|  |  |  |
| --- | --- | --- |
| Министерство науки и высшего образования  Российской Федерации | | |
| Федеральное государственное бюджетное  образовательное учреждение высшего образования | | |
| «Новосибирский государственный технический университет» | | |
|  | | |
| Кафедра прикладной математики | | |
|  | | |
| Практическое задание № 1 | | |
| по дисциплине «Информатика» | | |
|  | | |
| **Представление данных ЭВМ** | | |
|  | | |
|  | Факультет: | ПМИ |
| Группа: | ПМ-83 |
| Бригада: | 5 |
| Студенты: | Кравец Екатерина, |
|  | Судьярова Мария, |
|  | Шумский Владислав |
| Преподаватель: | Тракимус Юрий Викторович |
|  |  |
|  | | |
| Новосибирск | | |
| 2019 | | |

1. **Перевести заданное число в двоично-десятичный код**

|  |  |
| --- | --- |
| 0 | 0000 |
| 1 | 0001 |
| 2 | 0010 |
| 3 | 0011 |
| 4 | 0100 |
| 5 | 0101 |
| 6 | 0110 |
| 7 | 0111 |
| 8 | 1000 |
| 9 | 1001 |

00101

01001

00011

01111

01001

10011

00111

00111

01111

1. **Расшифровать число из заданного двоично-десятичного кода**

10011

10011

01011

01011

01111

10011

01001

1. **Зашифровать и дешифровать заданные фрагменты текста, используя таблицу кодов ASCII**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| а | б | в | г | д | е | ж | з | и | й | к | л | м | н | о | п |
| 224 | 225 | 226 | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 |
| р | с | т | у | ф | х | ц | ч | ш | щ | ъ | ы | ь | э | ю | я |
| 240 | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 | 253 | 254 | 255 |

2261

2321

2371

2471

2291

2411

2421

2291

2401

2261

2241

23551

2321

2281

2241

2461

2321

2551

1. **Записать прямой и дополнительный коды восьмибитового числа**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  | | --- | --- | | **Число** | 4710 | | **Прямой код** | 001011112 | | **Дополнительный** | 001011112 | |  |  | | **Число** | -10710 | | **Прямой код** | 011010112 | | **Инверсия** | 100101002 | | **Дополнительный** | 100101012 | | |  |  | | --- | --- | | **Число** | -10910 | | **Прямой код** | 011011012 | | **Инверсия** | 100100102 | | **Дополнительный** | 100100112 | |  |

1. **Записать целое число по его дополнительному коду**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  | | --- | --- | | **Дополнительный** | 01110100101100002 | | **Прямой код** | 01110100101100002 | | **Число** | 2987210 | |  |  | | **Дополнительный** | 01010101101101102 | | **Прямой код** | 01010101101101102 | | **Число** | 2194210 | | |  |  | | --- | --- | | **Дополнительный** | 11010101100000002 | | **Инверсия** | 11010101011111112 | | **Прямой код** | 0010101010000002 | | **Число** | -1088010 | |  |

1. **Записать шестнадцатеричное восьмибайтное и четырехбайтное представления действительного числа, интерпретируя его как число с плавающей запятой**

а)

|–27,625| = 11011.10= 1.101110 \*

= 4 + ( – 1) = 1027 = 1000000001

|  |  |  |  |
| --- | --- | --- | --- |
| **Double** | **знак** | **порядок** | **мантисса** |
| Номер бита | |  | | --- | | 63 | | **1** | |  | | |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** | **1** | | **C** | | | **0** | | | | **3** | | | | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | 1 | 0 | 1 | **1** | 1 | 0 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | **B** | | | | **A** | | | | **0** | | | | **0** | | | | **0** | | | | **0** | | | | **0** | | | | **0** | | | | **0** | | | | **0** | | | | **0** | | | | **0** | | | | **0** | | | | |
| число |
| **0x** |

Ответ: **C03BA0000000000**

|195.938| = 11000011.11110000001.. = 1.100001111110000001.. \*

= 7 + ( – 1) = 1030 = 1000000011

|  |  |  |  |
| --- | --- | --- | --- |
| **Double** | **знак** | **порядок** | **мантисса** |
| Номер бита | |  | | --- | | 63 | | 0 | |  | | |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** | **1** | 0 | | **4** | | | **0** | | | | **6** | | | | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | **1** | 0 | 0 | 0 | 0 | **1** | **1** | **1** | **1** | **1** | **1** | 0 | 0 | 0 | 0 | 0 | 0 | **1** | 0 | 0 | 0 | 0 | 0 | **1** | **1** | 0 | 0 | 0 | **1** | 0 | 0 | **1** | 0 | 0 | **1** | **1** | 0 | **1** | **1** | **1** | 0 | **1** | 0 | 0 | **1** | 0 | **1** | **1** | **1** | **1** | 0 | 0 | | | **8** | | | | **7** | | | | **E** | | | | **0** | | | | **4** | | | | **1** | | | | **8** | | | | **9** | | | | **3** | | | | **7** | | | | **4** | | | | **B** | | | | **C** | | | | |
| число |
| **0x** |

Ответ: **40687E04189374B**

б)

|–122.836| = 1111010.1101011000000100 = 1.1110101101011000000100 \*

= 6 + (– 1) = 133 = 1000010

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Float** | **знак** | **порядок** | | | | | | | | | **мантисса** | | | | | | | | | | | | | | | | | | | | | | |
| номер | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| число | **1** | **1** | 0 | 0 | 0 | 0 | **1** | 0 | | **1** | **1** | **1** | **1** | 0 | **1** | 0 | **1** | **1** | 0 | **1** | 0 | **1** | **1** | 0 | 0 | 0 | 0 | 0 | 0 | **1** | 0 | 0 | 0 |
| **0x** | **С** | | | | **2** | | | | **F** | | | | | **5** | | | | **A** | | | | **C** | | | | **0** | | | | **8** | | | |

Ответ: **C2F5AC0**

|213.773| = 11010101.110001011110001 = 1.1010101110001011110001 \*

= 7 + (– 1) = 134 = 1000011

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Float** | **знак** | **порядок** | | | | | | | | | **мантисса** | | | | | | | | | | | | | | | | | | | | | | |
| номер | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| число | **1** | **1** | 0 | 0 | 0 | 0 | **1** | **1** | | 0 | **1** | 0 | **1** | 0 | **1** | 0 | **1** | **1** | **1** | 0 | 0 | 0 | **1** | 0 | **1** | **1** | **1** | **1** | 0 | 0 | 0 | **1** | **1** |
| **0x** | **4** | | | | **3** | | | | **5** | | | | | **5** | | | | **C** | | | | **5** | | | | **E** | | | | **3** | | | |

Ответ: **4355C5E**

1. **Преобразовать шестнадцатеричный восьмибайтный и четырехбайтный коды в число с плавающей запятой**

a)

C388700

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **знак** | **порядок** | | | | | | | | | **мантисса** | | | | | | | | | | | | | | | | | | | | | | | |
| 0x | **C** | | | | **3** | | | | | **8** | | | | | **8** | | | | **7** | | | | **0** | | | | **0** | | | | **0** | | | |
| число | **1** | **1** | 0 | 0 | | 0 | 0 | **1** | **1** | **1** | | 0 | 0 | 0 | **1** | 0 | 0 | 0 | 0 | **1** | **1** | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| номер | 31 | 30 | 29 | 28 | | 27 | 26 | 25 | 24 | 23 | | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

1000011 = 135

135 – ( – 1) = 8

1.0001000011 \* = 100010000.11 = 272.875

Ответ: **-272.875**

438E380

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **знак** | **порядок** | | | | | | | | | **мантисса** | | | | | | | | | | | | | | | | | | | | | | | |
| 0x | **4** | | | | **3** | | | | | **8** | | | | | **E** | | | | **3** | | | | **8** | | | | **0** | | | | **0** | | | |
| число | 0 | **1** | 0 | 0 | | 0 | 0 | **1** | **1** | **1** | | 0 | 0 | 0 | **1** | **1** | **1** | 0 | 0 | 0 | **1** | **1** | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| номер | 31 | 30 | 29 | 28 | | 27 | 26 | 25 | 24 | 23 | | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

1000011 = 135

135 – ( – 1) = 8

1.00011100011 \* = 100011100.011 = 284.4375

Ответ: **284.4375**

б)

C07DF7A00000000

|  |  |  |  |
| --- | --- | --- | --- |
|  | **знак** | **порядок** | **мантисса** |
| Номер бита | |  | | --- | | 63 | | **1** | |  | | |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** | **1** | **1** | | **C** | | | **0** | | | | **7** | | | | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | **1** | **1** | 0 | **1** | **1** | **1** | **1** | **1** | 0 | **1** | **1** | **1** | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | **D** | | | | **F** | | | | **7** | | | | **A** | | | | **0** | | | | **0** | | | | **0** | | | | **0** | | | | **0** | | | | **0** | | | | **0** | | | | **0** | | | | **0** | | | | |
| число |
| 0x |

1000000011 = 1031

1031 – ( – 1) = 8

1.110111110111 \* = 111011111.0111 = 479.46875

Ответ: **-479.46875**

404BA3000000000

|  |  |  |  |
| --- | --- | --- | --- |
|  | **знак** | **порядок** | **мантисса** |
| Номер бита | |  | | --- | | 63 | | 0 | |  | | |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** | 0 | 0 | | **4** | | | **0** | | | | **4** | | | | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | **1** | 0 | 0 | **1** | **1** | 0 | **1** | 0 | 0 | 0 | **1** | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | **B** | | | | **A** | | | | **3** | | | | **0** | | | | **0** | | | | **0** | | | | **0** | | | | **0** | | | | **0** | | | | **0** | | | | **0** | | | | **0** | | | | **0** | | | | |
| число |
| 0x |

1000000010 = 1028

1028 – (– 1) = 5

1. 10111010001 \* = 110111.010001 = 55.2734375

Ответ: **55.2734375**