**Домашняя работа № 1 по дискретной математике**

**«Представление чисел с фиксированной и плавающей запятой в различных форматах»**

Вариант 111

Выполнил Куперштейн Дмитрий, группа P3113, табельный номер: 269359

|  |  |  |  |
| --- | --- | --- | --- |
| **A** = 1875 | **B** = 0,73 | **R** = 4242900016 | **S** = BDB3000016 |

1. Заданное число **A** представить в виде двоично-кодированного десятичного числа:
   1. в упакованном формате (BCD)
   2. в неупакованном формате (ASKII)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 0001.1000 | |  | 0111.0101 | |
| 1 | 8 |  | 7 | 5 |

а)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0011.0001 | |  | 0011.1000 | |  | 0011.0111 | |  | 0011.0101 | |
|  | 1 |  |  | 8 |  |  | 7 |  |  | 5 |

б)

1. Заданное число **A** и **-A** представить в форме с фиксированной запятой

A:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 0 | 0 | 0 |  | 0 | 1 | 1 | 1 |  | 0 | 1 | 0 | 1 |  | 0 | 0 | 1 | 1 |
| 15 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1 | 0 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 1 | 1 | 1 |  | 1 | 0 | 0 | 0 |  | 1 | 0 | 1 | 0 |  | 1 | 1 | 0 | 1 |
| 15 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1 | 0 |

-A:

1. Заданные числа **A** и **B** представить в форме с плавающей запятой в формате *Ф1*

A:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |  | 0 | 1 | 0 | 1 |  | 0 | 0 | 1 | 1 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| 0 | 1 |  |  |  |  |  | 7 | 8 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 31 | |

B:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |  | 1 | 0 | 1 | 0 |  | 1 | 1 | 1 | 0 |  | 0 | 0 | 0 | 1 |  | 0 | 1 | 0 | 0 |  | 0 | 1 | 1 | 1 |
| 0 | 1 |  |  |  |  |  | 7 | 8 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 31 | |

1. Заданные числа **A** и **B** представить в форме с плавающей запятой в формате *Ф2*

A:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 |  | 1 | 0 | 1 | 0 |  | 0 | 1 | 1 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| 31 | 30 |  |  |  |  |  |  | 23 | 22 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0 | |

B:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |  | 1 | 0 | 1 | 0 |  | 1 | 1 | 1 | 0 |  | 0 | 0 | 0 | 1 |  | 0 | 1 | 0 | 0 |  | 0 | 1 | 1 | 1 |
| 31 | 30 |  |  |  |  |  |  | 23 | 22 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0 | |

1. Заданные числа **A** и **B** представить в форме с плавающей запятой в формате *Ф3*

A:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 |  | 1 | 0 | 1 | 0 |  | 0 | 1 | 1 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| 31 | 30 |  |  |  |  |  |  | 23 | 22 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0 | |

B:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 |  | 1 | 0 | 1 | 0 |  | 1 | 1 | 1 | 0 |  | 0 | 0 | 0 | 1 |  | 0 | 1 | 0 | 0 |  | 0 | 1 | 1 | 1 |
| 31 | 30 |  |  |  |  |  |  | 23 | 22 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0 | |

1. Найти значения чисел **Y** и **Z** по из заданным шестнадцатеричным представлениям **R** и **S** в форме с плавающей запятой в формате *Ф1*

R:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |  | 0 | 0 | 1 | 0 |  | 1 | 0 | 0 | 1 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| 0 | 1 |  |  |  |  |  | 7 | 8 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 31 | |

S:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 |  | 0 | 0 | 1 | 1 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| 0 | 1 |  |  |  |  |  | 7 | 8 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 31 | |

Найдём число Y:

Мантисса равна 0,42916

Порядок равен разности характеристики и смещения (64):

66 – 64 = 2

Число Y равно 0,42916 ⋅ 162 = 42,916 = 66,5625

Найдём число Z:

Мантисса равна 0,B316

Порядок равен разности характеристики и смещения (64):

61 – 64 = -3

Знаковый бит равен единице - число отрицательное

Число Z равно –(0,B316)⋅ 16-3 = -0,000B316 = -0.00017070770263671875

1. Найти значения чисел **Y** и **Z** по из заданным шестнадцатеричным представлениям **R** и **S** в форме с плавающей запятой в формате *Ф2*

R:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |  | 0 | 0 | 1 | 0 |  | 1 | 0 | 0 | 1 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| 31 | 30 |  |  |  |  |  |  | 23 | 22 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0 | |

S:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 |  | 0 | 0 | 1 | 1 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| 31 | 30 |  |  |  |  |  |  | 23 | 22 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0 | |

Найдём число Y:

Мантисса равна 0,1100 0010 10012

Порядок равен разности характеристики и смещения (128):

132 – 128 = 4

Число Y равно 0,1100 0010 10012 ⋅ 24 = 1100, 0010 10012 = 12.16015625

Найдём число Z:

Мантисса равна 0,1011 00112

Порядок равен разности характеристики и смещения (128):

123 – 128 = -5

Знаковый бит равен единице - число отрицательное

Число Z равно –(0,1011 00112)⋅ 2-5 = -0, 0000 0 1011 00112 =

-0.0218505859375

1. Найти значения чисел **Y** и **Z** по из заданным шестнадцатеричным представлениям **R** и **S** в форме с плавающей запятой в формате *Ф3*

R:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |  | 0 | 0 | 1 | 0 |  | 1 | 0 | 0 | 1 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| 31 | 30 |  |  |  |  |  |  | 23 | 22 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0 | |

S:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 |  | 0 | 0 | 1 | 1 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| 31 | 30 |  |  |  |  |  |  | 23 | 22 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0 | |

Найдём число Y:

Мантисса равна 1,100 0010 10012

Порядок равен разности характеристики и смещённого порядка (127):

132 – 127 = 5

Число Y равно 1,100 0010 10012 ⋅ 25 = 11 0000,1010 012 = 48.640625

Найдём число Z:

Мантисса равна 1,011 00112

Порядок равен разности характеристики и смещения (127):

123 – 127 = -4

Знаковый бит равен единице - число отрицательное

Число Z равно –(1,011 00112 ⋅ 2-4) = -0,0001 0110 0112 =

-0.08740234375