Домашнее задание по Дискретной математике №6

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A = 83,42  
B = 59,82

**1.1 Формат Ф1**

A = (83,42)10 = (53,6B851F)16 = (0,536B851F)16 · 162

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

B = (59,82)10 = (3B,D1EB85)16 = (0,3BD1EB85)16 · 162

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

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| XA | = | – | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| XB | = | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| (XA-XB)пр. | = |  | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

(XA-XB) = 0; XC = XA = XB = 2

**а) A>0, B>0:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MA | = | + |  | . | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| MB | = |  | . | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 |
| MC | = |  |  | . | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 |

Результат сложения нормализован.  
  
MC = . 1 0 0 0 1 1 1 1 0 1 0 0

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

С\* = МС · 16Рс = (0,8F4)16 · 162 = 143,25.  
  
Определим абсолютную и относительную погрешности результата:  
ΔС = 143,24 – 143,25 = -0,01

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| δС = |  | -0,01 |  | · 100% = 0,00698% |
| 143,24 |

Результат получился представленным с избытком. Этот факт можно объяснить неточным представлением операндов.

**б) A>0, B<0:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MA | = | – |  | . | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| MB | = |  | . | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 |
| MC | = |  |  | . | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |

Результат вычитания нормализован.  
  
MC = . 0 0 0 1 0 1 1 1 1 0 1 0

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

С\* = МС · 16Рс = (0,17A)16 · 162 = 23,625.  
  
Определим абсолютную и относительную погрешности результата:  
ΔС = 23,6 – 23,625 = -0,025

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| δС = |  | -0,025 |  | · 100% = 0,10593% |
| 23,6 |

Результат получился представленным с избытком. Этот факт можно объяснить неточным представлением операндов.

**с) A<0, B>0:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MB | = | – |  | . | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 |
| MA | = |  | . | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| MC | = |  |  | . | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |

Результат вычитания нормализован и представлен в дополнительном коде.  
  
MC = . 1 1 1 0 1 0 0 0 0 1 1 0

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

С\* = МС · 16Рс = (-0,17A)16 · 162 = -23,625.  
  
Определим абсолютную и относительную погрешности результата:  
ΔС = -23,6 – (-23,625) = 0,025

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| δС = |  | 0,025 |  | · 100% = 0,10593% |
| -23,6 |

Результат получился представленным с избытком. Этот факт можно объяснить неточным представлением операндов.

**2.1 Формат Ф2**

A = (83,42)10 = (53,6B851F)16 = (0,10100110110101110000101)2 · 27

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

B = (59,82)10 = (3B,D1EB85)16 = (0,11101111010001111011)2 · 26

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

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| XA | = | – | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| XB | = | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| (XA-XB)пр. | = |  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |

(XA-XB) = 1; XC = XA = 7

**а) A>0, B>0:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MA | = | + |  | . | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 |
| MB | = |  | . | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| MC | = |  | 1 | . | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 |

Результат сложения денормализован влево.  
  
MC = . 1 0 0 0 1 1 1 1 0 0 1 1  
  
Т.к. выполнен сдвиг мантиссы вправо, характеристику результата нужно увеличить на 1 (ХC = ХC + 1 = 8).

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

С\* = МС · 2Рс = (0,100011110011)2 · 28 = 143,1875.  
  
Определим абсолютную и относительную погрешности результата:  
ΔС = 143,24 – 143,1875 = 0,0525

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| δС = |  | 0,0525 |  | · 100% = 0,03665% |
| 143,24 |

Результат получился представленным с избытком. Этот факт можно объяснить потерей значащих разрядов мантиссы результата при его нормализации.

**б) A>0, B<0:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MA | = | – |  | . | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 |
| MB | = |  | . | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| MC | = |  |  | . | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 |

Результат вычитания денормализован вправо.  
  
MC = . 1 0 1 1 1 1 0 0 1 1 0 0  
  
Т.к. выполнен сдвиг мантиссы влево, характеристику результата нужно уменьшить на 2 (ХC = ХC - 2 = 5).

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

С\* = МС · 2Рс = (0,1011110011)2 · 25 = 23,59375.  
  
Определим абсолютную и относительную погрешности результата:  
ΔС = 23,6 – 23,59375 = 0,00625

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| δС = |  | 0,00625 |  | · 100% = 0,02648% |
| 23,6 |

Результат получился представленным с избытком. Этот факт можно объяснить потерей значащих разрядов мантиссы результата при его нормализации.

**с) A<0, B>0:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MB | = | – |  | . | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| MA | = |  | . | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 |
| MC | = |  |  | . | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |

Результат вычитания денормализован вправо и представлен в дополнительном коде.  
  
MC = . 0 1 0 0 0 0 1 1 0 1 0 0  
  
Т.к. выполнен сдвиг мантиссы влево, характеристику результата нужно уменьшить на 2 (ХC = ХC - 2 = 5).

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

С\* = МС · 2Рс = (-0,1011110011)2 · 25 = -23,59375.  
  
Определим абсолютную и относительную погрешности результата:  
ΔС = -23,6 – (-23,59375) = -0,00625

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| δС = |  | -0,00625 |  | · 100% = 0,02648% |
| -23,6 |

Результат получился представленным с избытком. Этот факт можно объяснить потерей значащих разрядов мантиссы результата при его нормализации.

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.