CIS 210 Winter 2019 Final Exam

(1) What is the result of executing q1('CIS 210')?

VOWELS = 'aeiou'
CONSONANTS = 'bcdfghjklmnpqrstvwxyz'

def q1(st):
    v = ''
    c = ''
    for ch in st:
        if ch in VOWELS:
            v += ch
        elif ch in CONSONANTS:
            c += ch
    return v + c

a) ' ' b) None c) 'CIS 210' d) 'ICS 210' e) 'ICS'

(2-5) Given the following Python code:

```python
>>> for bit in '10':
    print(bit)
    print(bit in '01')
```

(2) The value of bit the first time the for loop is executed is

a) '1' b) '0' c) '10' d) True e) False

(3) The value of bit in '01' (second print) the first time the for loop is executed is

a) '1' b) '0' c) '10' d) True e) False

(4) The value of bit the second time the for loop is executed is

a) '1' b) '0' c) '10' d) True e) False

(5) The value of bit in '01' (second print) the second time the for loop is executed is

a) '1' b) '0' c) '10' d) True e) False
The Taylor series expansion for $e^x$ has the following form:

$$e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!}$$

If we truncate the sum after $N$ terms, we have an approximation for $e^x$ as:

$$e^x \approx \sum_{n=0}^{N-1} \frac{x^n}{n!}$$

Given the following Python code:

```python
from math import factorial  # factorial(n) returns n!

def approx_e(x, terms):
    '''(number, int) -> ??

    Generate approximation for e**x with
    n iterations of the Taylor series
    expansion for e**x. The approximate
    value of e**x is returned.
    
    >>> approx_e(1, 100)
    2.7182818284590455
    '''
    acc = 0
    x_to_power = 1
    for n in range(terms):
        acc += x_to_power/factorial(n)
        x_to_power *= x
    return acc
```

(6) Complete the docstring for `approx_e` below, consistent with this approximation for $e^x$.

a) int  b) float  c) str  d) list  e) None

(7) `approx_e` is an example of a(n) ?? pattern:

a) accumulator  b) filter  c) map  d) return
(8) What is the result of executing `>>> q8(75)`?

```python
def q8(temp):
    ''' No docstring on the exam '''
    message = ''

    if temp >= 90:
        message = 'very hot'

    if temp >= 80:
        message = 'hot'

    if temp >= 70:
        message = 'ok'

    if temp >= 60:
        message = 'cool'

    return message
```

a) 'very hot'  b) 'hot'  c) 'ok'  d) 'cool'  e) error

(9) What is the result of executing `q9()`?

```python
def q9():
    x = 5678
    y = 0
    while x > 0:
        y += 1
        x = x // 10
    return y
```

a) 4  b) 3  c) 567  d) 8  e) '5678'
(10-11) What is the result of executing the following UNTESTED Python code?

```python
>>> universities = ['UO', 'OSU', 'SOU']
>>> new = 'WOU'
>>> universities.append(new)
>>> print(universities)
```

(10)

a) ['UO', 'OSU', 'SOU']  
b) ['UO', 'OSU', 'SOU', 'WOU']  
c) ['WOU', 'UO', 'OSU', 'SOU']  
d) None

Continuing in the same interactive Shell session:

```python
>>> new = 'WOU'
>>> universities = universities.append(new)
>>> print(universities)
```

(11)

a) ['UO', 'OSU', 'SOU']  
b) ['UO', 'OSU', 'SOU', 'WOU']  
c) ['WOU', 'UO', 'OSU', 'SOU']  
d) None

(12) Given the following Python code:

```python
>>> import math
>>> from math import pi
>>> dir()
```

Which of the following would you expect to see in the _main_ namespace after `dir()` is executed?

a) import  
b) math  
c) sqrt  
d) math.pi  
e) math.sqrt

(13) A dependent child can be very loosely defined as a person under 18 years of age who does not earn $10,000 or more a year. An expression that would define a dependent child is

a) (age < 18) and (salary < 10000)

b) (age < 18) or (salary < 10000)

c) (age <= 18) and (salary < 10000)

d) (age <= 18) or (salary <= 10000)
(14) Given:

```python
import random
def createCentroids(k, datadict):
    '''(int, dict) -> list (of dict values)

    Create a starter list of k centroids
    for a k-cluster algorithm by
    randomly choosing from the items
    in datadict. The starter list is returned.
    '''
    centroids = []
    centroidCount = 0
    centroidKeys = []

    while centroidCount < k:
        rkey = random.randint(1, len(datadict))
        if rkey not in centroidKeys:
            centroids.append(datadict[rkey])
            centroidKeys.append(rkey)
            centroidCount += 1

    return centroids
```

```python
>>> d = {1: [1.1], 2: [2.9], 3: [3.4], 4: [2.7]}
>>> d[4] = [4.4]
```

Which could NOT be the result of executing

```python
>>> createCentroids(2, d)
```

a) [[4.4], [2.9]]  
b) [[2.9], [4.4]]  
c) [[2.7], [2.9]]  
d) [[3.4], [4.4]]  
e) [[1.1], [4.4]]
Given the following UNTESTED Python code:

```python
def q15(astring):
    '''(str) -> ??
    Exam function
    '''
symbols = ['@', '#', '$', '%', '&', '*']
symbols_ctr = 0

    for c in astring:
        if c in symbols:
            symbols_ctr += 1

    return (symbols_ctr >= 2)
```

(15) Complete the type contract:

a) int   b) str   c) bool   d) list   e) dict

(16) What will be the result of executing `>>> q15('CIS210')`?

a) 0   b) 1   c) True   d) False   e) 'CIS21'

(17) Which test will reveal the bug in the code?

a) q15('CIS210')     b) q15('CIS&210')     c) q15('CIS210*')
     d) q15('#CIS210')   e) q15('**CIS210**')

(18) What kind of error is this?

a) documentation   b) syntax   c) runtime   d) logical
(19) The following Python code
>>> x = 'hi'
>>> x = 0
>>> x = x < 0
demonstrates which characteristic of Python?

a) strong typing  
b) dynamic typing  
c) operator overloading  
d) loops  
e) conditionals

(20) The following Python code
>>> x = 'hi' + '-' + 'bye'
>>> y = 99 + 100
demonstrates which characteristic of Python?

a) strong typing  
b) dynamic typing  
c) operator overloading  
d) loops  
e) conditionals

(21) The following Python code
>>> x = 'hi' + 99
Traceback (most recent call last):
  File "<pyshell#41>", line 1, in <module>
    x = 'hi' + 99
TypeError: must be str, not int
demonstrates which characteristic of Python?

a) strong typing  
b) dynamic typing  
c) operator overloading  
d) loops  
e) conditionals
(22-23) After the following Python code is executed:

```python
>>> mystr = 'hello, world'
>>> yourstr = mystr
>>> mystr = 'good morning, world'
```

(22) The value of `mystr` is:

a) 'hello, world'  
b) 'good morning, world'  
c) `yourstr`

d) ''  
e) error

(23) The value of `yourstr` is:

a) 'hello, world'  
b) 'good morning, world'  
c) `yourstr`

d) ''  
e) error

(24-29) After the following Python code is executed:

```python
>>> mylist = [[1, 2], 'CIS210', 99.9, 100]
>>> yourlist = mylist
>>> mylist[1] = 'CIS211'
```

(24) The value of `mylist` is:

a) [[1, 2], 'CIS210', 99.9, 100]

b) ['CIS211', 'CIS210', 99.9, 100]

c) [[1, 2], 'CIS211', 99.9, 100]

d) [[1, 2], 'CIS210', 'CIS211', 100]

e) [[1, 2], 'CIS210', 99.9, 100, 'CIS211']

(25) The value of `yourlist` is:

a) [[1, 2], 'CIS210', 99.9, 100]

b) ['CIS211', 'CIS210', 99.9, 100]

c) [[1, 2], 'CIS211', 99.9, 100]

d) [[1, 2], 'CIS210', 'CIS211', 100]

e) [[1, 2], 'CIS210', 99.9, 100, 'CIS211']
In the same interactive Shell session, after the following Python code is executed:

```python
>>> next = mylist.pop()
```

(26) The value of `mylist` is:

a) `[[1, 2], 'CIS210', 99.9]`  
b) `['CIS211', 'CIS210', 99.9]`  
c) `[[1, 2], 'CIS211', 99.9]`  
d) `[1,2]`  
e) `100`

(27) The value of `yourlist` is:

a) `[[1, 2], 'CIS210', 99.9]`  
b) `['CIS211', 'CIS210', 99.9]`  
c) `[[1, 2], 'CIS211', 99.9]`  
d) `[1,2]`  
e) `100`

In the same interactive Shell session, after the following Python code is executed:

```python
>>> yourlist = mylist.pop()
```

(28) The value of `mylist` is:

a) `[[1, 2], 99.9]`  
b) `['CIS210', 99.9]`  
c) `[[1, 2], 'CIS211']`  
d) `[1,2]`  
e) `99.9`

(29) The value of `yourlist` is:

a) `[[1, 2], 99.9]`  
b) `['CIS210', 99.9]`  
c) `[[1, 2], 'CIS211']`  
d) `[1,2]`  
e) `99.9`
Given function `lowtemps` and file 'lowtemps.txt', with a record of the daily low temperature in Eugene from February 1 through February 10:

'lowtemps.txt' has two lines: a header line, and another line of comma separated values, which are the daily rainfall amounts:

```
#low temperature data final exam CIS 210 W19 02/01-15/2019 Eugene
43,35,37,29,29,28,26,30,29,29
```

def lowtemps(f):
    '''Exam function
    '''
    with open(f) as temp:
        temp.readline()
        temps = temp.readline().strip().split(',')

        tempd = {}
        day = 1
        for temp in temps:
            tempd[day] = int(temp)
            day += 1

        return tempd

The correct type contract for `lowtemps` is:

a) (file) -> file  b) (int) -> file  c) (int) -> float
   d) (str) -> list  e) (str) -> dict

The value of `temps` after `temps = temp.readline().strip().split(',')` is executed:

a) '#low temperature data final exam CIS 210 W19 02/01-15/2019 Eugene'

b) '43,35,37,29,29,28,26,30,29,29'

c) ['43', '35', '37', '29', '29', '28', '26', '30', '29', '29']

d) {1: 43, 2: 35, 3: 37, 4: 29, 5: 29, 6: 28, 7: 26, 8: 30, 9: 29, 10: 29}

e) {43: 1, 35: 1, 37: 1, 29: 4, 28: 1, 26: 1, 30: 1}
The value of tempd at the return statement is

a) "low temperature data final exam CIS 210 W19 02/01-15/2019 Eugene"

b) '43,35,37,29,29,28,26,30,29,29'

c) ['43', '35', '37', '29', '29', '28', '26', '30', '29', '29']

d) {1: 43, 2: 35, 3: 37, 4: 29, 5: 29, 6: 28, 7: 26, 8: 30, 9: 29, 10: 29}

e) {43: 1, 35: 1, 37: 1, 29: 4, 28: 1, 26: 1, 30: 1}

Given the following Python code:

```python
import math
def euclidD(point1, point2):
    '''(tuple, tuple) -> float

    Computes and returns the Euclidean distance between point1 and point2 (which must have same dimensions).

    Called by: createClusters

    >>> euclidD([3,0], [0,4])
    5.0
    '''
    total = 0
    for index in range(len(point1)):
        diff = (point1[index] - point2[index]) ** 2
        total = total + diff
    euclidDistance = math.sqrt(total)
    return euclidDistance
```

And the following UNTESTED main function:

```python
def main():
    '''driver'''
    points = ((1, 2), (3, 4), (5, 6))
    origin = (1, 1)
    for point in points:
        result = euclidD(origin, point)
        print(origin, point, result, point1, point2)

    return None
```
(33) The first time `euclidD` is called in `main`, the value of `point1` (in `euclidD`) is:
   a) (1, 1)   b) (1, 2)   c) (3, 4)   d) 1.0   e) no value/NameError

(34) The first time `euclidD` is called in `main`, the value of `point2` (in `euclidD`) is:
   a) (1, 1)   b) (1, 2)   c) (3, 4)   d) 1.0   e) no value/NameError

(35) The first time the `print` statement is called in `main`, the value of `origin` is:
   a) (1, 1)   b) (1, 2)   c) (3, 4)   d) 1.0   e) no value/NameError

(36) The first time the `print` statement is called in `main`, the value of `result` is:
   a) (1, 1)   b) (1, 2)   c) (3, 4)   d) 1.0   e) no value/NameError

(37) The first time the `print` statement is called in `main`, the value of `point1` is:
   a) (1, 1)   b) (1, 2)   c) (3, 4)   d) 1.0   e) no value/NameError

(38-40) Given the following Python code:
```python
def q38r(s):
    '''exam function'''
    if s == '':
        return 0
    elif len(s) == 1:
        return int(s)
    else:
        return int(s[0]) + q38r(s[1:])
```

```bash
>>> q38r('12345')
```

(38) The second time `q38r` is called, the value of `s` will be
   a) '12345'   b) '2345'   c) '1234'   d) '345'   e) ''

(39) Including the initial call to `q38r('12345')`, `q38r` will be called ?? times in all.
   a) 1   b) 2   c) 3   d) 4   e) 5

(40) The value returned by `q38r('12345')` will be
   a) '1'   b) '15'   c) 1   d) 15   e) None
(SA1) [2 pts.] Create name and id, variables of type str, and assign them to your name and student id number:

(SA2) [4 pts.] Replace the ?? with the result of executing the following code (indicate 'error' if the result would be a Python error message):

```python
>>> phrase = 'The quick brown fox'
>>> vowels = 'aeiou'
>>> s = phrase.split()
>>> s
??____________________
>>> type(s)
??____________________ #just give the Python type
>>> v = [x for x in phrase if x in vowels]
>>> v
??____________________
>>> type(v)
??____________________ #just give the Python type
```

(SA3-4) Mark the code to indicate changes that are needed.

(SA3) [6 pts.] Revise isInCircle to check whether point x, y is located in a circle centered at (0,0) with any radius (don’t forget docstring changes):

```python
import math
def isInCircle(x, y):
    '''(number, number) -> bool

    Returns True if point (x, y) is in the circle centered at (0,0) with radius 1.
    
    >>> isInCircle(.5, .5)
    True
    >>> isInCircle(1, 2)
    False
    '''
    d = math.sqrt(x**2 + y**2)
    return d <= 1
```
(SA4) [2 pts.] Revise `montePi` to call revised `isInCircle` to determine whether point \(x,y\) lands on the dart board (i.e., upper right sector of a circle with origin 0,0 and radius 1):

```python
def montePi(numDarts):
    '''
    (integer) -> float
    Uses a Monte Carlo algorithm (looping numdarts times) to generate an approximate value for \(\pi\).
    Due to randomness in the algorithm, function output may vary somewhat from function call to function call.
    >>> montePi(1000)
    3.168
    >>> montePi(1000000)
    3.141068
    '''
inCircle = 0
    # throw the darts and track whether they landed on the dart board.
    for i in range(numDarts):
        x = random.random()
        y = random.random()
        d = math.sqrt(x**2 + y**2)
        if d <= 1:
            inCircle += 1
    approxPi = inCircle/numDarts * 4
    return approxPi
```

(SA5) [2 pts.] Replace the `??` with the result of executing the following code (indicate 'error' if the result would be a Python error message):

```python
>>> name = "Prince Lucien Campbell"
>>> name = name.split()

>>> new = name[0][0] + name[1][0] + name[2][0]
>>> new
??
```
Given the following Python code:

```python
1 def q6(astr):
2     '''(str) -> (list)
3     Exam function.
4     '''
5     countdict = {}
6     for item in astr:
7         if item in countdict:
8             countdict[item] += 1
9         else:
10             countdict[item] = 1
11
12     countlist = countdict.values()
13     maxcount = max(countlist)
14
15     mli = []
16     for item in countdict:
17         if countdict[item] == maxcount:
18             mli.append(item)
19     '''
20     mli = [item for item in countdict if countdict[item] == maxcount]
21     '''
22     return mli

>>> teststr = 'zzzyxxxxww'

When >>> q6(teststr) is executed:

the value of countdict at line 11 is: ___??_____________________________________

the value of countlist after line 12 is executed is: ___??__________________________

the value of maxcount at line 14 is: ___??_____________________________________

the value of mli at line 22 is: ___??__________________________________________
(7) [12 pts.] Write a function, \texttt{mypow}, that returns \(x\) to the \(n\)th power, where \(x\) and \(n\), non-negative integers, are function parameters. Do \textit{not} use Python’s built-in power operator (**)) or function (\texttt{pow}).

a) Write a simple example of use for \texttt{mypow}:

b) Write one edge test case for \texttt{mypow}:

c) Write the function header for \texttt{mypow}:

d) Write the type contract for \texttt{mypow}:

e) Write an algorithm for solving \texttt{mypow} (natural language/pseudocode):

f) Write the rest of (i.e., do not include header and docstring) the Python code for \texttt{mypow}:
(8) [12 pts.] Write a program to print a message in an interesting format. Function spring will have one parameter, greeting, a string. It should return the greeting with every other word, starting with the first word, in uppercase, and the alternating words in lowercase. For example:

```> spring('Best wishes for a pleasant spring break.')</> 'BEST wishes FOR a PLEASANT spring BREAK.'</>

Then write a main function that calls spring and prints the resulting message. The program should be written using CIS 210 style guidelines. Function spring should include one “normal” and one “edge” example of use in the docstring, along with the type contract. (You may omit the brief description in the docstring of spring. The main function does not need a docstring.)