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Homework #1 Computer Organization
Due: January 30, 2009 (F)

A 10
B 11
C 12
D 13
E 14
F 15

1. Perform the following calculations:

(a)	(b)	(c)	(d)
1011011_2	1010010_2	$928A5_{16}$	$B3619_{16}$
$+\ 0011011_2$	$-\ 0100011_2$	$+\ 433BD_{16}$	$-\ 32A3D_{16}$
1110110_2	101111_2	$D5C62_{16}$	$89F36_{16}$

2. What are the limitations of Moore's Law? Why can't this law hold forever? Explain.

0.5 Every 18 months the # of gates on a chip doubles. Since chips stay about the same size, this means the gates get smaller and closer together. Eventually, a gate will reach atomic size and cannot get smaller.

3. Represent the following decimal numbers in binary using **8-bit** signed magnitude, one's complement, and two's complement:

decimal number	signed magnitude 8-bits	one's complement 8-bits	two's complement 8-bits
105_{10}	0 1 1 0 1 0 0 1	0 1 1 0 1 0 0 1	0 1 1 0 1 0 0 1
-85_{10}	1 1 0 1 0 1 0 1	1 0 1 0 1 0 1 0	1 0 1 0 1 0 1 1

(1.5) 0.5 0.5 0.5

4. Using 16-bits what is the range of values for each of the following representations:

a) unsigned integers: 0 to $2^{16}-1$ (65,535) 0.5

b) signed integers using two's complement: -2^{15} to $+2^{15}-1$ 0.5
$-32,768$ to $+32,767$

5. What decimal (base 10) value is represented by the 32-bit signed, two's complement value represented as a hexidecmal FFFF FE3B$_{16}$?

1111 1111 1111 1111 1111 1110 0011 1011 = −453
0 01 1100 0100
256 128 64 32 16 8 4 2 1
1 1100 0101 = +453

1 256 +128 384 +64 448 +5 453

6. Convert -25.28125$_{10}$ to its 64-bit IEEE-754 floating point representation.

16 8 4 2 1 . .5 .25 .125 .0625 .03125
1 1001. 0 1 0 0 1 = $1.1001010010 \times 2^{4+1023}$
1024 512 256 128 64 32 16 8 4 2 1
1 1 0 0 0 0 0 0 0 0 1 1 1 0 0 1 0 1 0 0 1 0 . . . 0

7. Suppose A, B and C are 32-bit IEEE 754 floating point variables with A having a normalized value of $1.11_2 \times 2^{75}$ and B having a normalized value of $1.101_2 \times 2^{30}$. After the assignment statement "C = A+B", why is C's value equal to A's value and not the sum?

1 1.110 . 0×2^{75}
.000 . . . 0101
29 0.5

7 1.110 . . . 0101×2^{75}