

# University of Cape Town ~~ Department of Computer Science

## Computer Science 1015F ~~ 2014

### Class Test 3

#### **\*\* Solutions \*\***

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:
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Student Number :

\_\_\_\_\_

Name (optional) :

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**Marks : 35**

**Time : 45 minutes**

**Instructions:**

- Answer all questions.
- Write your answers in PEN in the spaces provided.
- Show all calculations where applicable.

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**FOR  
OFFICIAL  
USE  
ONLY:**

Question		1	2	3	4	5	6	7	8
Max		10	15	10					
Marks	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Marker									

### Question 1 [10]

Study the following program and answer the questions that follow.

```
grid = []
for i in range (5):
    grid.append ([])
    for j in range (5):
        grid[-1].append (i+j)
for r in range (len (grid)):
    for c in range (len (grid[r])):
        print (grid[r][c],end=" ")
    print ()
```

- (i) What is the output from this program? [3]

```
01234
12345
23456
34567
45678
```

- (ii) Write Python code to create a new 2-dimensional 5x5 array with all elements initialized to 0. [3]

```
grid = []
for i in range (5):
    grid.append ([0] * 5)
```

- (iii) Suppose we have the following definition:

```
X = {1: ['a', 'b', 'c'], 2: ['d', 'e', 'f'], 3: ['g', 'h', 'i']}
```

- A. Write the expression to access element ['a','b','c']. [1]

```
X[1]
```

- B. Write the expression to access element 'e'. [1]

```
X[2][1]
```

- C. Write the code to add the (key, value) pair (4, ['x','y','z']) to the X dictionary. [1]

```
X[4] = ['x','y','z']
```

- D. Write the code to create a new empty dictionary named Y. [1]

```
Y = {}
```

## Question 2 [15]

Study the following function and answer the questions that follow.

```
def mystery (s, start, stop):  
    if stop<start:  
        return ""  
    elif start==0:  
        return s[0] + mystery (s[1:], start, stop-1)  
    else:  
        return mystery (s[1:], start-1, stop-1)
```

- (i) Indicate the parameters that are passed to each invocation of the recursive function, in sequence, when it is initially called with: [2]

```
mystery ("hello", 2, 3)  
mystery ("ello", 1, 2)  
mystery ("llo", 0, 1)  
mystery ("lo", 0, 0)  
mystery ("o", 0, -1)
```

- (ii) Explain in English and at a high level what this function does. [2]

*string slicing [2] or returns substring of s from start to stop [2]*

- (iii) What parameter value will result in an error? Why? [2]

*stop >= length of s [1]  
access to part of string that does not exist [1]*

- (iv) Write a non-recursive version of this function. [2]

```
def mystery (s, start, stop):  
    return s[start:stop+1]
```

- (v) Which version is more efficient – the iterative or recursive one? Explain your answer. [2]

*iterative. recursive takes more memory and time.*

- (vi) Write a recursive function countX to count the number of "X" characters in a given string. [5]

```
def countX (s):  
    if s == "": [1]  
        return 0 [1]  
    elif s[0] == "X": [1]  
        return 1 + countX (s[1:]) [1]  
    else  
        return countX (s[1:]) [1]
```

### Question 3 [10]

Study the following program and answer the questions that follow.

```
1 filename = input ("Enter a filename:")
2
3 f = open (filename, "r")
4 lines = f.readlines ()
5 f.close ()
6
7 for i in range (len (lines)):
8     lines[i] = lines[i][:-1]
9
10 del lines[0]
11
12 # write array lines to file filename
```

- (i) Explain in English and at a high level what this program does. [2]

*deletes the first line from a file*

- (ii) Write the code to write the content of the **lines** array to the original file, overwriting any previous content (line 12 onwards). [4]

```
f = open (filename, "w")
for line in lines:
    print (line, file=f)
f.close ()
```

- (iii) Explain what is happening in lines 7-8 and why this is necessary. [1]

*when a file is read in, each line has a trailing newline – this is being stripped.*

- (iv) Python has an exception handling mechanism that can deal with errors during file manipulation. Explain how each part of the **try ... except ... finally** construct works. [3]

*the code in try is executed [1] if an error occurs, the matching except clause is executed [1]  
finally the finally clause cleans up*