Name

This quiz was given in the fall of 2010. Note that some of the material related to computational complexity will be covered in lecture 8 this term.

This quiz is open book and open notes, but do not use a computer.

Answer all questions in the boxes provided.

1) Are each of the following True or False (15 points)

1.1. In Python the **keys** of a dict must be immutable.

1.2. There exist problems that **cannot** be solved in Python **without** using recursive functions.

1.3. In Python, tuples are **immutable**.

1.4. Recursive solutions to problems are usually **more** computationally efficient than iterative ones.

1.5. When Newton's method is used to find the root of a polynomial, the **order** of complexity is quadratic in the number of terms in the polynomial.

2) What does the following code print? (10 points)

```
x = 10.0
for i in range(10):
    x += 0.1
print x == 11.0
for i in range(10):
    x -= 0.1
print x == 10.0
```

3) Consider the following code:

```
def buildCodeBook():
    letters ='.abcdefghijklnopqrstuvwxyz'
    codeBook = {}
    key = 0
    for c in letters:
        codeBook[key] = c
        key += 1
    return codeBook

def decode(cypherText, codeBook):
    plainText = ''
    for e in cypherText:
        if e in codeBook:
            plainText += codeBook[e]
        else:
            plainText += ' '
    return plainText

codeBook = buildCodeBook()
msg = (3,2,41,1,0)
print decode(msg, codeBook)
```

3.1) What does it print? (10 points)

3.2) Characterize the complexity of decode using big Oh notation. (6 points)

4) Implement the body of the function specified in the box. (18 points)

```python
def addVectors(v1, v2):
    """assumes v1 and v2 are lists of ints. Returns a list containing
        the pointwise sum of the elements in v1 and v2. E.g.,
        addVectors([4,5], [1,2,3]) returns [5,7,3],and
        addVectors([], []) returns []. Does not modify inputs."""
```

5) The following code contains two semantic errors. Correct it so that it reads in integers until the user enters -1, and then prints the sum of the integers (8 points)

```
def getLines():
    inputs = []
    while True:
        line = raw_input('Enter a positive integer, -1 to quit: ')
        if line == -1:
            break
        inputs.append(line)
total = 0
for e in getLines():
    total += e
print total
```

6) Consider the function f that takes a str as its argument:

```
def f(s):
    """Assumes type(s) == str"""
    d = {}
    for c in s:
        if c in d.keys():
            d[c] += 1
        else: d[c] = 1
    x = None
    for k in d.keys():
        if x == None:
            x = d[k]
            y = k
        elif d[k] > x:
            x = d[k]
            y = k
    return y
```

6.1.) What is the value of the expression f('abbc') (7 points)

6.2.) Is the value of the expression f('bbcaa') predictable from the semantics of Python? Explain why or why not. (4 points)

6.3.) Is f total, i.e., defined for all values of s of type str? Explain why or why not. (4 points)

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7) Consider the following code:

```
def f(L):
    result = []
    for e in L:
        if type(e) != list:
            result.append(e)
        else:
            return f(e)
    return result
```

7.1. Answer True or False to each of the following (6 points)

a) The value of f('3') is ['3'].

b) The call f(3) would cause an error message to be displayed.

7.2. What does `print f([1, [[2, 'a'], ['a','b']], (3, 4)])` print? (10 points)

8. Do you think that the lectures are too slow paced, too fast paced, about right? (1 point)

9. Do you think that the problem sets are too easy, too hard, about right? (1 point)

6.00SC Introduction to Computer Science and Programming
Spring 2011