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 Jordan Kelly

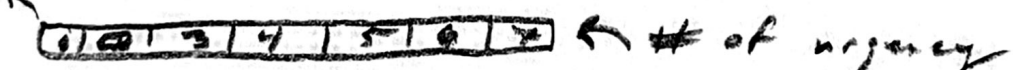
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer 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.

I would try it with a linked list, dynamically change size & pop by urgency.

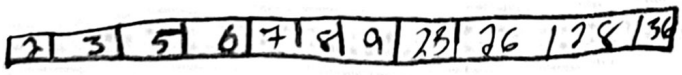
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

make a linked list where top priority is @ the top and least at the end, dynamically add depending on urgency, and pop most urgent



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

push everything from the back and find most urgent index then pop



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:

```
def counter(self, string, character)
    x = 0
    for i in string.length()
        if character == string[i]
            x++
    print(x)
```

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:

n

Explanation of best case time complexity:

you have to go through the list once to organize every time something is added and to oranize the whole set once so n^2

Worst case time complexity of algorithm:

n^2

Explanation of worst case time complexity:

because you have to go through twice to maintain the order, the initial, then after adding

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.

Basically what is done to not get negative bias in algorithms

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

Say bias towards a certain race or age of people going to apply. Non-bias would be a level field for everyone.

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:

First possible impact:

public code would be more closely examined and whoever copied would need permission

Second possible impact:

No more open sourcing

Third possible impact:

no more googling for help, much hard and time consuming

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:

physical harm, hurting someone

Second type of harm:

ethical harm, bias towards certain people

Third type of harm:

Car accidents between autonomous cars hurting the industry

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.

plan to work, hopefully here in bozeman, Ive applied for multiple local business' and would love to stay in the community

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)*
Egen 310r	70 hours

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:

local ssh

Non-trivial feature 2:

push/pull

Non-trivial feature 3:

merge conflict resolutions

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)*
python	50
Java	100
Ruble	50

Best wishes wrapping up the semester and in the future!