**Note:** Please post your homework to ICS232 D2L on or before the due date.

If you do not post your homework on or before the due data, please post your late homework when complete. (Late Homework: -15% Penalty).

1. (3 pts) Consider an unsigned fixed point decimal (Base10) representation with 8 digits, 5 to the left of the decimal point and 3 to the right.

a.      What is the range of the expressible numbers?

b.      What is the precision?

c.       What is the error?

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1. (3 pts) Convert this unsigned base 2 number, **1001 10112**, to each base given below

(Note: the space in the binary string is purely for visual convenience)

Show your work.

* 1. Using the Polynomial method convert the number above from base 2 to base 10 (decimal)

* 1. Using the grouping method convert number above from base 2 to base 16… (hex)

* 1. Using the grouping method convert number above from base 2 to base 8… (octal)

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1. (3 pts) Convert this unsigned base 2 number, **11011.100112**, to each base given below

(Note: The placement of the decimal point. Correct padding must be used)

Show your work.

* 1. Using the grouping method convert number above from base 2 to base 16… (hex)
  2. Using the grouping method convert number above from base 2 to base 8… (octal)
  3. Using the grouping method convert number above from base 2 to base 4… ( )

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1. (3 pts) Convert 597.2210 (decimal number) to **unsigned binary** using the remainder and multiplication methods:. Stop at the 6th digit to the right of the decimal place. (Show your work)

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1. (3 pt) Using the overflow concept and its identifying methods introduced in the class, solve the problem: suppose that we have a computing device that has only 8 bits. Using this device, add the following two unsigned 8 bit binary numbers and give the final result. If there is an overflow, point that out (you must clearly indicate whether your final result has overflow).

carry bits

0 1 1 0 1 1 1 0

+ 1 1 1 0 1 0 1 1

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Answer:

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1. (3 pts) Convert -12310 to an 8-bit binary number using the representations given below.

Show all 8 bits.

* 1. signed magnitude number

Answer:

* 1. one's complement number

Answer:

* 1. two's complement number

Answer:

* 1. excess 128 number (bias the two’s complement number)

Answer:

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1. (6 pts) Consider the bit pattern 1101 10102. **Provide the equivalent value in Base10 (decimal)** for this bit pattern based on the following assumptions: (if the bit pattern represents a negative number under the assumed context, then give its negative value). (show your work)

Assume the original number is expressed using:

* 1. signed magnitude representation

Answer:

* 1. unsigned representation

Answer:

* 1. one's complement representation

Answer:

* 1. two's complement representation

Answer:

* 1. excess 128 representation (biased two’s complement number)

Answer:

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1. (3 pts) This problem tests your knowledge about coding schemes. What is the binary bit pattern for the letter 'h' using?

**The answers should give the whole bit string (including leading 0s).**

* 1. ASCII encoding (7-bits)
  2. EBCDIC encoding (8-bits)
  3. UNICODE encoding (16 bits)

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1. (3 pts) Show how each of the following floating point values would be stored using IEEE-754 single precision (be sure to indicate the sign bit, the exponent, and the significand fields): (show your work)
   1. 12.5
   2. −1.5
   3. 0.75
   4. 26.625

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1. (6 pts) Show how each of the following floating point values would be stored using IEEE-754 double precision (be sure to indicate the sign bit, the exponent, and the significand fields): (show your work)
   1. 13.5
   2. −102.25
   3. 0.0078125

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1. (6 pts) Perform the following binary multiplications using Booth’s algorithm, (assuming signed two’s complement integers): (show your work)
   1. 1011 × 0101
   2. 0011 × 1011
   3. 1011 × 1100

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1. (3 pts) Using arithmetic shifting, perform the following on the two’s compliment numbers:
   1. double the value 000101012
   2. quadruple the value 011101112
   3. divide the value 110010102 in half

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1. (3 pts) Find the quotients and remainders for the following division problems modulo 2 (show your work)
   1. 10011112 ÷ 11012
   2. 10111102 ÷ 11002
   3. 10011011102 ÷ 110012
   4. 1111010102 ÷ 100112

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1. (6 pts) Using the CRC polynomial 1101, compute the CRC code word for the information word, 01001101. Check the division performed at the receiver. (Show your work)

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1. (6 pts) Using the CRC polynomial 1101, compute the CRC code word for the information word, 01011101. Check the division performed at the receiver. (Show your work)

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