |
|  |  | 00 | 01 | 11 | 10 |  |  |  | 00 | 01 | 11 | 10 |
| a3a4 | 00 | 1 |  |  |  |  | a3a4 | 00 | 1 |  |  |  |
| 01 |  | 1 | 1 | 1 |  | 01 |  | 1 | 1 | 1 |
| 11 |  | 1 | 1 | 1 |  | 11 |  |  | 1 | 1 |
| 10 | 1 |  |  |  |  | 10 | 1 |  |  |  |
|  |  | a1a2 = 10 | | | |  |  |  | a1a2 = 11 | | | |

С4

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | a5a6 | | | |  |  |  | a5a6 | | | |
|  |  | 00 | 01 | 11 | 10 |  |  |  | 00 | 01 | 11 | 10 |
| a3a4 | 00 |  |  | 1 |  |  | a3a4 | 00 | 1 |  | 1 |  |
| 01 | 1 |  | 1 |  |  | 01 | 1 |  | 1 |  |
| 11 | 1 |  | 1 |  |  | 11 | 1 |  | 1 |  |
| 10 | 1 |  | 1 |  |  | 10 | 1 |  | 1 |  |
|  |  | a1a2 = 00 | | | |  |  |  | a1a2 = 01 | | | |
|  |  | a5a6 | | | |  |  |  | a5a6 | | | |
|  |  | 00 | 01 | 11 | 10 |  |  |  | 00 | 01 | 11 | 10 |
| a3a4 | 00 | 1 |  | 1 |  |  | a3a4 | 00 | 1 |  | 1 |  |
| 01 | 1 |  | 1 |  |  | 01 | 1 |  | 1 |  |
| 11 | 1 |  | 1 |  |  | 11 | 1 | 1 |  |  |
| 10 | 1 |  | 1 |  |  | 10 | 1 |  |  |  |
|  |  | a1a2 = 10 | | | |  |  |  | a1a2 = 11 | | | |

С5

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | a5a6 | | | |  |  |  | a5a6 | | | |
|  |  | 00 | 01 | 11 | 10 |  |  |  | 00 | 01 | 11 | 10 |
| a3a4 | 00 | 1 |  |  | 1 |  | a3a4 | 00 | 1 |  |  | 1 |
| 01 | 1 |  |  | 1 |  | 01 | 1 |  |  | 1 |
| 11 | 1 |  |  | 1 |  | 11 | 1 |  |  | 1 |
| 10 | 1 |  |  | 1 |  | 10 | 1 |  |  | 1 |
|  |  | a1a2 = 00 | | | |  |  |  | a1a2 = 01 | | | |
|  |  | a5a6 | | | |  |  |  | a5a6 | | | |
|  |  | 00 | 01 | 11 | 10 |  |  |  | 00 | 01 | 11 | 10 |
| a3a4 | 00 | 1 |  |  | 1 |  | a3a4 | 00 | 1 |  |  | 1 |
| 01 | 1 |  |  | 1 |  | 01 | 1 |  |  | 1 |
| 11 | 1 |  |  | 1 |  | 11 |  | 1 | 1 |  |
| 10 | 1 |  |  | 1 |  | 10 | 1 |  | 1 |  |
|  |  | a1a2 = 10 | | | |  |  |  | a1a2 = 11 | | | |

С6