THE UNIVERSITY OF AUCKLAND

FIRST SEMESTER, 2016
Campus: City

COMPUTER SCIENCE

TEST

Principles of Computer Science

(Time Allowed: One hour)

Note:

- The use of calculators is NOT permitted.
- Compare the term test version number on the Teleform sheet supplied with the version number above. If they do not match, ask the supervisor for a new sheet.
- Enter your name and student ID on the Teleform sheet. Your name should be entered left aligned. If your name is longer than the number of boxes provided, truncate it.
- Answer all **Multiple-choice** questions on the Teleform answer sheet provided. Answer Section **B** in the space provided in this booklet. Attempt all questions.
- Use a dark pencil to mark your answers in the multiple choice answer boxes on the Teleform sheet. Check that the question number on the sheet corresponds to the question number in this question/answer book. If you spoil your sheet, ask the supervisor for a replacement.
- Write your answers in the space provided in the short answer section. Write as clearly as possible. The space provided will generally be sufficient but is not necessarily an indication of the expected length. Extra space is provided at the end of this exam book.

Surname:	
First Name(s):	
Student ID:	
Lab Time:	

MARKERS ONLY

Question		Mark	Out Of
1 – 24	Multiple Choice		35
25 – 26	Written		15
	TOTAL		50

Question 1
[1.5 marks] What is the output of the following code?

```
list1 = [(x,y) for x in range(5) if x%2 == 0 for y in range(5) if y%2 == 1]
print(list1)
```

(a) [(0, 1), (2, 1), (4, 1), (0, 3), (2, 3), (4, 3)]
(b) [(0, 1)]
(c) [(1, 0), (1, 2), (1, 4), (3, 0), (3, 2), (3, 4)]
(d) [(0, 1), (0, 3), (2, 1), (2, 3), (4, 1), (4, 3)]
(e) None of the above.

Question 2
[1.5 marks] What is the output of the following code?

```
my_list = [x ** 2 for x in range(10) if x%2 == 0]
print(my_list)
```

(a) [0, 2, 4, 6, 8, 10, 12, 14, 16, 18]
(b) [0, 4, 8, 12, 16]
(c) [0, 4, 16, 36, 64]
(d) [0, 1, 2, 4, 8, 16, 32, 64, 128, 256]
(e) None of the above.

Question 3
[1 5 marks] What is the output of the following code?

```
values = [[3, 4, 5, 1 ], [33, 6, 1, 2]]
for row in values:
    row.sort()
print(values)
```

(a) [1, 3, 4, 5, 1, 2, 6, 33]
(b) [[1, 3, 4, 5], [1, 2, 6, 33]]
(c) [1, 1, 2, 3, 4, 5, 6, 33]
(d) [[1, 2, 6, 33], [1, 3, 4, 5]
(e) None of the above.

Question 4
[1.5 marks] Suppose `list1` is `[1, 3, 2]`, what is `list1 * 2` and `list1.extend([34, 5])`?

(a) [2, 6, 4] and [35, 8, 2]
(b) [1, 1, 2, 2, 3, 3] and [1, 2, 3, 5, 34]
(c) [1, 3, 2, 1, 3, 2] and [1, 3, 2, 34, 5]
(d) [1, 3, 2, 2] and [1, 3, 2, [34, 5]]
(e) None of the above.

Question 5
[1.5 marks] What is the output of the following code?

```
total = 0
item = 0
while item < 6:
    item += 1
    total += item
    if total > 4: break
print(total)
```

(a) 6
(b) 8
(c) 10
(d) 7
(e) None of the above.

Question 6
[1.5 marks] What is the output of the following code?

```
total = 0
item = 0
while item < 6:
    item += 1
    total += item
    if total > 4: continue
print(total)
```

(a) 6
(b) 21
(c) 15
(d) 5
(e) None of the above.

Question 7
[1.5 marks] Consider the following function:

```
def test(name, number1 = "one", number2 = "two" ): ?
    print(name, number1, number2)
```

Which of the following correctly calls the above function?

(a) `test( number1 = "three" )`
(b) `test( number2 = "two", number1=1, "Name" )`
(c) `test( "Name", number2 = "one" )`
(d) `test( number1 = "two", "Name" )`
(e) All of the above.

The following function is used in the next 2 questions:

```
def f1(x = 1, y = 2):
    x = x + y
    y += 1
    print(x, y)
```

Question 8
[1.5 marks] What is the output of the following code fragment?

```
f1(y = 2, x = 1)
```

(a) 3 3
(b) 2 2
(c) 2 3
(d) 3 2
(e) The program has a runtime error because x and y are not defined.

Question 9
[1.5 marks] What is the output of the following code fragment?

```
f1(y = 5)
```

(a) 7 7
(b) 6 6
(c) 6 7
(d) 7 6
(e) The program has a runtime error because x and y are not defined.

Question 10
[1 mark] Algorithm analysis should be independent of all of the following EXCEPT _____.

(a) the number of significant operations in an algorithm
(b) the computer used to run a program which implements an algorithm
(c) the test data used to test a program which implements an algorithm
(d) the programming style used in the implementation of the algorithm
(e) None of the above.

Question 11
[1.5 marks] Given the following code fragment, what is the Big-O performance with respect to *n*?

```
k = 0
while k < n//2 :
    for j in range(n*n):
        print(k,j)
    k += 1
```

(a) O(n)
(b) O(n log n)
(c) $O(n^2)$
(d) $O(n^3)$
(e) None of the above.

Question 12
[1.5 marks] Consider the following class definition:

```
class A:
    def __init__(self):
        __a = 1
        self.__b = 1
        self._c = 1
        __d__ = 1
```

Which of the following is a **private** data field in the above class definition?

(a) __b
(b) _c
(c) __a
(d) __d__
(e) None of the above.

Question 13
[1.5 marks] Consider the following class definition:

```
class B:
      def __init__(self, s):
            self.s = s
      def print(self):
            print(s)
```

What is the output of the following code fragment?

```
a = B("Welcome")
a.print()
```

(a) The program has an error because class B should have a print method with signature print(self, s).
(b) The program has an error because class B should have a print method with signature print(s).
(c) The program has an error because class B does not have a constructor.
(d) The program would run if you change print(s) to print(self.s).
(e) None of the above.

The following function is used in the next 3 questions.

```
def divide(data):
      try:
            value = 10 / data
      except TypeError:
            print('Invalid Type')
      except:
            print('Error Occurred')
      else:
            print('Result = ' + str(value))
      finally:
            print('Finalization')
```

Question 14
[1.5 marks] What output is produced when the statement `divide(0)` is executed?

(a) Error Occurred
(b) Error Occurred
Finalization
(c) Divided by Zero
Finalization
(d) Divided by Zero
Result = 0
Finalization
(e) None of the above.

Question 15
[1.5 marks] What output is produced when the statement `divide('5')` is executed?

(a) Invalid Type
Finalization
(b) Invalid Type
(c) Error Occurred
Finalization
(d) Result = 2
Finalization
(e) None of the above.

Question 16
[1.5 marks] What output is produced when the statement `divide(5)` is executed?

(a) Result = 2.0
(b) Result = 2.0
Finalization
(c) Error Occurred
Result = 2.0
Finalization
(d) Finalization
(e) None of the above.

The definition of the `Count` class is used by the following 2 questions.

```
class Count:
    def __init__(self):
        self.count = 0
    def __str__(self):
        return '(' + str(self.count) + ')'
    def __repr__(self):
        return 'COUNT:' + str(self.count)
```

Question 17
[1.5 marks] What is the output of the following code fragment?

```
my_count = Count()
print(my_count)
```

(a) (0)
(b) COUNT:0
(c) 0
(d) COUNT:0 (0)
(e) None of the above.

Question 18
[1.5 marks] What is the output of the following code fragment?

```
def increment(c, times):
      c.count += 1
      times += 1

my_count = Count()
step = 0
increment(my_count, step)
print("count =", my_count.count, "step =", step)
```

(a) count = 0 step = 0
(b) count = 1 step = 0
(c) count = 0 step = 1
(d) count = 1 step = 1
(e) None of the above.

The definition of the `Circle` class is used by the following 4 questions.

```
import math
class Circle:

    def __init__(self, radius):
        self.__radius = radius

    def setRadius(self, radius):
        self.__radius = radius

    def getRadius(self):
        return self.__radius

    def area(self):
        return math.pi * self.__radius ** 2
```

Question 19
[1.5 marks] Which of the following code segment gives a correct implementation of the method `__str__` that defines a string representation of a `Circle` object? The format example with a `Circle(10)` object is "`Circle with radius 10`".

(a)
```
def __str__(self):
      return 'Circle with radius{0}' + self.radius
```
(b)
```
def __str__(self):
      return 'Circle' + self.__radius
```
(c)
```
def __str__(self):
      print('Circle with radius {0}'.format(self.__radius))
```
(d)
```
def __str__(self):
    return 'Circle with radius {0}'.format(self.__radius)
```
(e) None of the above.

Question 20
[1.5 marks] Which of the following code segment gives a correct implementation to add two `circle` objects? For example, the following code fragment:

```
x = Circle(5)
y = Circle(2)
print(x + y)
```

will produce the output:

```
Circle with radius 7
```

(a)
```
def add(self, other):
    return (self.__radius + other.__radius)
```
(b)
```
def __add__(self, other):
    return Circle(self.__radius + other.__radius)
```
(c)
```
def __+__(self, other):
    return Circle(self.__radius + other.__radius)
```
(d)
```
def __add__(other):
    return (self.__radius + other.__radius)
```
(e) None of the above.

Question 21
[1.5 marks] Which of the following code segment gives a correct implementation of the method `__eq__`, which compares two `Circle` objects? That is, two `Circle` objects are considered to be equal if they have the same area.

(a)
```
def __eq__(self, other):
    return self.area() == other.area()
```
(b)
```
def __==__(self, other):
    return self.radius == other.radius
```
(c)
```
def __eq__(other):
    return self.area() == other.area()
```
(d)
```
def equals(other):
    return self.__area() == other.__area()
```
(e) None of the above.

Question 22
[1.5 marks] Suppose that the above methods of the `Circle` class have been correctly implemented, what is the output of the following code?

```
a = Circle(10)
b = Circle(20)
c = Circle(24)
c.setRadius(10)
print(a is b, a is c, a == c)
```

(a) True False False
(b) False False False
(c) False True True
(d) False False True
(e) None of the above.

Question 23
[1.5 marks] Given the following sequence of stack operations, what is the top item on the stack when the sequence is complete?

```
m = Stack()
m.push(1)
m.push(3)
m.push(5)
m.peek()
m.push(m.pop()+ m.pop())
m.peek()
```

(a) 1
(b) 5
(c) 3
(d) 8
(e) The stack is empty.

Question 24
[1.5 marks] Consider the Stack ADT implemented using a Python list (called `items`) such that `push`() and `pop`() are defined as follows:

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

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

What is the big-O complexity of `push`() and `pop`()?

(a) push() is O(1) but pop() is O(n)
(b) pop() is O(1) but push() is O(n)
(c) both push() and pop() are $O(n^2)$
(d) both push() and pop() are O(n)
(e) both push() and pop() are O(1)

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SECTION B

Answer all questions in this section in the space provided. If you run out of space then please use the Overflow Sheet and indicate in the allotted space that you have used the Overflow Sheet.

Question 25: [7 marks]

Write a class that simulates a score tracker in basketball. The basketball team class should contain the following attributes:

- Name = name of the basket ball team
- Score = score of the basket ball team

The basketball team class should contain the following methods:

- constructor to set up the name and the initial score
- __str__ method to return a string representing the object
- __repr__ method to return a string that unambiguously describe the object
- free_throw method to add the score by 1
- make_shot method to add the score by 2
- three_point method to add the score by 3

For example, consider the following code fragment:

```
team1 = BasketballTeam('Raiders')
team2 = BasketballTeam('Tigers')
team1.make_shot()
team2.free_throw()
team1.three_point()
print(team1)
print(team2)
print(repr(team2))
```

The output is:

```
The Raiders have 5 points.
The Tigers have 1 point.
BasketballTeam: Tigers, 1
```

```
class BasketballTeam:
  def __init__(self, s):




  def __repr__(self):



  def __str__(self):









  def free_throw(self):



  def make_shot(self):



  def three_point(self):



```

(7 marks)

Question 26: [8 marks]

a) Complete the **`get_word`** function which takes a list of string as a parameter and returns the word in the list which comes first alphabetically. Note: you must use a loop to solve the problem. For example, the following code fragment:

```
print(get_word(['retrieves', 'substring', 'from', 'this', 'instance']))
print(get_word(['small', 'trouble', 'like', 'this', 'pebble']))
```

will produce the output:

```
from
like
```

`def get_word(my_list):`

(5 marks)

b) Complete the **`switch_values`** function which takes a list of numbers as a parameter and switches the initial and last elements of the list. For example, the following code fragment:

```
my_list = [7.0, 4.2, 7.9, 13.4, 15.9, 10.3]
switch_values(my_list)
print(my_list)
```

will produce the output:

```
[10.3, 4.2, 7.9, 13.4, 15.9, 7.0]
```

`def switch_values(numbers):`

(3 marks)

- Overflow Sheet 1 -
Write the question number and letter next to your answer. You must ALSO indicate in the allotted space that you have used the overflow sheet.

- Overflow Sheet 2 -
Write the question number and letter next to your answer. You must ALSO indicate in the allotted space that you have used the overflow sheet.