COA1 Exam 1 – Fall 2018

Name:

Computing ID:

Letters go in the boxes unless otherwise specified (e.g., for C 8 write "C" not "8").

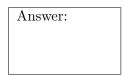
Write Letters clearly: if we are unsure of what you wrote you will get a zero on that problem. Bubble and Pledge the exam or you will lose points.

Single-select by default: Multiple select are all clearly marked; answer them by putting 1 or more letters in the box, or writing "none" if none should be selected.

Mark clarifications: If you need to clarify an answer, do so, and also add a \star to the top right corner of your answer box.

.....

Question 1 [2 pt]: What is 0xC2 in decimal?



Information for questions 2–5

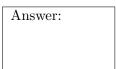
The following assume 8-bit 2's-complement numbers. For each number, bit 0 is the low-order bit, bit 7 is the high-order bit.

Question 2 [2 pt]: (see above) Complete the following sum, showing your work (carry bits, etc)

0 0 0 1 1 1 0 0 + 0 0 1 1 1 1 1 0 _____

Question 3 [2 pt]: (see above) If you add two negative numbers, you have experienced overflow if

- **A** the carry resulting from adding bit 7 is 0
- **B** the carry resulting from adding bit 7 is 1
- **C** the result is negative
- the result is positive D



CompID:

Information for questions 4–5

The following ask about **biassed** signed integers.

Question 4 [2 pt]: (see above) If the high-order bit of a **biassed** number is **1**, then the value it represents is

Question 5 [2 pt]: (see above) If the high-order bit of a **biassed** number is **0**, then the value it represents is

Answer:

Answer:

Information for questions 6–11

Each question gives two expressions of 32-bit two's-compliment integers x and y. If the two are equivalent for all x and y, write "same"; otherwise, write an example x (and y if used in the expressions) for which the two are different.

———— add example

Question 6 [2 pt]: (see above) x + y and ~((-x) + (~y))

(note that's two ~ and one -)

Question 7 [2 pt]: (see above) x + x + x and (x<<1) + x

Question 8 [2 pt]: (see above) !x and 1 & \sim ((x>>16) | (x>>8) | (x>>4) | (x>>2) | (x>>1) | x) **Question 9 [2 pt]:** The register type we discussed in class (the positive-edge-triggered D flipflop) has inputs D and clock and output Q. What signals need to be provided to D and clock to change Q from 1 to 0? Assume D, clock, and Q are all 1 before your description is used.

Answer:

Question 10 [2 pt]: Draw a 4-bit decrement circuit: that is, a set of logic gates with 4 input wires $(x_0 \text{ though } x_3)$ and four output wires $(z_0 \text{ through } z_3)$ such that the output is numerically 1 less than the input (z = x + -1).

Information for questions 11–12

Suppose we extended the ISA simulator you wrote in Lab 04 and PA 03 with the following code:

```
if (reserved == 1 && icode == 1) {
    M[oldPC + 1] = M[oldPC + 2];
    return oldPC + ____;
}
```

Question 11 [2 pt]: (see above) What number should be placed in the return statement where the code above has ____?

Answer:

Question 12 [2 pt]: (see above) Using the new instruction, write a program that moves a value from address 0×12 to address 0×34 . Answer in hexadecimal bytes, separated by spaces.

Answer: _____

Information for questions 13–14

Suppose we extended the ISA simulator you wrote in Lab 04 and PA 03 with the following code:

```
if (reserved == 1 && icode == 2) {
    R[a] = M[M[oldPC + 1] + R[b]];
    return oldPC + ____;
}
```

Answer: Question 13 [2 pt]: (see above) What number should be placed in the return statement where the code above has ____?

Question 14 [2 pt]: (see above) Suppose there is an array of bytes starting at address 0×40 . Using the new instruction, write a program that reads into R_3 the byte at index R_0 of that array. Answer in hexadecimal bytes, separated by spaces.

Answer:

Question 15 [2 pt]: If the 32-bit number 0x12345678 is stored in bigendian at address 0×20 , what is the value of the byte at address 0×22 ? Answer in hexadecimal.

Question 16 [2 pt]: If you read the bytes [ba, 98] as an unsigned littleendian 16-bit number, what is that number? Answer in hexadecimal.

Question 17 [2 pt]: Which of the following are true statements about back doors?

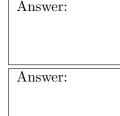
Select all that apply by putting 1 or more letters in the box. If none are true, write "none" in the box.

Α They can allow others to control your computer without your knowledge.

They can be added to a large project by one or two people with В relatively little work.

C They can be hidden in a way that makes them very hard to find.

- **D** They can be added in hardware.
- **E** They can be added in compilers.
- F They can be added in software.



Answer:

Information for questions 18–19

We discussed in class about patenting an ISA. These questions are about that and related ideas.

Question 18 [2 pt]: (see above) Why would copyrighting an ISA not be sufficient intellectual property protection to prevent clone products being created?

Answer: _____

Question 19 [2 pt]: (see above) Many people consider patents an important way to fuel invention and share knowledge. Why?

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Answer:

Pledge:

On my honor as a student, I have neither given nor received aid on this exam.

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