COSC 290.002

Class Exercises #2

1. Positional Numbering System

(I believe I interpreted parts a and b correctly; however I am not completely sure)

* 1. A set of valid numerals for base-r(radix-r) system
     1. What is the set of valid numerals for decimal number system (base-8)?

0, 1, 2, 3, 4, 5, 6, 7

* + 1. What is the set of valid numerals for hexadecimal number system(base-16)?

0, 1, 2, 3, 4, 5, 6, 7, 8, 9, a, b, c, d, e, f

* 1. Represent the following numbers as power of a radix form
     1. 31.4510  = **3**\*10^1 + **1**\*10^0 + **4**\*10^-1 + **5**\*10^-2
     2. 11101.11012 = 1\*2^4 + 1\*2^3 + 1\*2^2 + 1\*2^0 + 1\*2^-1 + 1\*2^-2 + 1\*2^-4
     3. 2c.f3e16 = 2\*16^1 + c\*16^0 + f\*16^-1 +3\*16^-2 + e\*16^-3

1. Converting between bases.
   1. 10210  = 11001102 = 6616
   2. 1010010102 = 33010 =5128
   3. 1538 = 10710 = 11010112
   4. f416 = 111101002 = 24410 =3648
   5. 22.9062510 = 10110.111012

(Maximum of six places to the right of the binary point)

* 1. 2.124023437510 = 10.0001112

(Maximum of six places to the right of the binary point)

* 1. 22.3410 = 42.1322225
  2. 11101.11012 = 29.812510
  3. 1011.11012 = 11.812510

1. Fill up the table in binary form for 4-bit number.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Decimal | SM | OC | TC | Excess-7 |
| +8 |  |  |  | 1111 |
| +7 | 0111 | 0111 | 0111 | 1110 |
| +6 | 0110 | 0110 | 0110 | 1101 |
| +5 | 0101 | 0101 | 0101 | 1100 |
| +4 | 0100 | 0100 | 0100 | 1011 |
| +3 | 0011 | 0011 | 0011 | 1010 |
| +2 | 0010 | 0010 | 0010 | 1001 |
| +1 | 0001 | 0001 | 0001 | 1000 |
| +0 | 0000 | 0000 | 0000 | 0111 |
| -0 | 1000 | 1111 |  |  |
| -1 | 1001 | 1110 | 1111 | 0110 |
| -2 | 1010 | 1101 | 1110 | 0101 |
| -3 | 1011 | 1100 | 1101 | 0100 |
| -4 | 1100 | 1011 | 1100 | 0011 |
| -5 | 1101 | 1010 | 1011 | 0010 |
| -6 | 1110 | 1001 | 1010 | 0001 |
| -7 | 1111 | 1000 | 1001 | 0000 |
| -8 |  |  | 1000 |  |

1. Represent the following decimal numbers in binary using 8-bit signed magnitude, one’s complement, two’s complement, and excess-127 representations:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Decimal | SM | OC | TC | Excess-127 |
| +50 | 00110010 | 0011010 | 0011010 | 10110001 |
| -26 | 10011010 | 11100101 | 11100110 | 01110110 |
| +110 | 00101110 | 00101110 | 00101110 | 11101101 |
| -121 | 11111001 | 10000110 | 10000111 | 00000110 |
| +70 | 01000110 | 01000110 | 01000110 | 11000101 |
| -42 | 10101010 | 11010101 | 11010110 | 01010101 |
| +15 | 00001111 | 00001111 | 00001111 | 10001110 |
| -27 | 10001101 | 11110010 | 11110011 | 01100100 |
| +16 | 00010000 | 00010000 | 00010000 | 10001111 |
| +118 | 01110110 | 01110110 | 01110110 | 11110101 |