Федеральное государственное автономное образовательное учреждение высшего образования «Национальный исследовательский университет ИТМО»

Факультет программной инженерии и компьютерной техники

Основы дискретной математики

Домашняя работа №8

Деление чисел с плавающей запятой

Вариант №18

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|  |  |  |
| --- | --- | --- |
| **№** | **A** | **B** |
| **18** | 6,6 | 0,026 |

# Задание 1. Выполнить операцию деления операндов в формате Ф1

A = (6,6)10 = (6,(9))16 = (0,6(9))16 × 161

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 |
| 0 | 1 |  |  |  |  |  | 7 | 8 |  |  |  |  |  |  | 15 |

B = (0,026)10 = (0,06A7EF9DB22)16 = (0,6A7F)16 × 16−1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 |
| 0 | 1 |  |  |  |  |  | 7 | 8 |  |  |  |  |  |  | 15 |

*XC* = *XA* − *XB* + *d;*

P*C*+ *d* = *.*

*XC* = 1 − (−1) + 64 = 66

P*C* = 2

|  |  |  |  |
| --- | --- | --- | --- |
| **N шага** | **Действие** | **Делимое** | **Частное** |
| **0** | *МА*  [-*МB*]доп  *R*0  *МА* → 4  [-*МB*]доп  *R0* | **0 0 1 1 0 1 0 1 0**  **1 1 0 0 1 0 1 1 0**  **0 0 0 0 0 0 0 0 0**  **0 0 0 0 0 0 1 1 0**  **1 1 0 0 1 0 1 1 0**  **1 1 0 0 1 1 1 0 0** | **0 0 0 0 0 0 0 0**    **R0>0**  **1 0 1 0 0 0 0 0**    **1 0 1 0 0 0 0 0** |
| **1** | ←*R0*  *МB* пр  *R1* | **1 0 0 1 1 1 0 0 1**  **0 0 1 1 0 1 0 1 0**  **1 1 0 1 0 0 0 1 1** | **0 1 0 0 0 0 0 0**    **0 1 0 0 0 0 0 0** |
| **2** | ←*R1*  *МB* пр  *R2* | **1 0 1 0 0 0 1 1 0**  **0 0 1 1 0 1 0 1 0**  **1 1 0 1 1 0 0 0 0** | **1 0 0 0 0 0 0 0**    **1 0 0 0 0 0 0 0** |
| **3** | ←*R2*  *МB* пр  *R3* | **1 0 1 1 0 0 0 0 1**  **0 0 1 1 0 1 0 1 0**  **1 1 1 0 0 1 0 1 1** | **0 0 0 0 0 0 0 0**    **0 0 0 0 0 0 0 0** |
| **4** | ←*R3*  *МB* пр  *R4* | **1 1 0 0 1 0 1 1 0**  **0 0 1 1 0 1 0 1 0**  **0 0 0 0 0 0 0 0 0** | **0 0 0 0 0 0 0 0**    **0 0 0 0 0 0 0 1** |
| **5** | ←*R4*  [-*МB*]доп  *R5* | **0 0 0 0 0 0 0 0 0**  **1 1 0 0 1 0 1 1 0**  **1 1 0 0 1 0 1 1 0** | **0 0 0 0 0 0 1 0**    **0 0 0 0 0 0 1 0** |
| **6** | ←*R*5  *МB* пр  *R6* | **1 0 0 1 0 1 1 0 0**  **0 0 1 1 0 1 0 1 0**  **1 1 0 0 1 0 1 1 0** | **0 0 0 0 0 1 0 0**    **0 0 0 0 0 1 0 0** |
| **7** | ←*R6*  *МB* пр  *R7* | **1 0 0 1 0 1 1 0 0**  **0 0 1 1 0 1 0 1 0**  **1 1 0 0 1 0 1 1 0** | **0 0 0 0 1 0 0 0**    **0 0 0 0 1 0 0 0** |
| **8** | ←*R7*  *МB* пр  *R8* | **1 0 0 1 0 1 1 0 0**  **0 0 1 1 0 1 0 1 0**  **1 1 0 0 1 0 1 1 0** | **0 0 0 1 0 0 0 0**    **0 0 0 1 0 0 0 0** |

*C\** = (0,1)16 × 163 = (100)16 = 256.

*C*T = 253,846154.

Δ*С* = *С*Т - *С*\* = 253,846154 – 256 = −2,15384615,

δ*С* = 100% = 100% = 0,84848485 %.

Погрешность вызвана неточным представлением операндов.

# Задание 2. Выполнить операцию деления операндов в формате Ф2

A = (6,6)10 = (6,(9))16 = (110,10011001100)2 = (0,11010011001100)2 × 23

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 |
| 15 | 14 |  |  |  |  |  |  | 7 | 6 |  |  |  |  |  | 0 |

B = (0,026)10 = (0,06A7EF9DB22)16 = (0,0000011010101)2 = (0,11010101)2 × 2−5

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 15 | 14 |  |  |  |  |  |  | 7 | 6 |  |  |  |  |  | 0 |

*XC* = *XA* − *XB* + *d;*

P*C*+ *d* = *.*

*XC* = 3 − (−5) + 128 = 136

P*C* = 8

|  |  |  |  |
| --- | --- | --- | --- |
| **N шага** | **Действие** | **Делимое** | **Частное** |
| **0** | *МА*  [-*МB*]доп  *R*0 | **0 1 1 0 1 0 0 1 1**  **1 0 0 1 0 1 0 1 1**  **1 1 1 1 1 1 1 1 0** | **0 0 0 0 0 0 0 0**    **0 0 0 0 0 0 0 0** |
| **1** | ←*R*0  [*МB*]пр  *R*1 | **1 1 1 1 1 1 1 0 0**  **0 1 1 0 1 0 1 0 1**  **0 1 1 0 1 0 0 0 1** | **0 0 0 0 0 0 0 0**    **0 0 0 0 0 0 0 1** |
| **2** | ←*R*1  [-*МB*]доп  *R*2 | **1 1 0 1 0 0 0 1 0**  **1 0 0 1 0 1 0 1 1**  **0 1 1 0 0 1 1 0 1** | **0 0 0 0 0 0 1 0**    **0 0 0 0 0 0 1 1** |
| **3** | ←*R*2  [-*МB*]доп  *R*3 | **1 1 0 0 1 1 0 1 0**  **1 0 0 1 0 1 0 1 1**  **0 1 1 0 0 0 1 0 1** | **0 0 0 0 0 1 1 0**    **0 0 0 0 0 1 1 1** |
| **4** | ←*R*3  [-*МB*]доп  *R*4 | **1 1 0 0 0 1 0 1 0**  **1 0 0 1 0 1 0 1 1**  **0 1 0 1 1 0 1 0 1** | **0 0 0 0 1 1 1 0**    **0 0 0 0 1 1 1 1** |
| **5** | ←*R*4  [-*МB*]доп  *R*5 | **1 0 1 1 0 1 0 1 0**  **1 0 0 1 0 1 0 1 1**  **0 1 0 0 1 0 1 0 1** | **0 0 0 1 1 1 1 0**    **0 0 0 1 1 1 1 1** |
| **6** | ←*R*5  [-*МB*]доп  *R*6 | **1 0 0 1 0 1 0 1 0**  **1 0 0 1 0 1 0 1 1**  **0 0 1 0 1 0 1 0 1** | **0 0 1 1 1 1 1 0**    **0 0 1 1 1 1 1 1** |
| **7** | ←*R*6  [-*МB*]доп  *R*7 | **0 1 0 1 0 1 0 1 0**  **1 0 0 1 0 1 0 1 1**  **1 1 1 0 1 0 1 0 1** | **0 1 1 1 1 1 1 0**    **0 1 1 1 1 1 1 0** |
| **8** | ←*R*7  [*МB*]пр  *R*8  *МС*→ | **1 1 0 1 0 1 0 1 0**  **0 1 1 0 1 0 1 0 1**  **0 0 1 1 1 1 1 1 1** | **1 1 1 1 1 1 0 0**    **1 1 1 1 1 1 0 1**  **0 1 1 1 1 1 1 0 1** |

*C\** = (0,11111101)16 × 28 = (11111101)2 = 253.

*C*T = 253,846154.

Δ*С* = *С*Т - *С*\* = 253,846154 – 253 = 0,846154,

δ*С* = 100% = 100% = 0,33333333%.

Погрешность вызвана неточным представлением операндов, и она меньше, чем при делении в формате Ф1.