CS-301 Computer Architecture
Assignment 4

Name:_____

1. Perform the following binary multiplications using Booth's algorithm, assuming signed two's complement integers:
   a. 1011×0101

   b. 0011×1011

   c. 1011×1100

2. Perform the following arithmetic operations:
   a. Double the value 00010101_2

   b. Quadruple the value 01110111_2

   c. Divide the value 11001010_2 in half.

3. If the floating-point number storage on a certain system has a sign bit, a 3-bit exponent, and a 4-bit significand:
   a. What is the largest positive and smallest positive number that can be stored on this system if the storage is normalized? (Assume no bits are implied, there is no biasing, exponents use two's complement notation, and exponents of all zeros and all ones are allowed.)

	Scientific Notation in Binary	**Binary Fraction**	**Decimal Value**
Smallest			
Largest			

   b. What bias should be used in the exponent if we prefer all exponents to be non-negative?

4. Assume that we are using the textbook's simple model of floating-point representations:
   a. Show how the computer would represent the numbers 100.0 and 0.25 using this floating-point format.

100.0	**0.250**

   b. Show how the computer would add the two floating-point numbers in part (a) by changing one of the numbers so they are both expressed using the same power of 2.

Number	**Scientific Notation in Binary**	**=**	**Scientific Notation Expressed using the same power of 2**
100.0		=	
0.250		=	
The sum of the two numbers		=	

   c. Show how the computer would represent the sum in part (b) using the given floating-point representation.

Binary Representation of Answer in (b)	**Scientific Notation in Binary**	**Binary Value**

   d. What decimal value for the sum is the computer actually storing? Explain.

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5. Write IEEE-754 single-precision floating point representation of the following. BE NEAT!

$-55\frac{23}{64}$																															
$64,000$																															
3.1415927																															

6. If the ASCII code for the letter A is 1000001, what is the ASCII code for the letter J?

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7. Decode the following ASCII message, assuming 7-bit ASCII characters and no parity:

1001010 1001111 1001000 1001110 0100000 1000100 1001111 1000101

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8. Give the decimal equivalents of the following IEEE-754 single-precision floating point numbers.

IEEE-754 Single-Precision Floating Point Number																																Decimal
0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1	1	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1	1	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	