

## 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.

0001 10  
1 11001

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	addr	data
00000		00101	
00001		00110	
00010		00111	
00011		01000	
00100		01001	

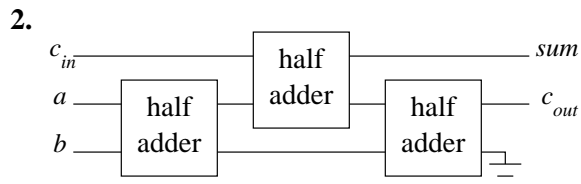
code	op	behavior
000	HALT	nothing further happens (computer halts)
001	JUMP	$PC \leftarrow data$
010	JZER	<b>if</b> $AC = 0$ <b>then</b> $PC \leftarrow data$ <b>else</b> $PC \leftarrow PC + 1$
011	JPOS	<b>if</b> $AC > 0$ <b>then</b> $PC \leftarrow data$ <b>else</b> $PC \leftarrow PC + 1$
100	LOAD	$AC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

## 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  $-10_{(10)}$



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