

CS2810 Homework 5 - 116 points - Due by midnight October 12. Submit this homework through Eagle.

For this homework assignment you may work individually or in a group of up to 3 students. If working in a group, be sure that when you turn in your homework through Eagle you include the names of everyone in the group.

Questions

1. (24 points, 2 points each cell) For the following table, fill in the blank cells with the appropriate value. For example, in row 1, the value in the base 10 column is the value of the decimal number which has a base 2 value of 101101, and similarly for the other two cells in that row, etc.

Base 2	Base 10	Base 3	Base 16
101101	<u>45</u>	<u>1200</u>	<u>2D</u>
<u>1001110</u>	78	<u>2220</u>	<u>4E</u>
<u>11001</u>	<u>25</u>	221	<u>19</u>
<u>101010111100</u>	<u>2748</u>	<u>10202210</u>	ABC

2.) (12 points, 4 points each part) As noted in class, when dealing with fractional parts, the conversion between bases may not be exact. For the following conversions, using truncation, give only enough digits so that the error of conversion is $\leq 0.1_{10}$ in all cases.

a.) $0.62_{10} = ?_2$

0.1001₂

b.) $0.111_2 = ?_{10}$

0.8₁₀

c.) $0.21_3 = ?_2$

0.11₂

3.) (24 points, 2 points each cell) For the following table, fill in the blank cells with the appropriate value. In each cell the number is in binary and it is a 6 bit value in all cells.

Base 2- Sign Magnitude	Base 2- 2's complement	Base 2- 1's complement
101101	<u>11011</u>	<u>110010</u>
011010	<u>011010</u>	<u>011010</u>
<u>110011</u>	101101	<u>101100</u>
<u>011010</u>	011010	<u>011010</u>
<u>110010</u>	<u>101110</u>	101101
<u>011010</u>	<u>011010</u>	011010

4.) (16 points, 4 points each part) In HEX, give the value for the following code words:

a.) 'A' = ?ASCII

41₁₆

b.) '7'=?ASCII

37₁₆

c.) '&'=? Unicode

0026₁₆

d.) "ab"=?C++ string

616200₁₆ The two extra 0's on the end are for the null character which terminates the string in C++

5.) (25 points, 5 points each part) In HEX or decimal are noted, give the value for the following:

a.) $83.5_{10}=?_{\text{HEX}}$ for IEEE754 format single precision

42A70000

b.) $1.101_2 \times 2^3 = ?_{\text{HEX}}$ for IEEE754 format single precision

41500000₁₆

c.) $0F0FCDE0_{\text{HEX-754-32bit}}=?_{\text{decimal}}$

7.0900944 X 10⁻³⁰

d.) $-\infty=?_{\text{HEX}}$ for IEEE754 format single precision

FF800000₁₆

e.) $0.101_2 \times 2^{-130} = ?_{\text{HEX}}$ for IEEE754 format single precision

00050000₁₆

6.) (5 points) What is the Hamming distance between FFF_{16} and 888_{16} ?

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7.) (10 points) What is the Hamming code for the following character set?

Character	Frequency	%
a	10	10
b	15	15
c	12	12
d	7	7
e	23	23
f	25	25
g	8	8

For this one the code is as given or if one switches the 1's and 0's it's also a legal code. For example, in the answer I give, the code for a is 100, it could likewise be 011. Remember if the second approach is used the switch must be made for all code words.

Character	Binary String code word
a	100
b	001
c	101
d	0000
e	11
f	01
g	0001