**Министерство образования и науки**

**Российской Федерации**

**САНКТ-ПЕТЕРБУРГСКИЙ НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ УНИВЕРСИТЕТ ИТМО**

Факультет программной инженерии и компьютерной техники

Дисциплина: Дискретная математика

**Домашняя работа №6**

Вариант 95

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2022 г

A=12,36

B=8,417

* 1. Формат Ф1

А=12,3610 = C.5(C28F5) =(0.C5(C28F5))16 \* 161

М*А*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 |

B=8,41710=8.6AC083126E916=(0.86AC083126E9)16 \* 161

М*B*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 |

* 1. Формат Ф2

А=12,3610= C.5(C28F5)=(0.1100010111000010100011110100)2 \* 24

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 |

B=8,41710 =8.6AC083126E916=(0,100001101010)2 \* 24

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 |

2.1 Формат Ф1

*XA* = 1 0 0 0 0 0 1

*XB* = 1 0 0 0 0 0 1

*XC*= 0 0 0 0 0 0 0

(XA-XB). = 0, *ХС =* XA =1

а) *А*>0, *B*>0:

М*А* = . 1 1 0 0 0 1 0 1 1 1 0 0

+

М*В* = . 1 0 0 0 0 1 1 0 1 0 1 1

М*С* = . 0 1 0 0 1 1 0 0 0 1 1 1

Результат сложения денормализован влево.

МС = . 0 0 0 1 0 1 0 0 1 1 0 0

Т.к. выполнен сдвиг мантиссы влево, то характеристику результата нужно увеличить на 1 (*ХС* = *ХС* +1 = 2).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |

*С*\* = М*С* · 16Р*с* = (0,14C)16 · 162 = (14.C)16 = 20.75

Определим абсолютную и относительную погрешности результата:

Δ*С* = 20.75 – 20,777 = -0.027

δ*С* = · 100% = 0.1%

Погрешность полученного результата объясняется неточным представлением операндов

б) *А*>0, *B*<0:

М*А*  = . 1 1 0 0 0 1 0 1 1 1 0 1

+

М*В*  = . 1 0 0 0 0 1 1 0 1 0 1 0

М*С*  = . 0 0 1 1 1 1 1 1 0 0 1 1

Результат сложения нормализован.

МС = . 0 0 1 1 1 1 1 1 0 0 1 1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 |

*С*\* = М*С* · 16Р*с* = (0,3F3)16 · 161 = (3,F3)16 = 3.94921875

Определим абсолютную и относительную погрешности результата:

Δ*С* = 3.94921875 – 3,943 = 0,00621875

δ*С* = · 100% = 0,15%

Погрешность полученного результата объясняется неточным представлением операндов.

в) *А*<0, *B*>0:

М*B* = . 1 0 0 0 0 1 1 0 1 0 1 0

М*А* = . 1 1 0 0 0 1 0 1 1 1 0 1

М*С* = . 1 1 0 0 0 0 0 0 1 1 0 1

Результат сложения нормализован и представлен в дополнительном коде.

МС = . 1 1 0 0 0 0 0 0 1 1 0 1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 |

*С*\* = М*С* · 16Р*с* = (-0,3F2)16 · 161 = (-3,F2)16 = -3.9453125

Определим абсолютную и относительную погрешности результата:

Δ*С* = -3.9453125 – (-3,943) = -0,0023125

δ*С* = · 100% = 0,05%

Погрешность полученного результата объясняется неточным представлением операндов.

2. Формат Ф2

А=12,3610= C.5(C28F5)=(0.1100010111000010100011110100)2 \* 24

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 |

B=8,41710 =8.6AC083126E916=(0,100001101010)2 \* 24

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 |

*XA* = 1 0 0 0 1 0 0

*XB* = 1 0 0 0 1 0 0

*XC*= 0 0 0 0 0 0 0

(XA-XB). = 0, *ХС =* XA = 4

а) *А*>0, *B*>0:

М*А* = . 1 1 0 0 0 1 0 1 1 1 0 0

+

М*В* = . 1 0 0 0 0 1 1 0 1 0 1 0

М*С* = 1. 0 1 0 0 1 1 0 0 0 1 1 0

Результат сложения денормализован влево.

МС = . 1 0 1 0 0 1 1 0 0 0 1 1

Т.к. выполнен сдвиг мантиссы влево, то характеристику результата нужно увеличить на 1 (*ХС* = *ХС* +1 = 5).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 |

*С*\* = М*С* · 16Р*с* = (0,101001100011)2 · 25 = (10100,1100011)16 = 20.7734375

Определим абсолютную и относительную погрешности результата:

Δ*С* = 20,777 – 20,7734375 = 0,0035625

δ*С* = · 100% = 0,01%

Погрешность полученного результата объясняется неточным представлением операндов

б) *А*>0, *B*<0:

М*А*  = . 1 1 0 0 0 1 0 1 1 1 0 1

+

М*В*  = . 1 0 0 0 0 1 1 0 1 0 1 0

М*С*  = . 0 0 1 1 1 1 1 1 0 0 1 1

Результат сложения нормализован.

МС = . 0 0 1 1 1 1 1 1 0 0 1 1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 |

*С*\* = М*С* · 16Р*с* = (0,001111110011)2 · 24 = (11,11110011)2 = 3.94921875

Определим абсолютную и относительную погрешности результата:

Δ*С* = 3.94921875 – 3,943 = 0,00621875

δ*С* = · 100% = 0,15%

Погрешность полученного результата объясняется неточным представлением операндов.

в) *А*<0, *B*>0:

М*А*  = . 1 1 0 0 0 1 0 1 1 1 0 1

+

М*В*  = . 1 0 0 0 0 1 1 0 1 0 1 0

М*С*  = . 1 1 0 0 0 0 0 0 1 1 0 1

Результат сложения нормализован и представлен в дополнительном коде.

МС = . 1 1 0 0 0 0 0 0 1 1 0 1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 |

*С*\* = М*С* · 16Р*с* = (-0,001111110011)2 · 24 = (-11,11110010)2 = -3.9453125

Определим абсолютную и относительную погрешности результата:

Δ*С* = -3.9453125 – (-3,943) = -0,0023125

δ*С* = · 100% = 0,05%

Погрешность полученного результата объясняется неточным представлением операндов.

5. В формате Ф2 результаты получились точнее из-за того, что операнды представлены точнее и при нормализации результата сдвиг производился на один двоичный разряд, а не на четыре.