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**Домашняя работа №6**

по дисциплине “Дискретная математика”

Вариант 11

Выполнил:

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**A = 5,134; B = 9,354**

**1.1 Формат Ф1**

A = (5,134)10 = (5,224DD3)16 = (0,5224DD3)16 · 161

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

B = (9,354)10 = (9,5A9FBE)16 = (0,95A9FBE)16 · 161

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

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

(XA-XB) = 0; XC = XA = XB = 1

**а) A>0, B>0:**

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

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

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

С\* = МС · 16Рс = (0,E7D)16 · 161 = 14,48828.  
  
Определим абсолютную и относительную погрешности результата:  
ΔС = 14,488 – 14,48828 = -0,00028

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| δС = |  | -0,00028 |  | · 100% = 0,00194% |
| 14,488 |

Погрешность полученного результата объясняется следующими факторами:

* неточным представлением операндов;

**б) A>0, B<0:**

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

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

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

С\* = МС · 16Рс = (-0,439)16 · 161 = -4,22266.  
  
Определим абсолютную и относительную погрешности результата:  
ΔС = -4,22 – (-4,22266) = 0,00266

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| δС = |  | 0,00266 |  | · 100% = 0,06294% |
| -4,22 |

Погрешность полученного результата объясняется следующими факторами:

* неточным представлением операндов;

**с) A<0, B>0:**

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

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

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

С\* = МС · 16Рс = (0,439)16 · 161 = 4,22266.  
  
Определим абсолютную и относительную погрешности результата:  
ΔС = 4,22 – 4,22266 = -0,00266

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| δС = |  | -0,00266 |  | · 100% = 0,06294% |
| 4,22 |

Погрешность полученного результата объясняется следующими факторами:

* неточным представлением операндов;

**2.1 Формат Ф2**

A = (5,134)10 = (5,224DD3)16 = (0,101001000100100111)2 · 23

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

B = (9,354)10 = (9,5A9FBE)16 = (0,100101011010101)2 · 24

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

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

(XA-XB) = -1; XC = XB = 4

**а) A>0, B>0:**

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

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

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

С\* = МС · 2Рс = (0,111001111101)2 · 24 = 14,48828.  
  
Определим абсолютную и относительную погрешности результата:  
ΔС = 14,488 – 14,48828 = -0,00028

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| δС = |  | -0,00028 |  | · 100% = 0,00194% |
| 14,488 |

Погрешность полученного результата объясняется следующими факторами:

* неточным представлением операндов;
* потерей значащих разрядов мантиссы одного из операндов при уравнивании порядков;

**б) A>0, B<0:**

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

Результат вычитания денормализован вправо и представлен в дополнительном коде.  
  
MC = . 0 1 1 1 1 0 0 0 1 1 1 0  
  
Т.к. выполнен сдвиг мантиссы влево, характеристику результата нужно уменьшить на 1 (ХC = ХC - 1 = 3).

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

С\* = МС · 2Рс = (-0,10000111001)2 · 23 = -4,22266.  
  
Определим абсолютную и относительную погрешности результата:  
ΔС = -4,22 – (-4,22266) = 0,00266

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| δС = |  | 0,00266 |  | · 100% = 0,06294% |
| -4,22 |

Погрешность полученного результата объясняется следующими факторами:

* неточным представлением операндов;
* потерей значащих разрядов мантиссы одного из операндов при уравнивании порядков;
* потерей значащих разрядов мантиссы результата при его нормализации;

**с) A<0, B>0:**

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

Результат вычитания денормализован вправо.  
  
MC = . 1 0 0 0 0 1 1 1 0 0 1 0

Т.к. выполнен сдвиг мантиссы влево, характеристику результата нужно уменьшить на 1 (ХC = ХC - 1 = 3).

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

С\* = МС · 2Рс = (0,10000111001)2 · 23 = 4,22266.  
  
Определим абсолютную и относительную погрешности результата:  
ΔС = 4,22 – 4,22266 = -0,00266

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| δС = |  | -0,00266 |  | · 100% = 0,06294% |
| 4,22 |

Погрешность полученного результата объясняется следующими факторами:

* неточным представлением операндов;
* потерей значащих разрядов мантиссы одного из операндов при уравнивании порядков;
* 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.