Informatics 41 • Fall 2011 • David G. Kay • UC Irvine • Your name _____

NINTH QUIZ

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

Problem 1 (3 points)

On the Deus X machine, one machine word consists of 4 bytes, or 32 bits.

(a) What's the largest number you can represent in one machine word on the Deus X, if you represent the number as ASCII characters?

(b) What's the largest number you can represent in one machine word on the Deus X, if you represent the number using binary-coded decimal (BCD)?

(c) What's the largest number you an represent in one machine word on the Deus X, if you represent the number as a binary number? To save you the time of doing the actual arithmetic, just circle *(i)*, *(ii)*, or *(iii)*: *(i)* over 100,000,000; *(ii)* over 65,535 but under 100,000,000; *(iii)* 65,535.

Problem 2 (6 points)

Suppose we define a four-element vector as follows:

```
(define V (vector "turkey" "cranberry" "pumpkin" "yam"))
```

`turkey`	`cranberry`	`pumpkin`	`yam`

(a) (1 point) For each element in the table above, show its element number (i.e., its index or the subscript).

(b) (2 points) What is the value of each of these expressions?

```
(vector-ref V 3)

(vector-ref V 0)

(vector-length V)

(vector? (vector-ref V 1))
```

(c) (1 point) Change your drawing above to show what happens when Scheme evaluates this expression:

```
(vector-set! V 3 "sweet potato")
```

(d) (2 points) What is the value of the following expression? Draw a box diagram as above.

```
(build-vector 6 (lambda (n) (* n n)))
```

Problem 3 (11 points)

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

(a) (1 point) What data structure does the program use to represent the collection of restaurants? (A couple of words is enough.)

(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 number of copies of the deleted restaurant is reduced by one.

B. The structure you described in part **(a)** is rearranged so that the next node in order replaces the node to be deleted.

C. The deleted restaurant isn't actually deleted; the program still stores it, but marks it as gone.

D. It is not possible to remove a restaurant; the "r" command is ignored.

(d) (2 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? (It's possible to answer this in just a couple of words.)

(e) Two of the collection functions do a full traversal of the collection, processing every item.
(e.1) (2 points) What are the names of those two functions?

(e.2) (2 points) One of them does an inorder traversal and one does a preorder traversal. Which is which?