

## EIGHTH QUIZ

You have 15 minutes from the start of class to complete this quiz. Read the problems with care; work with deliberate speed. Don't give us more than we ask for. The usual instructions apply. Good luck!

### Problem 1 (10 points)

We have distributed a Deus X reference sheet; you don't have to turn it back in, but we'll recycle it if you do. We'll have a better chance of assigning you partial credit if you show your work (e.g., draw a picture of the register(s) and/or memory locations).

(a) (5 points) Suppose that location 2222 of the Deus X machine's memory holds 30, location 3333 holds 100, and location 4444 holds ZOT!. What has the Deus X machine printed when these instructions have been executed?

0. 40      0      (enta 0)
1. 1    2222      (add 2222)
2. 6    4444      (out 4444)
3. 50   3333      (cmpa 3333)
4. 63      1      (jl 1)
5. 20   5555      (sta 5555)
6. 6    5555      (out 5555)
7. 8

(b) (3 points) Which of the following instructions would you expect to see as a single machine-language instruction on a typical processor (like the Deus X)? (Circle *one or more* of the following.)

- A. Divide one number by another.
- B. Play a sound when a register's value becomes zero.
- C. Compare two short segments of text to see whether one is greater than the other.
- D. Display a menu when the user clicks on "File" in the menu bar.
- E. Change a pixel to remove all the red from it.
- F. Compute the average of three numbers.

(c) (2 points) A common pattern in machine-language programming is, "load something into a register, do some arithmetic or other operation on it, and store the result back into memory." Why do we have all that shuffling around; why don't processors just do arithmetic directly on locations in main memory?

**Problem 2** (8 points)

We have distributed a version of the restaurant program with this exam.

(a) (1 point) What data structure does this program use to represent the collection of restaurants?

(b) (2 points) What algorithm does this program use to remove restaurants from the collection? (Just give the name of the algorithm—two words are enough.)

(c) (2 points) Which of the following best characterizes how this removal algorithm works? (Circle the one best answer.)

- A. The structure you described in part (a) is rearranged so that the next node in order replaces the node to be deleted.
- B. The deleted restaurant isn't actually deleted; the program still stores it, but marks it as gone.
- C. The number of copies of the deleted restaurant is decreased by one.
- D. It is not possible to remove a restaurant; the "r" command is ignored.

(d) (3 points) What happens in this program when the user adds a restaurant whose name is the same as a restaurant that's already in the collection?

**Problem 3** (2 points)

Programs written in the functional style or paradigm (where all data is passed into and returned from functions and there are no side effects—for example, no variables that exist independently) have two major advantages over programs written in the imperative or object-oriented style. What are they? (A simple sentence will suffice for each advantage.)