CS 320 Midterm (10%) – Fall 2021

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First/Given Name: _____ Last/Surname: _____

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Fill in these fields (left to right) on the scantron form (use pencil):

1. LAST NAME (surname), then FIRST (given name), fill in bubbles
2. IDENTIFICATION NUMBER: write your ID number, fill in bubbles
3. Under A of SPECIAL CODES, write your lecture number, fill in bubbles. 1=8:50am, 2=11am
4. Under B of SPECIAL CODES, tell us about the nearest person (if any) to your left. 0=no person to the left in your row, 1=somebody you do not know is there, 2=somebody you do know is there.
5. Under C of SPECIAL CODES, do the same as B, but for the person to your right
6. **Under D of SPECIAL CODES, write 6 and fill in bubble 6**. This is very important!

Make sure you fill all the special codes above accurately in order to get graded.

You have 40 minutes to take the exam. Use a #2 pencil to mark all answers. When you're done, please hand in these sheets in addition to your filled in scantron. You may not sit adjacent to your friends or other people you know in the class (having only one empty seat is considered "adjacent"). You may only reference your notesheet. You may not use books, your neighbors, calculators, or other electronic devices on this exam. Please place your student ID face up on your desk. Turn off and put away portable electronics now.

(Black Page for You to Do Scratch Work)

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Q1. If a Flask app has the following handlers, what does it print when a user visits the home page in a browser?

```
@app.route("/")
def home():
    print("X")
    return '<html><             "></body></html>'

@app.route("/plot.p
def f():
    print("Y")
    return "TODO"

@app.route("/out.svg")
def g():
    print("Z")
    return "TODO"
```

(A) X only   (B) X and Y   (C) X and Z   (D) X, Y, and Z

Q2. If L is a list with 100 items, what index should replace ???? to make the code probably run SLOWEST?

```
L.insert(????, "new entry")
```

(A) -1   (B) 0   (C) 50   (D) 99   (E) 100

Q3. Does the regular expression `r"\d.+b"` match anything in the string `"1B.abdc"` ?

(A) yes   (B) no

Q4. What is printed?

```
h = []
for item in [5, -1, 3, 0.5, 0]:
    heapq.heappush(h, item)
print(heapq.heappop(h))
```

(A) `5`   (B) `-1`   (C) `3`   (D) `0.5`   (E) `0`

Q5. Suppose the following runs without error:

```
# code hidden
X.next = Y
Y.next = X
Z.next = Y
```

Which of the following refers to the same object as X?

(A) X.next   (B) Z.next   (D) Y.next.next.next   (E) Z.next.next.next

Q6. The DOM (Document ... web page is a BST (Binary Search Tree).

(A) True   (B) False

Q7. Each function can have at most one frame on the stack at a time.

(A) True   (B) False

Q8. If a BST is constructed using the algorithm we learned in class, and the insert order is `[6, 7, 4, 10]`, where will `10` be?

(A) root.left.left   (B) root.left.right   (C) root.right.left   (D) root.right.right

Q9. What is the complexity of the following code, if N is the length of the list `L`? Choose the best answer.

```
for i in range(len(L)):
    for j in range(3):
        if i+j < len(L):
            print(L[i+j])
```

(A) $O(1)$ (B) $O(N)$ (C) $O(N^2)$ (D) $O(N^2 + 1)$ (E) $O(N^3)$

Q10. What does `nums` contain after the following runs?

```
nums = []
def h(z):
    if z > 2:
        h(z-1)
    nums.append(z)
h(5)
print(nums)
```
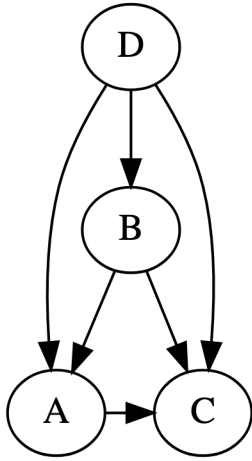
(A) `[2, 3, 4]`   (B) `[2, 3, 4, 5]`   (C) `[]`   (D) `[4, 3, 2]`   (E) `[5, 4, 3, 2]`

Q11. What type does `check_output` **return?**

(A) int   (B) bytes   (C) bool   (D) str   (E) utf8

Q12. What can be said about the following graph?

(A) it is not acyclic and not connected

(B) it is connected but not acyclic

(C) it is acyclic but not connected

(D) it is both connected and acyclic

Q13. What error might we get when running the following code?

```
dog.fetch("A", "B")
```

(A) `TypeError: fetch() takes 1 positional argument but 3 were given`

(B) `TypeError: fetch() takes 2 positional arguments but 2 were given`

(C) `TypeError: fetch() takes 3 positional arguments but 2 were given`

(D) `TypeError: fetch() takes 4 positional arguments but 4 were given`

Q14. What is `x` **?**

```
class C:
    def __init__(self, vals):
        self.vals = vals

    def __len__(self):
        return 1

    def __getitem__
        return 2

obj = C([3, 5, 4])
x = len(obj.vals) #
```

(A) 1   (B) 2   (C) 3   (D) 4   (E) 5

Q15. Where is a `deque` **most useful in BFS code?**

(A) to track which nodes have been visited

(B) to track nodes to be visited in the future

(C) to store the path from source to destination

Q16. What is something htop shows?

(A) how large a zip file is

(B) how much memory is being used

(C) how much storage space is being used

(D) what the largest compressed file is inside of a zip file

Q17. What is the complexity of the following code, if N is the length of the list `L` **? Choose the best answer.**

```
for num in L:
    avg = sum(L) / len(L)
    if num > 2 * avg:
        print("outlier!")
```

(A) $O(1)$ (B) $O(N)$ (C) $O(N^2)$ (D) $O(N^2 + 1)$ (E) $O(N^3)$

Q18. Which algorithm is recursive?

(A) DFS   (B) BFS

Q19. What will the length of Y be equal to after the following runs?

```
with open("coords.txt") as f:
    X = f.read()
    Y = f.read()
```

(A) 0

(B) len(X)

(C) total length of the file

(D) whatever the length o̲̲̲ ̲̲̲̲̲̲̲ ̲̲e file is

Q20. For git, "headless"

(A) there is no branch named HEAD

(B) there is no tag named HEAD

(C) the HEAD branch does ̲o̲t̲ ̲p̲o̲i̲n̲t̲ ̲t̲ö̲ ̲the main commit

(D) the latest commit in untagged

(E) HEAD does not point to any branch