

CSCI-UA.0201-003
Computer Systems Organization
Midterm Exam - Fall 2014
(60 minutes)

Last name:

First name:

Notes:

- If you perceive any ambiguity in any of the questions, state your assumptions clearly
 - Questions vary in difficulty; it is strongly recommended that you do not spend too much time on any one question.
 - This exam is open book/notes.
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1. (4 points) Circle the correct answer among the choices given. If you circle more than one answer, you will lose the grade of the corresponding question.

(A) Registers usage convention is needed to:

1. make our programs correct
2. make our programs faster
3. make our programs work with other programs and library
4. make our programs more memory efficient

(B) Presenting +17 in signed integer or in IEEE 754 single precision floating point yields the same bit pattern.

1. The above statement is true
2. The above statement is false
3. It depends on whether the machine is 32-bit or 64-bit
4. It depends on whether the machine is big-endian or little endian.

(C) Which of the following has a larger size (in terms of bytes), assuming 32-bit machine?

1. pointer to a character
2. pointer to an integer
3. pointer to a float
4. pointer to pointer
5. They are all of the same size.

(D) Assume a function is called from two different places in a C program running on a 32-bit x86 machine:

1. The stack frame of that function is of the same size each time.
2. The stack frame size of that function differs based on the arguments.

3. (4 points) State two scenarios where (some) local variables of a function must be in the stack and not in registers?

Scenario 1:

Scenario 2:

4. For the following two functions (assume $n \geq 0$):

```
int fact(int n)
{
    int i;
    int result = 1;

    for (i = n; i > 0; i--)
        result = result * i;

    return result;
}

int fact_u2(int n)
{
    int i;
    int result = 1;

    for (i = n; i > 0; i-=2) {
        result = (result * i) * (i-1);
    }

    return result;
}
```

(a) (2 points) What does the function `fact` do?

(b) (2 points) For which values of `n` do `fact` and `fact_u2` produce similar results?

(c) (2 points) What is the minimum modification that we can do to `fact_u2` such that it always produces same result as `fact`?