

CS3330 Exam 1 – Spring 2014**Name:** _____

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

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

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.

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Question 1 [1 points]: What is decimal 17 in hexadecimal? (answer with just the hex digits, no leading 0x)

Answer:

Question 2 [1 points]: Suppose the 32-bit value 0x12345678 is stored at address 0x24 of a little-endian computer. What byte is stored at address 0x23?

- A 0x34
- B A known value not listed here
- C 0x65
- D An unknown value because the number does not overlap address 0x23
- E 0x56
- F 0x43

Answer:

Question 3 [1 points]: Which of the following x86 operations modifies two program registers?

- A `popl %eax`
- B `pushl %eax`
- C `movl %eax, 10(%ebx,%ecx,4)`
- D `movl %eax, %ebx`
- E `addl %eax, %ebx`
- F `call Funname`
- G `ret`

Answer:

Question 4 [1 points]: a is the 8-bit value 00110010 and b is the 8-bit value 10101110. What is $a \& b$?

- A 10011100
- B 11011100
- C 10111110
- D 11100000
- E 00100010
- F 10101110
- G 00110010
- H none of the above

Answer:

Question 5 [1 points]: What is a “callee-save” register?

- A A program register that the called procedure may modify
- B A program register that the called procedure may not modify
- C A special register that saves which procedure was called
- D None of the above

Answer:

Question 6 [1 points]: Suppose that the value stored in byte b of memory is $b + 16$. What is the value in `%eax` after running the following Y86 instructions

```
mrmovl 0x20, %eax
mrmovl 0x34, %ebx
xorl   %ebx, %eax
```

(your answer should be eight hex characters, like 000000C3).

Answer:

Question 7 [1 points]: In what phase of the sequential Y86 implementation does the address of the next instruction get computed, assuming there is *not* a jump or procedure call?

- A Decode
- B Execute
- C Fetch
- D None of the above

Answer:

Question 8 [1 points]: `pushl`, `popl`, `call`, and `ret` all modify `%esp`, either increasing or decreasing it by 4. `pushl` makes the same change to `%esp` as:

- A `ret`
- B `popl`
- C `call`
- D None of the above

Answer:

Question 9 [1 points]: What is 11000011 in hexadecimal?

- A 0x183
- B 0xc3
- C 0x303
- D 0x63
- E 0x33
- F 0xd3
- G 0xb3

Answer:

Question 10 [1 points]: What bytes of memory are accessed by the x86 operation `movl 100, %ecx`?

- A 100, 101, 102, and 103
- B 100 and 99
- C 100 and 101
- D 100
- E 100, 99, 98, and 97

Answer:

Question 11 [1 points]: In what phase of the sequential Y86 implementation does the address of the next instruction get computed, assuming there *is* a jump or procedure call?

- A Fetch
- B Decode
- C Execute
- D None of the above

Answer:

Question 12 [1 points]: How many bits are in a byte?

- A 1
- B 32
- C 64
- D 4
- E 2
- F 16
- G 8
- H Which one of the above depends on the computer

Answer:

Question 13 [1 points]: a is the 8-bit value 00110010 and b is the 8-bit value 10101110. What is $a \mid b$?

- A 10111110
- B 10101110
- C 11100000
- D 00100010
- E 00110010
- F 11011100
- G 10011100
- H none of the above

Answer:

Question 14 [1 points]: The PC of the next instruction in Y86 (when there is not a jump) is either $PC + 1$, $PC + 2$, $PC + 5$, or $PC + 6$. Since this is addition, why is it not performed in the ALU?

- A The ALU might be busy doing something else
- B We need the ALU's output to decide what we are adding to the PC
- C Trick question – computing the PC is performed in the ALU
- D The ALU doesn't do addition
- E We need its output as an input to the ALU

Answer:

Question 15 [1 points]: How many bits are in a word?

- A 16
- B 8
- C 64
- D 32
- E Which one of the above depends on the computer

Answer:

Question 16 [1 points]: What is hexadecimal 0x30 in decimal?

Answer:

Question 17 [1 points]: The code `(s && a) || (!s && b)` implements

- A Set membership
- B Adder
- C Decoder
- D MUX
- E Equality
- F None of the above

Answer:

Question 18 [1 points]: A C switch statement can be compiled into x86 as an array of code locations and a jump to an element of that array. Which of the following best describes how that would be implemented in Y86?

- A You can't do it: Y86 doesn't support arrays
- B The same as in x86: a jump with an element of the array as the target
- C You'd load the array element into a register, then jump to that register's value
- D You can't do it: Y86 only lets you jump to immediate values

Answer:

Question 19 [1 points]: The bias of any IEEE-style floating point number is $2^{e-1} - 1$, where e is the number of exponent bits. Suppose 111010 is a six-bit IEEE-style floating point number, but you don't know how many exponent bits there are. Which of the following is **not** a possible value for this number? Answers are written in binary.

- A NaN
- B -1100
- C -100000000000
- D $-\infty$
- E -1000000

Answer:

Question 20 [1 points]: The bias of any IEEE-style floating point number is $2^{e-1} - 1$, where e is the number of exponent bits. If largest normalized binary number a particular IEEE format can hold is 1111.11, how many fraction bits does this format have?

- A 1
- B 9
- C 8
- D 3
- E 2
- F 5
- G 4

Answer:

Question 21 [1 points]: Suppose the 32-bit value 0x12345678 is stored at address 0x24 of a big-endian computer. What byte is stored at address 0x25?

- A 0x43
- B 0x56
- C A known value not listed here
- D 0x34
- E An unknown value because the number does not overlap address 0x25
- F 0x65

Answer:

Question 22 [1 points]: In what phase of the sequential Y86 implementation does the value of registers get read from the register file?

- A Fetch
- B Decode
- C Memory
- D None of the above

Answer:

Question 23 [1 points]: What is hexadecimal 0x1a in binary? (answer with just the bits, no leading 0s)

Answer:

Question 24 [1 points]: Suppose the 32-bit value 0x12345678 is stored at address 0x24 of a little-endian computer. What byte is stored at address 0x25?

- A A known value not listed here
- B 0x43
- C An unknown value because the number does not overlap address 0x25
- D 0x56
- E 0x34
- F 0x65

Answer:

Question 25 [1 points]: a is the 8-bit value 00110010 and b is the 8-bit value 10101110. What is $a \wedge b$?

- A 10111110
- B 11011100
- C 00100010
- D 10011100
- E 11100000
- F 00110010
- G 10101110
- H none of the above

Answer:

Question 26 [1 points]: The code $(a == b) \parallel (a == c) \parallel (a == d)$ implements

- A MUX
- B Equality
- C Decoder
- D Set membership
- E Adder
- F None of the above

Answer:

Question 27 [1 points]: Suppose the 32-bit value 0x12345678 is stored at address 0x24 of a big-endian computer. What byte is stored at address 0x23?

- A 0x65
- B 0x34
- C 0x43
- D A known value not listed here
- E An unknown value because the number does not overlap address 0x25
- F 0x56

Answer:

Question 28 [1 points]: Write 0x19 in binary. Do not include any leading 0s.

Answer:

Question 29 [1 points]: Assume %eax contains the number 30 and %ecx contains the number 50 (both presented in decimal). What address is read by the x86 (or y86) operation `movl 4(%eax), %ecx`?

- A 54
- B 50
- C 34
- D 120
- E 200
- F 26
- G 46
- H 30

Answer:

Question 30 [1 points]: Suppose that the value stored in byte b of memory is $b + 16$. What is the value in `%eax` after running the Y86 command `mrmovl 0x24, %eax`?

- A 0x24
- B 0x40
- C 0x34
- D None of the above

Answer:

Question 31 [1 points]: What is a “caller-save” register?

- A A special register that saves who called the procedure
- B A program register that the called procedure may not modify
- C A program register that the called procedure may modify
- D None of the above

Answer:

Question 32 [1 points]: Suppose we are executing `addl %eax, %ebx`. Which two named values in the sequential Y86 architecture are fed into the ALU as its operands?

- A `%eax` and `%ebx`
- B `valA` and `valB`
- C 0 (`%eax` is register number 0) and 3 (`%ebx` is register number 3)
- D `regA` and `regB`
- E None of the above

Answer:

Question 33 [1 points]: A value is read from memory into a register in `mrmovl` and in which other operation in the list below?

- A `subl`
- B `nop`
- C `irmovl`
- D `jne`
- E `ret`
- F `halt`
- G `call`
- H `rrmovl`
- I `popl`
- J `rmmovl`
- K `pushl`

Answer:

Question 34 [1 points]: What is two’s-compliment 11...1100 in decimal?

Answer:

Question 35 [1 points]: We write labels in our assembly, but they are not part of the ISA (either x86 or Y86). Why not?

- A They're turned into addresses when we assemble the files
- B They're like comments: they only have meaning to us, not to the computer
- C They just change how other instructions are encoded
- D The assembler turns them into other instructions as a pre-processing stage

Answer:

Question 36 [1 points]: a is the 8-bit value 00110010 and b is the 8-bit value 10101110. What is a - b?

- A 10101110
- B 10011100
- C 11100000
- D 10111110
- E 11011100
- F 00100010
- G 00110010
- H none of the above

Answer:

Question 37 [1 points]: We can encode the C command a ? b : c, where all three variables are of type int, as

- A (a & b) | ((!a) & c)
- B ((-!a) & b) | ((-!a) & c)
- C ((!a) & b) | ((!a) & c)
- D Any of the above
- E None of the above

Answer:

Question 38 [1 points]: The code (a && b) || (!a && !b) implements

- A MUX
- B Adder
- C Set membership
- D Equality
- E Decoder
- F None of the above

Answer:

Question 39 [1 points]: What is binary 110010 in decimal?

Answer:

Question 40 [1 points]: How many of the following x86 operations reads values from exactly two registers? Your answer should be a number between 0 and 4.

- A `addl %eax, %ebx`
- B `movl %eax, (%ebx)`
- C `movl %eax, %ebx`
- D `movl %eax, (%ebx,%ecx)`

Answer:

Question 41 [1 points]: Assume x is the most positive signed integer. What is $x + 1$?

- A $+\infty$
- B 0
- C -1
- D $-x$
- E none of the above

Answer:

Question 42 [1 points]: a is the 8-bit value 00110010 and b is the 8-bit value 10101110. What is $a + b$?

- A 10101110
- B 11011100
- C 10011100
- D 10111110
- E 11100000
- F 00100010
- G 00110010
- H none of the above

Answer:

Question 43 [1 points]: In general, which of the following is slowest?

- A moving from one register to another
- B comparing two numbers to decide where to jump
- C doing division
- D doing addition
- E accessing memory

Answer:

Question 44 [1 points]: Which of the following features of Y86 makes it like a RISC architecture?

- A Math ops only function on registers
- B Parameters are passed on the stack
- C Instructions have variable lengths
- D All of the above are RISC-like
- E None of the above are RISC-like

Answer:

Question 45 [1 points]: The bias of any IEEE-style floating point number is $2^{e-1} - 1$, where e is the number of exponent bits. If largest normalized binary number a particular IEEE format can hold is 1111.11, how many exponent bits does this format have?

- A 3
- B 5
- C 1
- D 2
- E 4
- F 9
- G 8

Answer:

Question 46 [1 points]: What is binary for the most negative five-bit two's-compliment number? Answer in binary (i.e., with 5 bits, each either a 1 or a 0)

Answer:

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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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