UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

BACHELOR OF SCIENCE IN INFORMATION SYSTEMS

Academic Year 2015/2016 – First Year Examination – Semester 1 – 2016

IS 1001 – Programming and Problem Solving

TWO (2) HOURS

To be completed by the candidate

Examination Index No: _____

Important Instructions to candidates:

1. The medium of instruction and questions is **English**.
2. If a page or a part of this question paper is not printed, please inform the supervisor immediately.
3. Note that questions appear on both sides of the paper. If a page is not printed, please inform the supervisor immediately.
4. Write your index number on each and every page of the question paper.
5. This paper has **4** questions and **15** pages.
6. Answer **ALL** questions. All questions carry equal marks (**25** marks).
7. Any electronic device capable of storing and retrieving text including electronic dictionaries and mobile phones are **not allowed**.
8. Non-programmable Calculators **allowed**.

For Examiner's use only	
Question No	**Marks**
1	
2	
3	
4	
Total	

Index No. : .....

1.

(a) (a) Consider the following python code which performs zip command the pairing of key-values in the following dictionary:

```
A0 = dict(zip(('a','b','c','d','e'),(1,2,3,4,5)))
A1 = range(10)
A2 = sorted([i for i in A1 if i in A0])
A3 = sorted([A0[s] for s in A0])
A4 = [i for i in A1 if i in A3]
A5 = {i:i*i for i in A1}
A6 = [[i,i*i] for i in A1]
print(A0)
print(A1)
print(A2)
print(A3)
print(A4)
print(A5)
print(A6)
```

What would be the output of the above code?

[3 Marks]

(b) Consider the following python code;

```
a = 61 # 61 = 0011 1101
b = 14 # 14 = 0000 1110
c = 0
c = a & b;
print ("Line 1 - Value of c is ", c )
c = a | b;
print ("Line 2 - Value of c is ", c)
c = a ^ b;
print ("Line 3 - Value of c is ", c)
c = ~a;
print ("Line 4 - Value of c is ", c)
c = a << 2;
print ("Line 5 - Value of c is ", c)
c = a >> 2;
print ("Line 6 - Value of c is ", c)
```

What would the output of the above code be?

[3 Marks]

(c) Write a python code to convert the total time given in seconds given into: days, hours, minutes, and seconds.

[4 Marks]

(d) Illustrate how (dry run) the above code written in part (c) above works on the total seconds given below.

(i) 522009

(ii) 344455

[4 Marks]

(i)

(ii)

(e)Mathematically, we define the exponent of a number in terms of its smaller powers. For example, computing the exponent of a number can be described as follows:

$2^4 = 2x\ 2^3$
$2^3=2x2^2$
$2^2=2x2^1$
Base value $2^1=2$
Generally $2^n=2x2^{(n-1)}$

(i) Write a recursive python program to compute the powers of any given value as x^y where, x is the coefficient and y is the exponent.

[4 Marks]

(ii) Illustrate (trace) the execution pattern of the program using a suitable diagram based on the program written in part (e)(i) above when x=2 and y=4.

[3 Marks]

(f) Consider the following python program.

```
def is_even(x):
    if x % 2 == 0:
        print('even')
    print('odd')
    return x - 1

def branch(x):
    if x > 5:
        print('one')
    elif x > 0:
        print('two')
    if x > 10:
        print('three')
    else:
        print('four')
    return x + 5
# print ("Answer a")
a = is_even(4)
print(a)
#print ("Answer b")
b=branch(20)
print(b)
#print ("Answer c")
c = branch(3)
print(c)
#print ("Answer d")
d = is_even(is_even(5))
print(d)
#print ("Answer e")
e = branch(branch(3))
print(e)
```

If one executes the above program, what would be the output of a, b, c, d and e respectively.

[4 Marks]

Answer a:	Answer b:	Answer c:	Answer d:	Answer e:

Index No. : .....

2

(a) Write down the appropriate python command(s), if one wants to open a file c:\marks.txt for reading purposes.

[3 Marks]

(b) Write down the appropriate python command(s), if one wants to open a file c:\marks.txt for appending data

[3 Marks]

(c) Which of the following statements are true or false? Write down your answers as 'true' or 'false' in the following boxes.

(i) When you open a file for reading, if the file does not exist, an error occurs.

(ii) When you open a file for reading, if the file does not exist, the program will open an empty file.

(iii) When you open a file for writing, if the file does not exist, a new file is created.

(iv) When you open a file for writing, if the file exists, the existing file is overwritten with the new file.

[3 Marks]

(i)	(ii)	(iii)	(iv).....

(d) Write a python program to write the following 3 data records in a file named "price.txt". Assume that the attributes of the file are item_number , number_of_items and the unit_price respectively.

1 3 500
2 4 250
3 2 400

[3 Marks]

(e) One wants to add the following two data records to the file created in part (d) above without overwriting the existing data. How would you modify the program written in part (d) above to achieve this task?

4 9 600
5 7 250

[3 Marks]

(f) Write a python program to carry out the following all activities.

(i) Read the data stored in the "price.txt" file.
(ii) Calculate the total_price of each item.

(Hint: total_price = number_of_item x item_price)

(iii) Print the grand_total of all the items
(Hint: grand_total= totals of total_price)
(iv) Write the following data in a separate file named "total_price.txt"
total_price of each item
grand_total

[10 Marks]

Index No. : .....

3

(a)Write a python program to sort a set of integer values using the Bubble sort algorithm.

[3 Marks]

(b) Illustrate how the above program written in part (a) above works on the data set below.

[54, 26, 93, 17, 77, 31, 44, 55, 20]

Use a suitable diagram to illustrate the answer.

[3 Marks]

(c)The implementation of the Stack abstract data type (ADT) using Python list can be represented as follows:

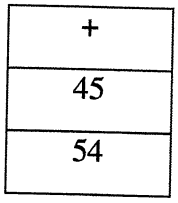
```
class Stack:
    def __init__(self):
        self.items = []

    def push(self, item):
        self.items.append(item)

    def pop(self):
        return self.items.pop()

    def is_empty(self):
        return (self.items == [])
```

Assume that one wants to create the following stack.



(i) Write down a python code to create the above stack. You may assume 54 as the bottom element of the stack.

[3 Marks]

(ii) Write down an iterative python program to remove all the items from the stack created in part (c)(i) above. You may use is_empty ADT to determine if stack is empty and pop () ADT to remove the item from the stack.

[3 Marks]

(d) Giving a suitable example for each, explain the difference between the immutable and mutable data type.

[5 Marks]

(e) Using the information given below, write a python code segment to create a class.

- Name of the class is ***Student***
- Attributes of this class are ***name*** and ***institute***.
- When creating an object the initial value of the attribute ***institute*** is set to "**ucsc**".
- A method named ***SetName*** takes the name of the student as an argument and assign that value to attribute ***name.***

[8 Marks]

Index No. : .....

4.

(a) Write the output of the following commands/code segments.

[3x5 = 15 Marks]

(i)
```
>>> (0, 1, 2000000) < (0, 3, 4)
```

(ii)
```
>>> t = ('a', 'b', 'c', 'd', 'e')
>>> t[0] = 'A'
```

(iii)
```
>>> a=5
>>> b=8
>>> b,a = a,b
>>> b,  a
```

(iv)
```
>>> items = { 'abc' : 1 , 'KLM' : 42, 'SLR': 100}
>>> for each in items:
        print(each, items[each])
```

(v)
```
>>> items = { 'abc' : 1 , 'KLM' : 42, 'SLR': 100}
>>> print (items.get('LRT', 0))
```

(b) The first table shows the line number and the lines of the code. Read the given code segment. Describe what each line of code does in the spaces given in the second table.

[10 marks]

Line #	Line of the code
1	import sqlite3
2	conn = sqlite3.connect(sports.sqlite3')
3	cur = conn.cursor()
4	cur.execute('DROP TABLE IF EXISTS Games ')
5	cur.execute('CREATE TABLE Tracks (player TEXT, plays INTEGER)')
6	conn.close()

Line #	Description
1	
2	
3	
4	
5	
6	

****