Homework 2

(Due date: February 15th @ 7:30 pm)

Presentation and clarity are very important! Show your procedure!

Problem 1 (15 pts)

- Multiply the following signed fixed-point numbers (6 pts):

01.101 × 1.011001	100.101 × 01.10001	10.000 × 10.10101

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

101.0101 ÷ 1.101	10.0101 ÷ 01.11	1.1011 ÷ 1.01101

Problem 2 (11 pts)

- We want to represent numbers between -512 and 511.9997. What is the fixed-point format that requires the fewest number of bits for a resolution better or equal than 0.0005? (4 pts).
- We want to represent numbers between -127.05 and 116.25. What is the fixed-point format that requires the fewest number of bits for a resolution better or equal than 0.0015? (4 pts).
- Represent these numbers in Fixed Point Arithmetic (signed numbers). Select the minimum number of bits in each case.

-129.625	-69.1875	113.3125

Problem 3 (10 pts)

- Complete the table for the following fixed-point formats (signed numbers): (4 pts)

Fractional bits	Integer Bits	FX Format	Range	Dynamic Range (dB)	Resolution
9	3				
11	5				
15	9				

- Complete the table for these floating point formats (which resemble the IEEE-754 standard). Only consider ordinary numbers.

Exponent bits (E)	Significant bits (p)	Min	Max	Range of e	Range of significand
8	6				
10	13				
15	32				

Problem 4 (20 pts)

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

Single (32 bits)		Double (64 bits)	
✓ 10DBD800	✓ 7F8CACA0	✓ DECAFC0FFEE80000	✓ ACCEDE90BEAD5000
✓ 800BEEF0	✓ 70DECADE	✓ C9A7DEAFBEE00000	✓ 800CBEBEFACE0000

Problem 5 (44 pts)

- Perform the following 32-bit floating point operations. For fixed-point division, use 8 fractional bits. Truncate the result when required. Show your work: how you got the significand and the biased exponent bits of the results. Provide the 32-bit result.

✓ 3DE38C80 + 3A80D980	✓ 80A18000 − 83CEC000	✓ 7A09D300 × 4D080000	✓ 800C0000 ÷ 494C0000
✓ 80123000 + 804E8000	✓ 09DECAF0 − 7AD90000	✓ 90DECADE × FF800000	✓ 7F800000 ÷ 800ABBAA
✓ 7FEEFCA0 + FACADE90	✓ F0B1ABEE − 7F800000	✓ 0B09A000 × 8FACC000	✓ C9746000 ÷ 40490000