CS3330 Exam 1 - Spring 2015

Name:

Directions: Put the letter of your selection or the short answer requested in the box. **Write clearly**: if we are unsure what you wrote you will get a zero on that problem.

There are several variants of this exam being given at the same time. Copying from your neighbor is not only cheating, it is also foolish.

Test proctors will *not* provide clarification during the exam. If you find something **ambiguous** or unclear, explain that clearly on your exam and add a * to the top right corner of your answer box so we know to look for your note when grading.

Unless otherwise specified, all questions assume a little-endian computer.

If you do not sign the pledge on the last page you will get a zero on the entire exam.

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Question 1: A register has which of the following?

A a clock input

B more data outputs than data inputs

C a clock output

D more data inputs than data outputs

Answer:

Question 2: Let f_{32} be the number of distinct numbers that can be represented in 4-byte IEEE-style floating point and u_{32} be the number of distinct numbers that can be represented as unsigned 4-byte integers. Which of the following is true?

A
$$f_{32} = u_{32} + 1$$

B
$$f_{32} = u_{32}$$

C
$$f_{32} > u_{32} + 1$$

D
$$f_{32} < u_{32} - 1$$

Answer:

Question 3: Assume that eax is register number 0, that register eax contains the number 0x7, and that edx is register number 2. The assembly 2(%eax) means:

A 2 + the value stored in memory at address 0x7

B the value stored in memory at address 0x9

 ${f C}$ the same thing as ${\tt %edx}$

D call function 2 with argument 0x7

E 0x9 (i.e., 2+7)

 $\textbf{F} \quad \texttt{0xE} \ (i.e., 2 \times 7)$

G the value stored in memory at address 0xE

H %edx plus %eax

I call function 2 with argument 0

J %edx times %eax

Question 4: Let s_8 be the number of distinct numbers that can be represented as signed (two's-complement) 1-byte integers and u_8 be the number of distinct numbers that can be represented as unsigned 1-byte integers. Which of the following is true?

- **A** $s_8 = u_8$
- **B** $s_8 = u_8 1$
- **C** $s_8 < u_8 1$
- **D** $s_8 > u_8 + 1$
- **E** $s_8 = u_8 + 1$

Answer:

Question 5: Which of the five phases determines how many bytes long an instruction is?

- **A** Fetch
- **B** Decode
- **C** Writeback
- **D** Execute
- **E** Memory
- **F** Which of the above depends on which instruction is being run

Answer:

Question 6: a & b is the bitwise version of a && b; a | b is the bitwise version of a || b; which of the following is the bitwise version of a == b?

- **A** ~(a ^ b)
- $B \sim (a = b)$
- \mathbf{C} a = b
- **D** a ^ b
- E ~a ^ ~b
- $F \sim a = \sim b$

Answer:

Question 7: Four-bit binary 1011 - 0110 is: (answers in binary)

- **A** 0100
- **B** 0010
- **C** 1101
- **D** 1111
- **E** 0001
- **F** 0101
- **G** 0011

Answer:

Question 8: Which of the five phases writes a value when running rmmovl %eax, (%ebx)?

- **A** Memory
- **B** Execute
- **C** Decode
- **D** Writeback
- **E** Fetch
- **F** More than one of the above
- **G** None of the above

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Question 9: Y86 does not have an instruction for jumping to an address stored in a register location; instead the conceptual action jmp %eax can be implemented by

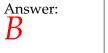
A rmmovl %eax, \$1234; jmp \$1234

B pushl %eax ; ret

C rrmovl %eax, %PC

D All of the above work

E None of the above work



Question 10:

What is the result of binary 1100 times decimal 10? Write your answer in hexidecimal (no leading 0x or leading 0s, just the hex digits)

Answer: 78

Question 11:

Consider an 3-bit IEEE-style floating point number with 1 exponent bit (bias 0). How many distinct finite numbers can it represent? Answer as a number written in decimal (e.g., if the answer is eleven write 11, not 0xB or 0b1011).

Answer:

Ouestion 12:

How many bits are used in the smallest IEEE-style floating-point number format that is able to represent all numbers between -7 and 7 (inclusive)? Answer as a number written in decimal (e.g., if the answer is eleven write 11, not 0xB or 0b1011). -7 = 1 101 11

Answer:

Question 13:

A hardware multiplexer has 1 data output and 3 selection inputs; how many data inputs does it have? Answer as a number written in decimal (e.g., if the answer is eleven write 11, not 0xB or 0b1011).

Answer:

Question 14: Register %esi is one of the "caller-save" registers. This means that if procedure baz calls procedure xyxxy

A xyxxy may communicate with baz through register %esi

B baz must assume xyxxy could have changed %esi

C baz may assume xyxxy did not change %esi

D baz may communicate with xyxxy through register %esi

Answer:

Question 15: A call instruction is conceptually

A a popl

B a popl and a jmp

C a jmp

D a pushl

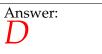
E a pushl and a jmp

Answer:

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Question 16: Register %edx is one of the "callee-save" registers. This means that if procedure baz calls procedure xyxxy

- A xyxxy may communicate with baz through register %edx
- **B** baz must assume xyxxy could have changed %edx
- C baz may communicate with xyxxy through register %edx
- **D** baz may assume xyxxy did not change %edx



Question 17: Which of the five phases has no work to do when executing a call instruction?

- **A** Memory
- **B** Decode
- **C** Writeback
- **D** Fetch
- **E** Execute
- **F** All of the above have work to do for a call instruction

Answer:

Answer:

Question 18: If we did not have an assembly instruction for push1, we could achieve the same functionality in x86 by (pick the minimal correct answer):

- **A** one mov1 instruction
- **B** one addl (or subl) instruction and two movl instructions
- **C** two mov1 instructions
- **D** two addl (or subl) instructions and one movl instruction
- **E** one addl (or subl) instruction and one movl instruction
- **F** two addl (or subl) instructions and two movl instructions
- **G** None of the above, though push1 can be replaced by other operations
- **H** None of the above because push1 cannot be replaced by other operations

Question 19: Initially byte i of memory is $i + 0x20 \pmod{256}$, %eax contains the number 3, and %ebx contains the number 5. What is in %ebx after running x86 movl (%eax), %ebx (or Y86 mrmovl (%eax), %ebx)?

- **A** 3
- **B** 5
- **C** 0x25
- **D** 0x23
- **E** None of the above
- **F** Insufficient information given to determine which of the above

Answer: E

Question 20: Which of the five phases determines what the next PC is?

- **A** Memory
- **B** Fetch
- **C** Decode
- **D** Execute
- **E** Writeback
- **F** Which of the above depends on which instruction is being run

Question 21: Initially byte i of memory is $i + 0x20 \pmod{256}$, %eax contains the number 0x01020304, and %ebx contains the number 5. What is in byte 0x06 of memory after running $x86 \pmod{256}$ movl %eax, (%ebx) (or Y86 rmmovl %eax, (%ebx))?

- **A** 0x02
- **B** 0x01
- **C** 0x03
- **D** 0x26
- **E** 0x04
- **F** None of the above
- **G** Insufficient information given to determine which of the above

Answer:

Question 22: Which of the following is more typically true of CISC than RISC instruction sets?

- A register operands have the same location within every instruction
- **B** all instructions are the same length
- **C** many program registers
- **D** a clean and simple set of opcodes
- **E** most opcodes can accept operands in several addressing mode

Answer:

Question 23: Edsger Dijkstra wrote "Go To Statement Considered Harmful" in 1968 in which he argued (translated into current language) that code that uses goto becomes needlessly hard to read and maintain compared to only using if and while. In assembly, we use the goto-like jump instructions extensively; the main reason for this is

- A Dijkstra was wrong
- **B** no one is reading assembly anyway
- **C** there is no other alternative in assembly
- **D** goto is only bad when mixed with higher-level constructs

Answer:

Question 24: Which of the five phases determines the destination register for instructions that write to registers?

- **A** Writeback
- **B** Fetch
- **C** Memory
- **D** Decode
- **E** Execute
- **F** Which of the above depends on which instruction is being run

Answer:

Question 25: Consider a 5-bit IEEE-style floating point number with 3 exponent bits (bias 3). Which of the following *can* be expressed in this format? Options are written in binary

- **A** 1.01
- **B** -0.0001
- **C** 11000
- **D** -111
- **E** All of the above can be represented in this format
- **F** None of the above can be represented in this format
- **G** None of the above because you can't have a 5-bit IEEE-style floating point number with 3 exponent bits

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