University of Cape Town ~~ Department of Computer Science

Computer Science 1015F ~~ 2017

Class Test 3

Enter the following details AND shade in the corresponding blocks to the right with your Student Number.

Faculty (please tick one):

Science	Engineering	Commerce	Humanities	Other:

Student Number :

_____

Name (optional) :

_____

Marks : 40

Time : 40 minutes

Instructions:

a) Answer all questions.

b) Write your answers in PEN in the spaces provided.

c) Show all calculations where applicable.

A	☐	☐	☐	☐	☐	☐	☐	☐	☐	0
B	☐	☐	☐	☐	☐	☐	☐	☐	☐	1
C	☐	☐	☐	☐	☐	☐	☐	☐	☐	2
D	☐	☐	☐	☐	☐	☐	☐	☐	☐	3
E	☐	☐	☐	☐	☐	☐	☐	☐	☐	4
F	☐	☐	☐	☐	☐	☐	☐	☐	☐	5
G	☐	☐	☐	☐	☐	☐	☐	☐	☐	6
H	☐	☐	☐	☐	☐	☐	☐	☐	☐	7
I	☐	☐	☐	☐	☐	☐	☐	☐	☐	8
J	☐	☐	☐	☐	☐	☐	☐	☐	☐	9
K	☐	☐	☐	☐	☐	☐				
L	☐	☐	☐	☐	☐	☐				
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Q	☐	☐	☐	☐	☐	☐				
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T	☐	☐	☐	☐	☐	☐				
U	☐	☐	☐	☐	☐	☐				
V	☐	☐	☐	☐	☐	☐				
W	☐	☐	☐	☐	☐	☐				
X	☐	☐	☐	☐	☐	☐				
Y	☐	☐	☐	☐	☐	☐				
Z	☐	☐	☐	☐	☐	☐				

FOR OFFICIAL USE ONLY:

Question	1	2	3	4	5	6	7	8
Max	23	17						
Marks								
Marker								

Marks

0	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
3	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
4	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
5	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
7	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
8	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
9	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Question 1 – Arrays and Recursion [23]

Examine the `Q1.py` module listed at the end of the test and answer the following questions.

(i) Write down the **exact output** produced when the `Q1.py`. module is executed. [7]

(ii) Write Python code for the function `mirror(arr1D)` in the `Q1.py` module that alters `arr1D` as follows. This function changes `arr1D` to be twice its original length, where the additional elements added are a reflection of the original list. For example, in the Python interpreter, it would behave as follows.

```
>>> X=[1,2,3]
>>> mirror(X)
>>> print(X)
[1, 2, 3, 3, 2, 1]
```

[5]

(iii) The function `boss(arr1D)` in the `Q1.py` module function is recursive. What is the recursive stopping case for this function? [1]

(iv) Explain clearly, briefly and in general what the `boss(arr1D)` function does. [1]

(v) Write down the exact output when the function `boss(arr1D)` in the `Q1.py` module is called as follows in the Python interpreter. [2]

```
import Q1.py
print(Q1.boss([40,10,56,15]))
```

(vi) Explain, with reasons, what will happen if the function `boss(arr1D)` in the `Q1.py` module is called as follows in the Python interpreter. [2]

```
import Q1.py
Q1.boss([])
```

_____
_____
_____
_____

(vii) Now write a **recursive version** of the function `tot(numbersL)` that has the same output as the iterative version on all inputs. You can assume that only non-empty 1D lists of integers will be sent to the function. [5]

```
def totRec(numbersL):
    """Returns the sum of the elements in a list of numbers"""
```

_____
_____
_____
_____
_____
_____

Question 2 – Dictionaries and Files [17]

Examine the `Q2.py` module listed at the end of the test and answer the following questions.

(i) Explain what happens if this program is executed and a file called "`input.txt`" does not exist in the current directory. [2]

_____

_____

(ii) Explain what happens if this program is executed and a file called "`output.txt`" does not exist in the current directory. [2]

_____

_____

(iii)The file "`input.txt`" contains the following lines of text.

```
hamburger 3
coke 1
hamburger 2
chips 5
coke 3
```

Write down the exact contents of the file "`output.txt`" after the program has executed. [4]

_____

_____

_____

_____

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(iv) Write a function `FlipFile(filename)` that reverses the contents of a file. For example, `FlipFile("input.txt")` would change the contents of "`input.txt`" to the the following lines of text.

```
coke 3
chips 5
hamburger 2
coke 1
hamburger 3
```

[9]

Code examples for the test – you may detach this sheet.

Question 1

```
#Module Q1.py
def tot(numbersL):
    """Returns the sum of the elements in a list of
numbers"""
    sum=0
    for n in numbersL: sum+=n
    return sum

def amplify(arr1, arr2):
    if len(arr1)!=len(arr2): return
    for i in range(len(arr1)):
        arr1[i]*=arr2[i]

def create(rows, cols):
    arr2D=[]
    for i in range(rows):
        arr2D.append([])
        for j in range(cols):
            arr2D[i].append(0)
    return arr2D

def boss(arr1D):
    if len(arr1D)==1:return arr1D[0]
    val=boss(arr1D[1:])
    if val>arr1D[0]: return val
    return arr1D[0]

def mirror(arr1D):
    #Code missing here


chars=['b','a','t']
X=[1,2,3]
print(chars)
amplify(chars,X)
print(chars)
print(create(2,3))
print(create(X[0],tot(X)))
```

_____Question 2_____

```
#Module Q2.py

file1=open("input.txt",'r')

weights={}
for line in file1:
    values=line.split()
    word,number=values[0],eval(values[1])
    if word!='':
        if word not in weights:
            weights[word]=number
        else:
            weights[word]=weights[word]+number
file1.close()

file2=open("output.txt",'w')

for w in weights:
    print(w,weights[w],file=file2)

file2.close()
```