UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

BACHELOR OF SCIENCE IN INFORMATION SYSTEMS

Academic Year 2013/2014 – First Year Examination – Semester I – 2014

IS1001 – 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 in each and every page of the question paper.
5. This paper has **4** questions and **12** 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 are allowed.

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

(1)

(a) Consider the following simultaneous assignments:

x,y= (45+34) / (21-4), 56*57*58*59

Convert the above assignment statements into a more readable code format.

(5 Marks)

(b) divmod() function returns the results of both floor division and modulo.

Thus, divmod(x,y) is equivalent to x//y, x%y

If one wants to convert 7330 seconds into hours, minutes and seconds using the instruction given above. What would be the appropriate python code?

(5 Marks)

(c) A Teacher wrote the following python code to print the value of q when x=5.

```
def calc_q1(x):
    q = 4 * x + 1
    print(q)

calc_q1(5)
```

He/she has assigned you to modify his/her program to perform the following:
Modify the above code to rearrange the statement(s) in the calc_q1 function, to print the value of x after evaluating the statement q = 4 * x + 1. What would be the value printed if calc_q1 function is called with the value 21.

(5 Marks)

(d) Consider the following python program segment

```
names=['kapila','nimal','latha','kumara','saman','Padma']
indices=[0,1,2,3,4]
for i in indices:
    index=len(names)-1
    print(i,index,names[i])
```

If one executes the above program segment, what would be the output?

(5 Marks)

(e) You have been assigned as a developer to create a multiplication table to teach primary school children. At the testing stage, you should write the code to generate the following table with multiples of 10 where the multiplication number is 2.

Enter the number of multiples: 10

Enter number: 2

1	2.0
2	4.0
3	6.0
4	8.0
5	10.0
6	12.0
7	14.0
8	16.0
9	18.0
10	20.0

Write a python program to generate the above multiplication table with the above input interface.

(5 Marks)

(2)

(a) What is meant by recursion? Provide an example to where recursion is used in problem solving.

(5 Marks)

(b) Consider the following python code.

```
def factorialRecursive(x): #recursive
  if x == 0:
    return  1
  else:
    return x * factorialRecursive(x-1)
print(factorialRecursive(5))
```

Explain, the above program execution using suitable diagram(s) with backtracking.

(7 Marks)

(c) Consider the following mathematical relationships.

f(1)=3;

f(n+1)=f(n)+3

One wants to generate the output from the above formulas as follows.

3 6 9 12 15 18 21 24 27

Write a **recursive** python program to regenerate above number set using the mathematical formula given above.

(7 Marks)

(d) Consider the following program

```
from math import sqrt
n = input("Maximal Number? ")
n = int(n)+1
for a in range(1,n):
   for b in range(a,n):
      c_square = a**2 + b**2
      c = int(sqrt(c_square))
      if ((c_square - c**2) == 0):
         print (a, b, c)
```

If n is =10, what would be the output of the above program.

(6 Marks)

(3)

Consider the following list.

list=['sunil','apple',234.67,125,'kamal','kingdom']

Write down the necessary python commands to perform the following.

(a) If one assumes the above list is a stack, how could you insert "information system' as the topmost element in the stack?

(2 Marks)

(b) If one wants to remove the two elements most recently inserted into the stack.

(3Marks)

(c) If one assume the above stack as a general list, how could you insert the word "computer science" as the new second element of the list?

(2 Marks)

(d) if one wants to reverse the content of the list.

(2 Marks)

(e) If one tried to sort the contents of the list using the python command list.sort() and the order of the output is incorrect. Write down reason(s).

(3 Marks)

(f) Class Circle has several methods as follows:

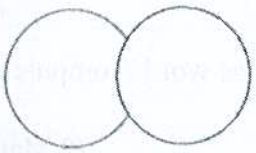
a. getCenterX() returns the X coordinate of the center of a circle.
b. getCenterY()returns the X coordinate of the center of a circle.
c. getRadius() returns the radius of a circle.

Both coordinates and radius are given in the same unit of measurement. Two objects are created from class Circle as C1 and C2. In developing a computer game, you need to know whether two circles collide (ie. intersect or touch) with each other.

Write a method called isCollide(parameter) in class Circle to determine whether it collides with another circle. This method takes a circle object as one input parameter and returns a Boolean value. The method is called as isCollide(c2), where c2 is instance of Circle.

(6 Marks)

Hint – The following diagram shows two circles that collide with each other



(g) The file Student.txt contains the names of 10 students. The names are written line by line. You are required to read the name of the students contained in the Student.txt file, calculate the length of each name, and write the length of the name in a second file. The name given to the second file is NameLength.txt. Sample content of both files are given below. Make sure to properly handle the files.

(7 Marks)

Student file (Student.txt)	NameLength (NameLength.txt)
Edward Nikalas	14
Elizabeth Philiips	16

(4)

(a) A garment factory producing shirts has an application written in the object-oriented style. This software contains a class called Shirt. The Shirt class has methods to execute the shirt production process. At the initial stage, the factory produces shirts with collar size 16 and length of 60 cm.

A shirt1 is an instance of class Shirt. It can be produced by executing method Shirt(). In short, shirt1= Shirt(). Executing this method produces shirts with collar size 16 and length of 60. You are required to define the class Shirt and the initializer for the class.

(3 Marks)

(b) At the next stage, you are asked to modify the class definition such that it takes the collar size and the length of the shirt. For example, the executed method to produce shirt2 is shirt2= Shirt(15, 65)

You are required to define the class Shirt and the initializer method.

(3 marks)

(c) At the next stage, you are asked to write a class method to modify the collar size of a given shirt. The new collar size is given as a parameter. You are required to write an appropriate method.

(3 Marks)

(d) In the software application, a frame in the browser window is created and a button is added to the frame. When the button is clicked, the length of the shirt is increased by one unit. A draw handler attached to the frame displays the length of the shirt. The simplegui module provides necessary methods to create a frame, draw other objects, and handle events.

Describe the steps taken to do the following tasks.

(a) Importing the simplegui module.
(b) Creating a frame and start the frame.
(c) Adding a button.
(d) Changing the size of the shirt.
(e) Displaying the length of the shirt.

(10 Marks)

(f) Write how to define a tuple, list, and dictionary and list the advantages of them.

(6 Marks)

****