Homework 1

(Due date: September 15th)

Presentation and clarity are very important! Show your procedure!

PROBLEM 1 (15 PTS)

- Calculate the result of the additions and subtractions for the following fixed-point numbers.

UNSIGNED		SIGNED	
0.101010 + 1.0110101	1.00101 - 0.0000111	10.001 + 1.001101	0.0101 - 1.0101101
10.1101 + 1.1001	100.1 + 0.1000101	1000.0101 - 111.01001	101.0001 + 1.0111101

PROBLEM 2 (25 PTS)

- Multiply the following signed fixed-point numbers:

01.001 × 1.001001	10.0001 × 01.01001	1000.000 × 10.010101	0.1101010 × 11.1111011

- Get the division result (with $x = 4$ fractional bits) for the following signed fixed-point numbers:

101.1001 ÷ 1.011	11.011 ÷ 1.01011	10.0110 ÷ 01.01	0.101010 ÷ 110.1001

PROBLEM 3 (20 PTS)

- We want to represent numbers between -255.9 and 234.5. What is the fixed point format that requires the fewest number of bits for a resolution better or equal than 0.0025? (5 pts).

- Represent these numbers in Fixed Point Arithmetic (signed numbers). Select the minimum number of bits in each case.

-125.125	-232.625	-78.1875	212.3125

PROBLEM 4 (10 PTS)

- Complete the table for the following fixed point formats (signed numbers):

Fractional bits	Integer Bits	FX Format	Range	Dynamic Range (dB)	Resolution
7	5				
12	4				
17	7				

- Complete the table for the following floating point formats (which resemble the IEEE-754 standard) with 16, 24, 48 bits. Only consider ordinary numbers.

Exponent bits (E)	Significant bits (p)	Min	Max	Range of e	Range of significand
7	8				
8	15				
11	36				

PROBLEM 5 (30 PTS)

- Calculate the decimal values of the following floating point numbers represented as hexadecimals. Show your procedure.

Single (32 bits)		Double (64 bits)	
✓ E8000978	✓ 800BCCAA	✓ FA09D3784D039B7D	✓ FACADE50404900DB
✓ 80DE0FEE	✓ 7FFCAFEA	✓ 80DEADBEE9700400	✓ FE80000009AB00DE
✓ 3DE32856	✓ FACEB00C	✓ DECAFAAA0BEEF0A0	✓ DFC0FC0FFEE10800