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 Brooks Palin

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 probably implement a priority queue. That way, those that are the most urgent are Pushed to the front, and popped when complete.

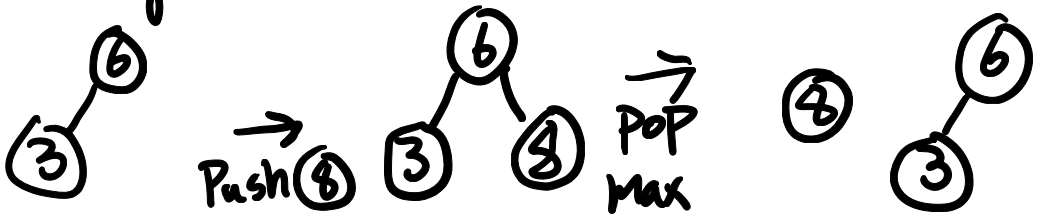
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

you could have a sorted array that uses quick sort or merge sort when an item is inserted, the data is retrieved from the head of the list.



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

you could make a bst, and sort on by priority. The largest values would be on the right



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): rust

Your solution:

```rust
fn count_char(str : &str, cha : char) -> u32 {
    let mut count :u32 = 0;

    for c :char in str.chars() {
        if c == cha {
            count += 1;
        }
    }

    count
}
```

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)

Explanation of best case time complexity:

This is the best case, where every element of k that is added is put onto the front. So the number of operations would be k.

Worst case time complexity of algorithm: O(K·N)

Explanation of worst case time complexity:

In the worst case, the algorithm will have to traverse the entire linked list for each ellement in K. Therefore the number of operations would be k·N

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)*
Wisetail	front end bugchasing	400 ~
Green Helix	front end dev	500 ~

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

algorithmic bias is when an algorithm neglect those within protected groups.

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

There are a lot of ways this could happen depending on the software. Maybe a sort would put those that are part of a protected farther in the back? I guess I don't know exactly what college admission software does

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: prepackaged language libraries ruled free to use no matter earnings. Small companies thrive.

Second possible impact: Some companies wouldn't realese new Programing languages because there is no return on investment.

Third possible impact: language api's may require a paywall.

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
This is a no brainer, this is what common people fear. The car could make a mistake and cause physical damage.

Second type of harm: fiscal harm
A mistake on the road could cost a lot of money for the company and the family involved.

Third type of harm: Job harm
alot of taxi drivers may loose their job over something like that.

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.

Well, the TLDR is that I am going to try to get a job in the valley, that is like 30ish hours a week so that I can focus on starting my own bussiness.

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. (none)

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. (none)

Activity Description	*Hours Spent (estimate)*

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: git

Non-trivial feature 1: commits: kinda like save points. Saves the current state of my code when I like where my code is at.

Non-trivial feature 2: reverts: revert back to a safe spot after I make big mistakes.

Non-trivial feature 3: Online repos this allows me to work in groups on project that I couldn't otherwise. The heart and soul of open-source dev.

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)*
Learned unity	~60 hours
Learned rust	~50 hours
Learned C++	~30 hours
personal sideprojects	~1000 hours
Learned opengl	~100 hours
Learned C#	~20 (similar to java)
Open source work	~150 hours

Best wishes wrapping up the semester and in the future!