CS 320 Exam 3 (16%) - Fall 2022

Instructor: Tyler Caraza-Harter
First/Given Name: _____. Last/Surname: _____
Net ID: _____ @wisc.edu
Fill in these fields (left to right) on the scantron form (use pencil):

1. LAST NAME (surname) and FIRST NAME (given name), fill in bubbles
2. IDENTIFICATION NUMBER is your Campus 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 4 and fill in bubble 4**. This is very important!

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

You have 2 hours 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 turn off and put away portable electronics now.

If multiple answers are correct, choose the best answer (for example, the most informative one when doing complexity analysis).

(Blank Page for You to Do Scratch Work)

Q1. Which search algorithm visits all the children, then all the grandchildren, and so on?

(A) BFS (B) BST (C) DFS (C) DST (D) CGG

Q2. Each _____ has one instruction pointer

(A) program (B) process (C) thread (D) stack (E) heap

Q3. Your zip file is 2 megabytes (MB) and has a 2x compression ratio. How large are the uncompressed contents?

(A) 0.5 MB (B) 1 MB (C) 2 MB (D) 4 MB

Q4. How many oranges are classified as apples, according to the following confusion matrix?

	apples	oranges	bananas
apples	35	5	97
oranges	43	67	70
bananas	16	80	69

(A) 5 (B) 38 (C) 43 (D) 48

Q5. What is something firewalls do often?

(A) block ports (B) host robots.txt (C) return 429 (D) check passwords

Q6. `df` has 12 columns and 111 rows. After running the following, how many columns will `p.components_` have?

```
p = PCA(5)
p.fit(df)
```

(A) 5 (B) 12 (C) 60 (D) 111

Q7. A process's address space contains:

(A) only code (B) only data (C) both code and data

Q8. Which vector is NOT in the column space of the following matrix?

```
[[-1 1],
 [ 0 2],
 [ 0 3]]
```

(A) `[[-1], [-2], [-3]]` (B) `[[0], [0], [0]]` (C) `[[1], [2], [2]]` (D) `[[0], [2], [3]]`

Q9. What is a special method that context managers implement?

(A) `__context__` (B) `__eq__` (C) `__exit__` (D) `__len__` (E) `__lt__`

Q10. True/False: all DAGs are connected in some way (either strongly or weakly)

(A) True (B) False

Q11. What does a web browser check to determine what the file format is for a given resource?

(A) the extension (B) the status code (C) the content type

Q12. What is the recall for oranges, given the following confusion matrix?

	apples	oranges	bananas
apples	0	1	5
oranges	5	3	2
bananas	0	3	1

(A) 0.3 (B) 0.4 (C) 3 (D) 10

Q13. If a BST is constructed using the algorithm we learned in class, and the insert order is `[8, 13, 3, 14]`, where will `14` be?

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

Q14. With K-Means clustering, what are we usually hoping for?

(A) low inertia, few clusters
(B) low inertia, many clusters
(C) high inertia, few clusters
(D) high inertia, many clusters

Q15. If `A=np.array([[3, 5], [1, 4]])` and `b=np.array([[6, 2]])`, what is `A*b`?

(A) `[[18,10],[6,8]]` (B) `[[18,30],[2,8]]` (C) `[[24,40],[8,32]]` (D) `[[28],[14]]`

Q16. What are the bounds on possible values for `s`?

```
p = LogisticRegression()
p.fit(train[xcols], train[ycol])
s = p.score(test[xcols], test[ycol])
```

(A) -infinity to infinity (B) -infinity to 1 (C) 0 to 1 (D) 0 to infinity (E) -1 to 1

Q17. After `obj.fit(df1)`, you successfully call `obj.predict(df2)`. What could the type of `obj` possibly be?

(A) LinearRegression (B) LogisticRegression (C) KMeans (D) AgglomerativeClustering

Q18. If shapely shapes X and Y overlap, which expression produces the shape that covers the most area? Assume X is larger than Y.

(A) `X.intersection(Y)` (B) `Y.difference(X)` (C) `X.union(Y)` (D) `X.difference(Y)`

Q19. If you're computing centroids in geopandas, you want a coordinate reference system in units of what?

(A) pixels (B) degrees (C) radians (D) meters

Q20. The HEAD in git CANNOT do which of the following?

(A) point to a branch that points to a commit
(B) point directly to a commit
(C) point to a tag that points to a commit

Q21. Suppose `b` is a Selenium WebDriver and that the following code runs without error. What can we guarantee about `y` and `z`?

```
w = "????" # an unknown string
x = b.find_element(by="id", value="some_element")
y = len(b.find_elements(by="tag name", value=w))
z = len(x.find_elements(by="tag name", value=w))
```

(A) y < z (B) y <= z (C) y == z (D) y >= z (E) y > z

Q22. Complexity analysis is most concerned with which of the following?

(A) measuring how long a step will take to run once
(B) relating the number of steps executed to an input size
(C) counting how many steps will execute for a specific input
(D) identifying ways to write functions with fewer lines of code

Q23. What is `matrix.argmin(axis=0)`, where `matrix` is the following numpy array?

```
array([[60, 54, 50, 55],
       [56, 51, 61, 59],
       [52, 57, 58, 53]])
```

(A) [2 1 0 2] (B) [2 1 0] (C) [50 51 52] (D) [52 51 50 53] (E) [60 57 61 59]

Q24. What will `re.findall` give us for the pattern r"([AB])([BC])" and the text "ABC"?

(A) 0 matches
(B) 1 group containing 2 matches
(C) 1 group containing 4 matches
(D) 1 match containing 2 groups
(E) 2 matches, each containing 2 groups

Q25. The shape of `A` is (9, 6), the shape of `B` is (6, 8), and the shape of `C` is (8, 5). What is the shape of `A@B@C`?

(A) (6, 8) (B) (8, 5) (C) (9, 5) (D) (9, 6)

Q26. True/False: if `p` is a sklearn `Pipeline`, then `p.predict(X)` will call `.predict` on every stage of the pipeline.

(A) True (B) False

Q27. In A/B testing, "CTR" an example of a(n) _____.

(A) factor (B) metric (C) cookie (D) treatment

Q28. For what kind of recursive function is it most useful to draw a call graph?

(A) functions that DO something (B) functions that RETURN something

Q29. If M is a numpy matrix representing a color image, how can you slice it to get one corner of the image to display with `plt.imshow`?

(A) `M[:100,-100:]` (B) `M[:100,100:]` (C) `M[100:,100:,:]` (D) `M[:"up left"]`

Q30. True/False: geopandas (the version used in class this semester) raises an exception when you plot GeoDataFrames with different coordinate reference systems in the same axes area.

(A) True (B) False