

**CompSci 240, C and Assembly Programming  
Exam 2**

Name:

Answer Key

Thursday, November 7, 2019

Closed-book test: no books, no notes, no electronics.

1. **12 pts** Fill in this table to show all **4-bit** bitstrings in **canonical** order, and the corresponding **hexadecimal** values. Then show the corresponding **base-10** values, assuming the bitstrings represent *Unsigned Binary* values; *2's-Complement* values; *Excess-7* values; *BCD* values; all in **base-10** notation.

Use as many lines as needed.

Bits	Hex.	Unsigned	2's - Compl.	Excess-7	BCD
0000	0	0	0	-7	0
0001	1	1	1	-6	1
0010	2	2	2	-5	2
0011	3	3	3	-4	3
0100	4	4	4	-3	4
0101	5	5	5	-2	5
0110	6	6	6	-1	6
0111	7	7	7	0	7
1000	8	8	-8	1	8
1001	9	9	-7	2	9
1010	a	10	-6	3	-
1011	b	11	-5	4	-
1100	c	12	-4	5	-
1101	d	13	-3	6	-
1110	e	14	-2	7	-
1111	f	15	-1	8	-

2. **4 pts** How many bytes does UTF-8 use to represent a character in the ASCII subset? Show the UTF-8 representation of the letter 'z' (lowercase).

UTF-8 uses one byte for ASCII characters. 'z' <--> U+0x7a

3. **4 pts** Write the largest possible (most positive) 12-bit 2's-complement number in (a) binary, and (b) hexadecimal forms.

0111 1111 1111, 0x7ff

4. **4 pts** Write the smallest possible (most negative) 8-bit 2's-complement number in (a) binary, and (b) hexadecimal forms.

1000 0000 0000, 0x80

5. **4 pts** Write the value -1 as a 16-bit 2's-complement number in (a) binary, and (b) hexadecimal forms.

1111 1111 1111 1111, 0xffff

6. **4 pts** Extend the 2's-complement integer 10101<sub>2</sub> to eight bits, and convert it to hexadecimal.

1111 0101, 0xf5