**Задания для самостоятельной работы №3**

Разделить **112** на **-57** на сумматоре обратного кода, результат представить в прямом коде.

Переведём числа в двоичную СС:

X = +10110 = +11001012

Y = -6210 = -1111102

Возьмём разрядную сетку n = 7:

Xпр = Xоб = 0|000001 100101

Yпр = 1|111110

Yоб = 1|000001

(-Y)об = 0|111110

Пробное вычитание:

|X|пр - |Y|пр × 2n-1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| + | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | **И. П.** R = |X|пр |
|  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |  |  |  |  |  |  | R = |X|пр - |Y|пр \* 26 |
|  | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |  |

**R < 0:** переполнения нет – делить можно

По правилам деления положительного числа на отрицательное:

|  |  |  |
| --- | --- | --- |
| Знак остатка |  |  |
| Младший разряд промежуточного частного | zi = 0 | zi = 1 |
| Восстановление остатка | – | Нужно |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0` | И.П. R = Xоб |
|  |  | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0` | - | R0 🡨 |
| 1) | + | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 |  |  |  |  |  |  | R1 = R0 + Yоб × 25 |
|  |  | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0` | 1 | R < 0: z5 = 1 |
|  | + | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 |  |  |  |  |  |  | Восстан. остатка |
|  | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |  |  |  |  |  |  |  |
|  | + |  |  |  |  |  |  |  | 1 |  |  |  |  |  |  |  |
|  |  | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0` | 1 |  |
|  |  | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0` | 1 | - | R1 🡨 |
| 2) | + | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 |  |  |  |  |  |  | R2 = R1 + Yоб × 24 |
|  |  | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0` | 1 | 1 | R < 0: z4 = 1 |
|  | + | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 |  |  |  |  |  |  | Восстан. остатка |
|  | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |  |  |  |  |  |  |  |
|  | + |  |  |  |  |  |  |  | 1 |  |  |  |  |  |  |  |
|  |  | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0` | 1 | 1 |  |
|  |  | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0` | 1 | 1 | - | R2 🡨 |
| 3) | + | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 |  |  |  |  |  |  | R3 = R2 + Yоб × 23 |
|  |  | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0` | 1 | 1 | 1 | R < 0: z3 = 1 |
|  | + | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 |  |  |  |  |  |  | Восстан. остатка |
|  | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |  |  |  |  |  |  |  |
|  | + |  |  |  |  |  |  |  | 1 |  |  |  |  |  |  |  |
|  |  | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0` | 1 | 1 | 1 |  |
|  |  | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0` | 1 | 1 | 1 | - | R3 🡨 |
| 4) | + | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 |  |  |  |  |  |  | R4 = R3 + Yоб × 22 |
|  |  | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0` | 1 | 1 | 1 | 1 | R < 0: z2 = 1 |
|  | + | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 |  |  |  |  |  |  | Восстан. остатка |
|  | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 |  |  |  |  |  |  |  |
|  | + |  |  |  |  |  |  |  | 1 |  |  |  |  |  |  |  |
|  |  | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0` | 1 | 1 | 1 | 1 |  |
|  |  | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0` | 1 | 1 | 1 | 1 | - | R4 🡨 |
| 5) | + | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 |  |  |  |  |  |  | R5 = R4 + Yоб × 21 |
|  |  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0` | 1 | 1 | 1 | 1 | 1 | R < 0: z1 = 1 |
|  | + | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 |  |  |  |  |  |  | Восстан. остатка |
|  | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |  |  |  |  |  |  |  |
|  |  | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0` | 1 | 1 | 1 | 1 | 1 |  |
|  | + |  |  |  |  |  |  |  | 1 |  |  |  |  |  |  |  |
|  |  | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0` | 1 | 1 | 1 | 1 | 1 |  |
|  |  | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0` | 1 | 1 | 1 | 1 | 1 | - | R5 🡨 |
| 6) | + | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 |  |  |  |  |  |  | R6 = R5 + Yоб × 20 |
|  | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0` |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 1 |  |  |  |  |  |  |  |
|  |  | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1` | 1 | 1 | 1 | 1 | 1 | 0 | R > 0: z0 = 0 |

Деление завершено: Sz = Sx ⊕ Sy = 0 ⊕ 1 = 1 (ответ – отрицательное число)

Т.к. ответ – отрицательное число, в бит знака ставим 1

Zоб = 1|111110

Zпр = 1|000001 = -110

Остаток = 1101112 = 5510

Действительно, при делении 112 на -57 получается -1 при остатке 55

Значит, ответ верный