THE UNIVERSITY OF AUCKLAND

FIRST SEMESTER, 2018
Campus: City

COMPUTER SCIENCE

TEST

Principles of Computer Science

(Time Allowed: 50 minutes)

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:	

MARKERS ONLY

Question		Mark	Out Of
1 – 27	Multiple Choice		38
28 – 29	Written		12
	TOTAL		50

Question 1

[1.5 mark] What code would produce the output `a'b"c`?

(a) `print(""a'b"c"")`

(b) `print('a'+'''+'b'+'"'+'c')`

(c) `print(""a'""+"b"+"""c"")`

(d) `print('''a'b"c''')`

(e) None of the above

Question 2

[1.5 marks] If you would like to add ‘a’ to every element in `list1`, which of the following code should you use?

(a) `[x+'a' for str(x) in list1]`

(b)
```
for x in list1:
    x += 'a'
```

(c)
```
i=0
while i < len(list1):
    list1[i] = str(list1[i]) + 'a'
    i+=1
```

(d) `[str(x)+'a' for x in list1]`

(e)
```
for i in range(len(list1)):
    list1[i] += 'a'
```

Question 3

[1.5 marks] What output would be generated by the following code fragment?

```
x = [['a', 2],'bc','def']
y = [9, 8, 7]
for item in x:
    item * len(x)
for index in range(len(y)):
    y[index] = x[index] * y[index]
print('Result =', x[2], y[1])
```

(a) `Result = def [['a',2], ['a',2], ['a',2], ['a',2], ['a',2], ['a',2], ['a',2], ['a',2], ['a',2]]`

(b) `Result = defdefdef bcbcbcbcbcbcbcbc`

(c) `Result = defdefdef bcbcbcbcbcbcbcbcbcbcbcbcbcbcbcbcbcbcbcbcbcbcbcbc`

(d) `Result = def bcbcbcbcbcbcbcbc`

(e) None of the above

Question 4

[1.5 marks] What output would be generated by the following code fragment?

```
x = [(1), [1, 2]]
x[0] += 7
x[1].append([3, 4])
x[1].extend([5, 6])
x[1][1] += x[1][0]
print(x)
```

(a) `[8, [1, 3, [3, 4], 5, 6]]`

(b) `[(8), [1, 3, 3, 4, 5, 6]]`

(c) `[(1, 7), [1, 2, 3, 4, [5, 6]]]`

(d) `[(1, 7, 3, 4), [1, 3, [5, 6]]]`

(e) None of the above

Question 5

[1.5 mark] What output would be generated by the following code fragment?

```
def gentlex(x=3):
    return x*3
values = ['a', 'aba', [1], [1, 3], '']
print([gentlex(x) for x in values if len(x) < 2])
```

(a) `['aaa', 'abaabaaba', [1, 1], [1, 9], '   ']`

(b) `['aaa', [1, 1, 1], 9]`

(c) `['aaa', [1, 1, 1], '']`

(d) `['aaa', [1, 1, 1], '   ']`

(e) None of the above

Question 6

[1.5 marks] What output would be generated by the following code fragment?

```
values = [('hello',),("world",)]
my_list = [str(values[x])[::-1] for x in range(len(values))]
print(my_list)
```

(a) `[('hello',), ('world',)]`

(b) `['olleh', 'dlrow']`

(c) `[('olleh',), ('dlrow',)]`

(d) `["),'olleh'(", "),'dlrow'("]`

(e) `Syntax Error`

Question 7

[1.5 marks] What output would be generated by the following code fragment?

```
import copy
x = [1, 2, 3]
x1, x2, x3 = x, x, x
x1 += [4]
x2 = x2 + [5]
x.append(5)
x3 = copy.deepcopy(x)
print(x is x1, x is x2, x1 is x2, x1[0] is x2[0], x3[0] is x[0])
```

(a) `True False False True True`

(b) `False False True True False`

(c) `True True False False False`

(d) `False False False False False`

(e) None of the above

Question 8

[1.5 marks] Consider the following code fragment.

```
class Point:
      def __init__(self, loc_x, loc_y):
            self.x = loc_x
            self.y = loc_y
      def __repr__(self):
            return 'Point(' +str(self.x)+ ', ' + str(self.y)+ ') '
      def translate(self, dx, dy):
            self.x += dx
            self.y += dy

p = Point(0,0)
```

Fill in the blanks of the following 1) statement of code and 2) sentence.

1)

```
otherp = ______(str(p))
```

2)

The above statement of code _______ an instance of a `Point` object named `otherp`

(a) `print, outputs`

(b) `eval, creates`

(c) `print, displays`

(d) `return, returns`

(e) None of the above

Question 9

[1.5 marks] Consider the following `Point` class from the previous question. What is the output of the following?

```
p1 = Point(1,2)
p2 = Point(3,4)
result1 = p1.translate(1,1)
result2 = p2.translate(p1.x, p1.y)
print(result2)
```

(a) `AttributeError`

(b) `(5,7)`

(c) `(4,5)`

(d) `None`

(e) `Syntax Error`

Question 10

[1.5 marks] Consider the `Point` class from above and the following code:

```
import json
json_str = json.dumps(????)
print(json_str)
json_dict = json.loads(json_str)
result = Point(json_dict["x"], json_dict["y"])
print(result)
```

and the output:

```
{
  "__class__": "Point",
  "x": 1,
  "y": 2
}
Point(1, 2)
```

The above code is incomplete. Which of the following alternatives is the correct code to replace the ???? in order to produce the output as shown above?

(a) `{"__class__": "Point", "x": 1, "y": 2}, prettyprinting = True`

(b) `{"__class__": "Point", "x": 1, "y": 2}`

(c) `{"__class__": "Point", "x": 1, "y": 2}, indent = 2, sort_keys = True`

(d) `{"__class__": "Point", "self.x": 1, "self.y": 2}, indent = 2`

(e) None of the above

Question 11

[1.5 marks] Consider the following code:

```
def gcd(m, n):
    while m % n != 0:
        old_m = m
        old_n = n
        m = old_n
        n = old_m % old_n
    return n

answer = gcd(169,35)
```

How many times was the `while` condition evaluated before an integer was returned?

(a) 4
(b) Syntax error
(c) 6
(d) 5
(e) None of the above

Question 12

[1.5 marks] Consider the following code, in addition to the Point class from previous questions:

```
def __iadd__(self, other):
    self.x = self.x + other.x
    self.y = self.y + other.y
    return self

q = Point(1,1)
q += q
```

The result of the `q += q` is __________ .
In the `__iadd__`method, `'other'` is ________ to `'self'`.

(a) an in-place add i.e. same point object q has the values (2, 2), an alias to
(b) a syntax error, an alias to
(c) an in-place add i.e. the same point object q has the values (2, 2), a mutated copy of
(d) a syntax error, a copy of
(e) a returned point object q with the values (2, 2), a mutated copy of

Question 13

[1.5 marks] Consider the following code:

```
def upsidedown(x):
    try:
        return 1/x
    except ZeroDivisionError:
        raise
    except TypeError:
        return "You gotta give me a number"
    finally:
        return 2/x

k = upsidedown(1)
l = upsidedown('a')
m = upsidedown(0)
print(k,l,m)
```

What is the output (ignoring whitespace) ?

(a) `1.0  You gotta give me a number ZeroDivisionError: division by zero`

(b) `2.0  You gotta give me a number ZeroDivisionError: division by zero`

(c) `TypeError: unsupported operand type(s) for /: 'int' and 'str'`

(d) `ZeroDivisionError: division by zero`

(e) None of the above

The definition of the `Movie` class is used by the following question.

```
class Movie:
    def __init__(self, title, minutes, language):
        self.__title = title
        self.__minutes = minutes
        self.language = language

    def __add__(self, other_movie):
        return  self.__minutes + other_movie.__minutes

    def __radd__(self, other):
        return  self.__minutes + other * 2

    def set_minutes(self, value):
        if value > 0:
            self.__minutes = value

    def get_minutes(self):
         return self.__minutes
```

Question 14
[1.5 marks] What output would be generated by the following code fragment?

```
movie3 = Movie('Ready Player One', 100, 'English')
movie1 = Movie('Fluency', 321, 'Te Reo')
movie3 = 2 + movie1
print(movie3)
```

(a) `Fluency(521 minutes)`

(b) `AttributeError: 'int' object has no attribute 'get_minutes'`

(c) `325`

(d) `521`

(e) `<__main__.Movie object at 0x7fc22fc625f8>`

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

```
class Queuecircular:
    def __init__(self, n):
        self.items = []
        self.MAX_QUEUE = n
        self.back = 0
        self.front = self.MAX_QUEUE - 1
        for i in range(self.MAX_QUEUE):
            self.items.append(' ')
    def enqueue(self, item): # if not full
        self.items[___"a"___] = item
        self.back = ___"b"___
    def dequeue(self): # if not empty
        self.front = ___"c"___
        item = self.items[___"d"___]
        return item
```

Question 15
[1.5 marks] What should be **“a”**?

(a) `self.back`

(b) `self.front`

(c) `self.front + 1`

(d) `self.back + 1`

(e) `self.back - 1`

Question 16
[1.5 marks] What should be **“b”**?

(a) `self.back % self.MAX_QUEUE`

(b) `(self.back + 1) % self.MAX_QUEUE`

(c) `(self.front + 1) % self.MAX_QUEUE`

(d) `self.front % self.MAX_QUEUE`

(e) `(self.back - 1) % self.MAX_QUEUE`

Question 17
[1.5 marks] What should be **"c"**?

(a) `self.front % self.MAX_QUEUE`
(b) `(self.front - 1) % self.MAX_QUEUE`
[✓ (c) `(self.front + 1) % self.MAX_QUEUE`]
(d) `(self.back + 1) % self.MAX_QUEUE`
(e) `(self.back) % self.MAX_QUEUE`

Question 18
[1.5 marks] What should be **"d"**?

[✓ (a) `self.front`]
(b) `self.front + 1`
(c) `self.back`
(d) `self.back + 1`
(e) `self.front - 1`

Question 19
[1.5 marks] What is the value of the postfix expression ['18', '6', '/', '8', '*', '2', '/']?

(a) 2.0
(b) 3.0
(c) 6.0
[✓ (d) 12.0]
(e) 8.0

The definition of the `brackets_checker` function below is used by the following 2 questions. Assuming that the `Stack` class and the `matches` function are included already.

```
def brackets_checker(symbol_string):
    st = Stack()
    balanced = True
    index = 0
    while index < len(symbol_string) and balanced:
        symbol = symbol_string[index]
        if symbol in "([{":
            st.push(symbol)
        elif symbol in ")}]":
            if st.is_empty():
                balanced = False
            else:
                top = st.pop()
                if not matches(top, symbol):
                    balanced = False
        print(index, ":", end=" ")
        st.printall()
        index = index + 1
    if balanced and st.is_empty():
        return True
    else:
        return False
```

Question 20

[1.5 marks] What stack information is printed at line 16 and 17 when "index" is 2 if the following statement is executed?

```
print(brackets_checker("{(}{[])}"))
```

(a) 2 : {

(b) 2 : { (

(c) 2 : ([

(d) 2 : (

(e) 2 : { [

The definition of the Stack class below is used by the following 2 questions.

```
class Stack:
    def __init__(self):
        self.items = []
    def is_empty(self):
        return self.items == []
    def size(self):
        return len(self.items)
    def push(self, item):
        self.items.append(item)
    def pop(self):
        try:
            result = self.items.pop()
        except IndexError:
            result = 'The stack is empty!'
        return result
    def peek(self):
        try:
            result = self.items.pop()
        except IndexError:
            result = 'The stack is empty!'
        else:
            self.items.append(result)
        return result
```

Question 21

[1.5 marks] What output is produced when the following statements are executed?

```
s = Stack()
s.push('dog')
print(s.peek(), end=' ')
s.push('cat')
print(s.peek(), end=' ')
s.push(8)
s.pop()
print(s.size())
```

(a) `dog cat 2`

(b) `dog dog 1`

(c) `dog cat 1`

(d) `dog The queue is empty! 0`

(e) `cat dog 1`

Question 22
[1.5 marks] What output is produced when the following statements are executed?

```
s = Stack()
s.push('dog')
print(s.peek(), end=' ')
s.push('cat')
s.pop()
s.pop()
print(s.peek(), end=' ')
print(s.size())
```

(a) dog dog 1

[✓ (b) dog The stack is empty! 0]

(c) dog cat 2

(d) dog The stack is empty! -1

(e) dog cat 1

Question 23
[1 mark] What is the Big-O time complexity of method “pop()” for **python list**?

(a) O(n^2)

(b) O(n)

[✓ (c) O(1)]

(d) O(log n)

(e) O(n * log n))

Question 24
[1 mark] What is the Big-O time complexity of method “pop(0)” for **python list**?

[✓ (a) O(n)]

(b) O(n * log n))

(c) O(n^2)

(d) O(1)

(e) O(log n)

Question 25
[1 mark] What are the Big-O time complexity of the best implementation of push() and pop() for stack ADT using python list?

(a) O(n^2) and O(n) respectively

(b) O(n) and O(n) respectively

[✓ (c) O(1) and O(1) respectively]

(d) O(1) and O(n) respectively

(e) O(1) and O(n^2) respectively

Question 26

[1 mark] What are the Big-O time complexity of the best implementation of enqueue() and dequeue() for basic queue ADT (NOT circular queue) using python list?

(a) O(1) and O(n^2) respectively

(b) O(n^2) and O(n) respectively

(c) O(1) and O(1) respectively

(d) O(n) and O(n) respectively

(e) O(1) and O(n) respectively

Question 27

[1 mark] What is the Big-O complexity based on the number of executions on the statement "sums = i + sums" in the following code?

```
def rate(n):
    sums = 0;
    i = 0;
    while i < n:
        sums = i + sums
        i = i + 3
```

(a) O(log n)

(b) O(n * log n))

(c) O(n)

(d) O(n^2)

(e) O(1)