**Санкт-Петербургский национальный исследовательский университет информационных технологий, механики и оптики.**

**Дискретная Математика.**

**Задание №1**

**Выполнил: Болорболд Аригуун, группа Р3111**

**Вариант 62**

**A = 1150, B = 0.405**

**1. Заданное число А представить в виде двоично-кодированного десятичного числа:**

а) в упакованном формате (BCD):

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | 1 | 5 | 0 |
| 0001 | 0001 | 0101 | 0000 |

A = 0001.0101.0010.0101

б) в неупакованном формате (ASCII):

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | 1 | 5 | 0 |
| 0011.0001 | 0011.0001. | 0011.0101. | 0011.0000 |

A = 0011.0001.0011.0001.0011.0101.0011.0000

**2. Заданное число А и –A представить в форме с фиксированной запятой:**

2.1) A = 115010

(1150)10 = 1150/2 = 575 (ост. 0)

575/2 = 287 (ост. 1)

287/2 = 143 (ост. 1)

143/2 = 71 (ост. 1)

71/2 = 35 (ост. 1)

35/2 = 17 (ост. 1)

17/2 = 8 (ост. 1)

8/2 = 4 (ост. 0)

4/2 = 2 (ост. 0)

2/2 = **1** (ост. 0)

A = (0000010001111110)­2 = (47E)16

|  |  |  |  |
| --- | --- | --- | --- |
| 0000 | 0100 | 0111 | 1110 |
| 0 | 4 | 7 | E |

2.2) -A = -(1150)10 = (1111101110000001)2

[-A]пр = (0000010001111110)­2 – прямой код,

[-A]об= (1111101110000000)2 – обратный код,

+ 1

[-A]доп= 1111101110000001 – дополнительный код

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

3.1) A = (1150)10 = (47E)16

A = (0,47E)16 \* 163

мантисса порядок

Характеристика числа А:

XA = PA + 64 = (67)10 = (1000011)2

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

знак + характеристика мантисса

3.2) B = (0,405)10 =(0,67AE147)16

B = (0,67AE147)16 \* 160

Характеристика числа B:

XB = PB + 64 = 64 = (1000000) ­2

6 7 A D 7 1

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

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

4.1) A = (1150)10 = (47E)16 = (10001111110)2

A = 0,1000111111 \* 211

XA = 11 + 128 = (139)10 = (10001011)2

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

Знак + характеристика мантисса

4.2) B = (0,405)10 = (0.67AE147)16 =

=

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0, | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
|  | 6 | | | | 7 | | | | A | | | | E | | | | 1 | | | | 4 | | | |

= (0,11001111010111000010100)2 \* 2-1

Характеристика числа B:

XB = PB + 128 = 127 = (01111111)2

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

Знак + характеристика мантисса

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

5.1) A =(1150)10 = 100011111102 = 1,000111111 \*210

Мантисса Порядок

Смещенный порядок числа А:

XA = РА + 127 = 137 = (10001001)2

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

5.2) B = 0,40510 = (0,0110011110101110000101000110)­2 = (1,10011110101110000101000110) \* 2-2

Смещенный порядок числа B:

XB = P**B** + 127 = 125 = (01111101)2

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

**Часть 2**

**R = 40FA0000 S = BEF70000**

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

6.1) R = 40FA0000

4 0 F A 0 0 0 0

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

Xy = 65 = 64 + 1

Смещение порядок

Y = -(0,FA)16 \* 161 = -(F,A)16

Y = - (15\*160 + 10\*16-1) = 15,625

Y = 15,625

6.2) S = BEF70000

B E F 7 0 0 0 0

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

PZ = XZ – 64 = 62 – 64 = -2

Z = -(0.F7)16 \*16-2 = -(0.00F7)16

Z = -247/164 =-247/216 = -247/64\*10-3 = -3.85\*10-3

**7. Найти значения чисел V и W по их заданным шестнадцатеричным представлениям R и S в форме с плавающей запятой в формате Ф2.**

7.1) R = 40FA0000

4 0 F A 0 0 0 0

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

PV = 129 – 128 = 1

V = (0,1111101) \*21

V = (1,953125)10

7.2) S = BEF70000

B E F 7 0 0 0 0

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

Порядок числа W:

PW = 125-128 = -3

W = -0,11110111\*2-3

W= -(0,00011110111)2

W = -1111011\*2-11 = -247/2048 = -(0,96484375)10

**8. Найти значения чисел T и Q по их заданным шестнадцатеричным**

**представлениям R и S в форме с плавающей запятой в формате Ф3**

8.1) R=40FA0000

4 0 F A 0 0 0 0

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

PT= 129 – 127 = 2

T=(1,111101) 2 \* 22

T = 111,11012 = (7,8125)10

8.2) S = BEF70000

B E F 7 0 0 0 0

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

PQ= 125-127=-2

Q = -1,1110111 \* 2-2

Q = 0.011110111 = 11110111 \* 2-9 = 247/512 = 0,482421875

Q = 247/512