Montana State University Computer Science Department

Graduating Senior Exam

Spring Semester 2022, 80 minutes.

Your performance helps us assess how well we are meeting our stated learning outcomes for computer science majors. To pass this exam, spend at least 45 minutes in order to provide a carefully reasoned answer to each question. This information will help us make improvements.

Name Peyton Ellis

Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer service team needs a way to find the most urgent ticket in the system and remove it when it has been addressed. New tickets can arrive at any time.

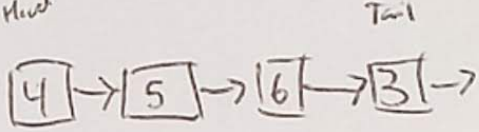
a) What simple data structure would best model this situation? Explain.

A linked list bcuz you can easily move through it

b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.



c) Describe a second way in which this data structure could be implemented and draw a picture of that data structure.



Question 2: Write a function in a language of your choice that has two parameters: a string and a character. The function should return the number of times that the character occurs in the string.

Your language of choice (e.g. Python): Python

Your solution:

```
if __name__ == '__main__':

    S = "String here, Sir"
    ch = 'r'

    if S.__contains__(ch):
        print("ch found")
```

Question 3: Consider a singly linked list that contains **n** floating point numbers and is maintained in ascending order. An additional **k** floating point numbers will be added to the list, one at a time. You may assume that **k << n**.

Best case time complexity of algorithm:

O(K+N)

Explanation of best case time complexity:

Adding K items to N

Worst case time complexity of algorithm:

O(KN)

Explanation of worst case time complexity:

Computer is really slow

Question 4: List any extracurricular community involvement (e.g. the Gallatin Valley Food Bank or coaching), extracurricular university involvement (e.g. Engineering Ambassadors, Swing Cats, AWC or ACM) or paid internships (e.g. Workiva intern or Undergraduate Course Assistant) that you were involved with during your time at MSU. For each activity, (1) **provide** the name of the organization, (2) **describe** briefly your main activities and (3) **estimate** the total number of hours you spent.

Organization	*Main Activities*	*Hours Spent (estimate)*

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Consistent errors in a computer that create unfair outcomes

b) Provide a hypothetical example of how algorithmic bias could manifest itself in college admissions software.

If a College used to have a racist admissions dept and then made an admissions algorithm based on past acceptees then it would still have those biases.

Question 6: In 2010 Oracle sued Google claiming copyright and patent infringement for 11,500 lines of Java API copied code. Google used this small subset of code from the JAVA API for their mobile platform operating system. Pick a side (Google or Oracle) to win this lawsuit and explain 3 possible impacts to the computing industry of this win.

Side you choose to win: Google

First possible impact:
Boiler plate code can not be owned by ~~Oracle~~ One Company

Second possible impact:
Code could be stolen more easily

Third possible impact:
Hurts Oracles market share.

Question 7: In the ACM Code of Ethics and Professional Conduct, one ethical principle stated is to ***avoid harm***. Describe three different types of harm that the software of an autonomous, self-driving car might cause.

First type of harm:
It might accidentally run Some one over

Second type of harm:
It might decide to kill a pedestrian to save the drivers life

Third type of harm:
It might assist Criminals.

Question 8: Describe your one-year plan following graduation. If you plan to work, list where you have applied (the company and the position) and mention whether you have received any offers. If you plan to go to graduate school, list where you have applied (the school and the area of study) and mention whether you have received any acceptances.

I plan to work IN IT. ive applied to
A+E Design
Murdocks Ranch + Home supply
Acadeus
MSU
many more

Question 9: List any organized social activities that you were involved with during your time at MSU. For each activity, (1) **provide** the name of the organization, (2) **estimate** the total number of hours you spent.

Organization Name	*Hours Spent (estimate)*

Question 10: List any activities that you were involved with during your time at MSU that prepared you to work more effectively with teammates whose backgrounds are significantly different than your own. For each activity, (1) **describe** the activity and (2) **estimate** the total number of hours you spent.

Activity Description	*Hours Spent (estimate)*
Computer Science Road Trip 2022	32
TA (495)	80

Question 11: Name the most sophisticated version control system that you use and describe three nontrivial features it has.

Name of most sophisticated version control system: GitHub

Non-trivial feature 1:
Branches for potential revisions.

Non-trivial feature 2:
Makes code potentially available to the public.

Non-trivial feature 3:
Allows people every where to contribute code

Question 12: During your time at MSU, list any major non-classroom, non-paid activities that you engaged in to help prepare for your computer science career. For example, you might have taught yourself a programming language or attended a workshop on a CS topic. For each activity, **estimate** the number of hours spent.

Activity Description	*Hours Spent (estimate)*

Best wishes wrapping up the semester and in the future!