Data Structures and Algorithms Test 2

Tuesday July 19, 2022

Time: 11:00 – 12:00 HRS

Part I: Attempt all Questions by Stating your Selected Choice

1. Given the following list:

```
a = ['foo', 'bar', 'baz', 'qux', 'quux', 'corge']
```

Which of the following output are correct from their commands

A.
```
print(a[-6])
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
IndexError: list index out of range
```

B.
```
a[:] is a
True
```

C.
```
print(a[4::-2])
['quux', 'baz', 'foo']
```

D.
```
max(a[2:4] + ['grault'])
'qux'
```

E.
```
print(a[-5:-3])
['bar', 'baz']
```

2. Consider the following code:

```
class MyIterator:
    def __init__(self, max):
        self.max = max
        self.curr = 0
    def __next__(self):
        if self.curr < self.max:
            ret = self.curr
            self.curr += 1
            return ret
        else:
            raise StopIteration()
    def __iter__(self):
        return self
it = MyIterator(10)
for i in it:
    print(i, end=' ')
```

After executing the above, which of the following is right output?

A. `[2, 4, 8, 10, 12, 14, 16, 18, 20, 22]`

B. `[0, 1, 2, 3, 4, 5, 6, 7, 8, 9]`

C. `0 1 2 3 4 5 6 7 8 9`

D. `[2, 4, 4, 8, 5, 16, None, 20, 22, 24]`

For questions 3 – 5, for each of the following functions, determine the corresponding worst-case runtime complexity in terms of the input list size, N. Assume that all `lst` arguments are Python lists.

3.

```
def fA(lst):
    for _ in range(len(lst)):
        x = lst[0]
```

```
            del lst[0]
            lst.append(x)
```

A. O(1)
B. O(logN)
C. O(N)
D. $O(N^2)$

4.

```
def fB(lst):
    x = lst[0]
    cs = [1]
    for j in range(1, len(lst)):
        if x == lst[j]:
            cs[-1] += 1
        else:
            x = lst[j]
            cs.append(1)
```

A. O(1)
B. O(logN)
C. O(N)
D. $O(N^2)$

5.

```
def fC(lst):
    r = 0
    n = 100
    if len(lst) < n:
        n = len(lst)
    for x in range(n):
        r += x
```

A. O(1)
B. O(logN)
C. O(N)
D. $O(N^2)$

Part II: Attempt all Questions

a) What are the contents of the dictionary `dct` after the following code is executed?

```
dct = {}
for x in 'a man a plan a canal'.split():
    if len(x) not in dct:
        dct[len(x)] = [x]
    else:
        dct[len(x)].append(x)
```

b) Write a Python function that correctly computes `1/2 + 2/3 + 3/4 + ... + 99/100`. Use a `timeit.timeit()` function in your solution to time your function.

c) Write a code snippet that creates a NumPy array of size N.

End! Happy Coding!