CPE/EE 323 Introduction to Embedded Computer Systems
Homework I

Problem #1 (25 points)

Fill in the following table. Show your work as illustrated for (a).

	Decimal	32-bit binary	Hexadecimal number (8 hex digits)	4-byte packed BCD number
(a)	**12,348**	**0000.0000.0000.0000.0011.0000.0011.1100**	**0000_303C**	**00. 00.30.3?**
(b)			DBF3_23AB	
(c)	10,245			
(d)		0111.0011.0010.1100.1001.0100.0010.1100		
(e)				83.29.19.43

(a)
12348/16 = 771⌊12
771/16 = 48⌊3
48/16 = 3⌊0
3/16 = 0⌊3

$12348_{10} = 303C_{16} = 0000\_303C_{16} = 0000\_0000\_0000\_0000\_0011\_0000\_0011\_1100_2 = 00.00.303?$
("?" marks an illegal BCD digit).

Problem #2 (25 points)

Consider the following 16-bit hexadecimal numbers (second column). Each of these values can be interpreted as an unsigned 16-bit integer, a signed 16-bit integer represented in 2's complement, or as a sign-and-magnitude integer. Provide the decimal value for each number and interpretation. Show your work as illustrated in (a).

	16-bit hex	Unsigned int	Signed int	Sign-and-magnitude
(a)	**A223**	**41507**	**-24029**	**-8739**
(b)	81C2			
(c)	9689			
(d)	A2EB			
(e)	39CD			

(a) unsigned: $A223_{16} = 10*16^3 + 2*16^2 + 2*16^1 + 3*16^0 = 41507_{10}$
signed: $A223_{16} = 1010.0010.0010.0011_2$ => this is a negative number;
two's complement is: $0101.1101.1101.1101 = 5DDD_{16} = 24029_{10}$ => $A223_{16} = -24029$
sign-and-magnite: $-2223_{16} = -8739$

Problem #3 (25 points)

Consider the following arithmetic operations. Find the results and set the flags C, V, N, and Z accordingly.

(a) 8-bit, two's complement

$55_{10} + 105_{10}$

(b) 8-bit, two's complement

$(-55)_{10} - 68_{10}$

(c) 16-bit, two's complement

$-45_{8} - 88_{16}$

(d) 16-bit, two's complement

$-AF_{16} + 34_{10}$

(e) 16-bit, two's complement

$AF_{16} + 99_{10}$

Problem #4 (25 points)

(a) Convert the following number from decimal to the IEEE 32-bit floating point.
78.03125_{10}

(b) Convert the following number from the binary IEEE floating point to decimal.
$60E3AB00_{16}$