Quiz 2, CSCI 150, Fall 2003

Name: _____

1. [10 pts] Suppose we define a six-bit floating point system with one sign bit, three exponent bits (using excess 3), and two mantissa bits.

a. Represent each of the following decimal numbers in this six-bit system.

$5_{(10)}$

$-2_{(10)}$

b. For each of the following bit patterns in this six-bit floating-point system, express its numerical equivalent as a base-10 decimal number or as a base-10 fraction.

0 001 10

1 110 01

2. [5 pts] Draw a full adder's designed using only half adders. (You may not use logic gates.)

3. [5 pts] Explain in detail what HYMN does during the fetch phase of the fetch-execute cycle.

4. [10 pts] Suppose we want HYMN to read a number N from the user and then output $5 - N$. What should be in the computer's memory when HYMN starts? (Express your answer in bits.)

addr	data
00000	
00001	
00010	
00011	
00100	

addr	data
00101	
00110	
00111	
01000	
01001	

code	op	behavior
000	HALT	nothing further happens (computer halts)
001	JUMP	PC $\leftarrow$ $data$
010	JZER	**if** AC $= 0$ **then** PC $\leftarrow$ $data$ **else** PC $\leftarrow$ PC $+ 1$
011	JPOS	**if** AC > 0 **then** PC $\leftarrow$ $data$ **else** PC $\leftarrow$ PC $+ 1$
100	LOAD	AC $\leftarrow$ **M**$[data]$; PC $\leftarrow$ PC $+ 1$
101	STORE	**M**$[data]$ $\leftarrow$ AC; PC $\leftarrow$ PC $+ 1$
110	ADD	AC $\leftarrow$ AC $+$ **M**$[data]$; PC $\leftarrow$ PC $+ 1$
111	SUB	AC $\leftarrow$ AC $-$ **M**$[data]$; PC $\leftarrow$ PC $+ 1$

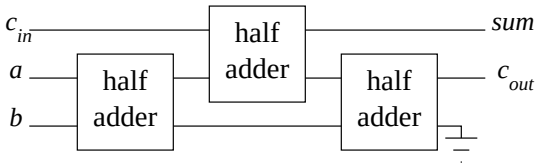
Solutions, Quiz 2, CSCI 150, Fall 2003

Statistics	
mean	23.120 (578.000/25)
stddev	6.538
median	24.000
midrange	17.000-28.000
#1a.	3.20 / 5
#1b.	2.96 / 5
#2.	1.88 / 5
#3.	1.64 / 5
#4.	7.44 / 10
+ 6-point bonus	

1. **a.** $5_{(10)}$ 0 101 01
$-2_{(10)}$ 1 100 00

b. 0 001 10 $0.375_{(10)}$ or $\frac{3}{8}$
1 110 01 $-10_{(10)}$

2.



3. It loads from memory from the address contained in the PC, storing the data found there into the IR.

4.

addr	data	translation
00000	100 11110	LOAD 11110
00001	101 00111	STOR 00111
00010	100 00110	LOAD 00110
00011	111 00111	SUB 00111
00100	101 11111	STOR 11111
00101	000 00000	HALT
00110	000 00101	5