Fall 2024 CSCI 605 Assignment #4

Requirement

- **You must print out this assignment template, fill it with your answers in writing, and you must not change the template –** Note: You will lose 5 pts if you fail to do so.
- Scan your assignment into a PDF file and submit it to Canvas.
- **You must scan clearly. Unreadable content will not be graded.**
- Your final PDF file should be named as: "YourFirstName.YourLastName.CSCI-605.A04.pdf".
  Example: **John.Doe.CSCI-605.A04.pdf –** Note: You will lose 5 pts if your file is not named correctly.
- You must work out, write up and submit the solutions **independently**.
- Bring your completed assignment on paper to submit in the class on the submission date or the immediate next class.

Submission

- Due: Oct. 4, 2024, 23:59:59
- PDF or JPG file on Canvas

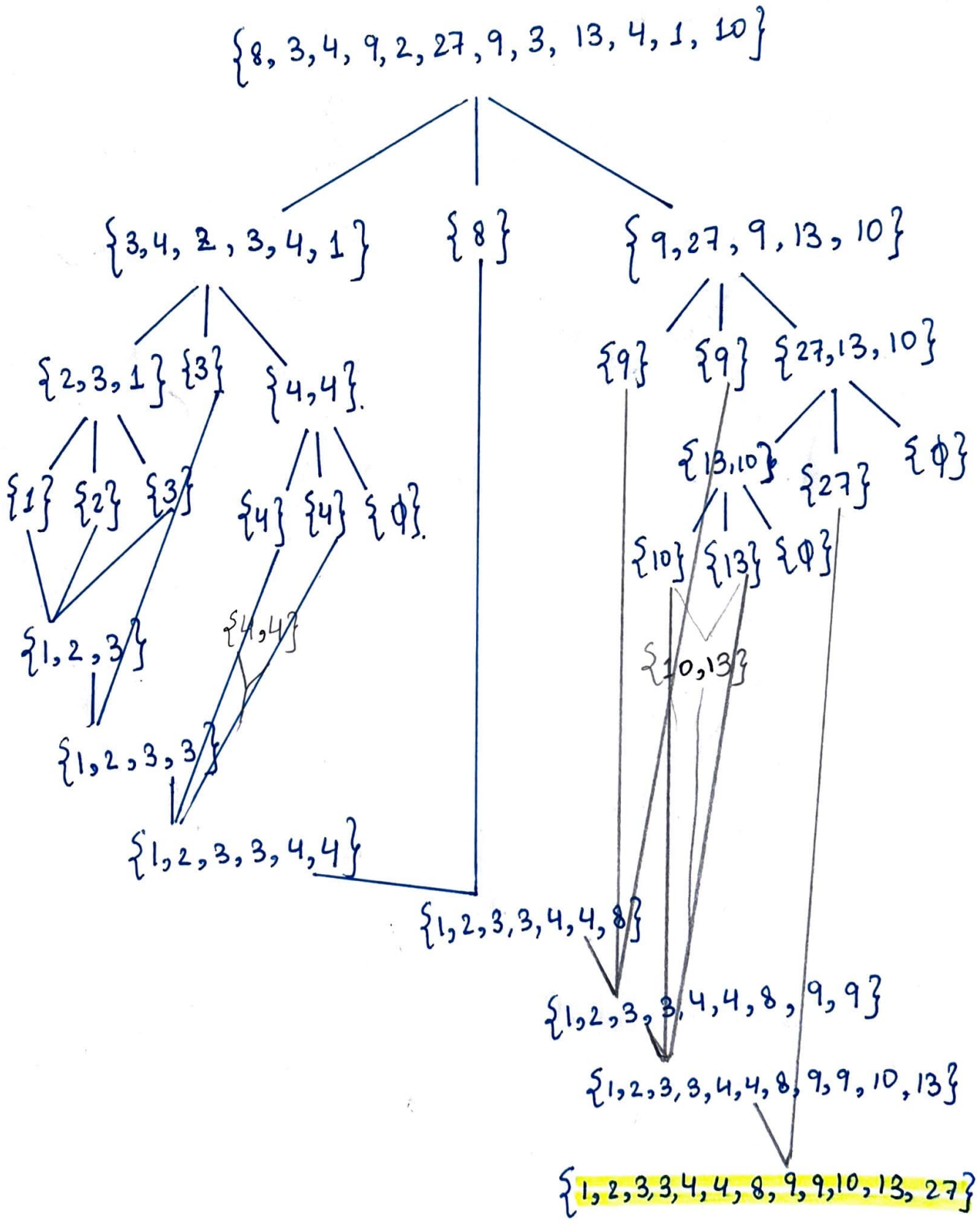
Problems

0. Full Names

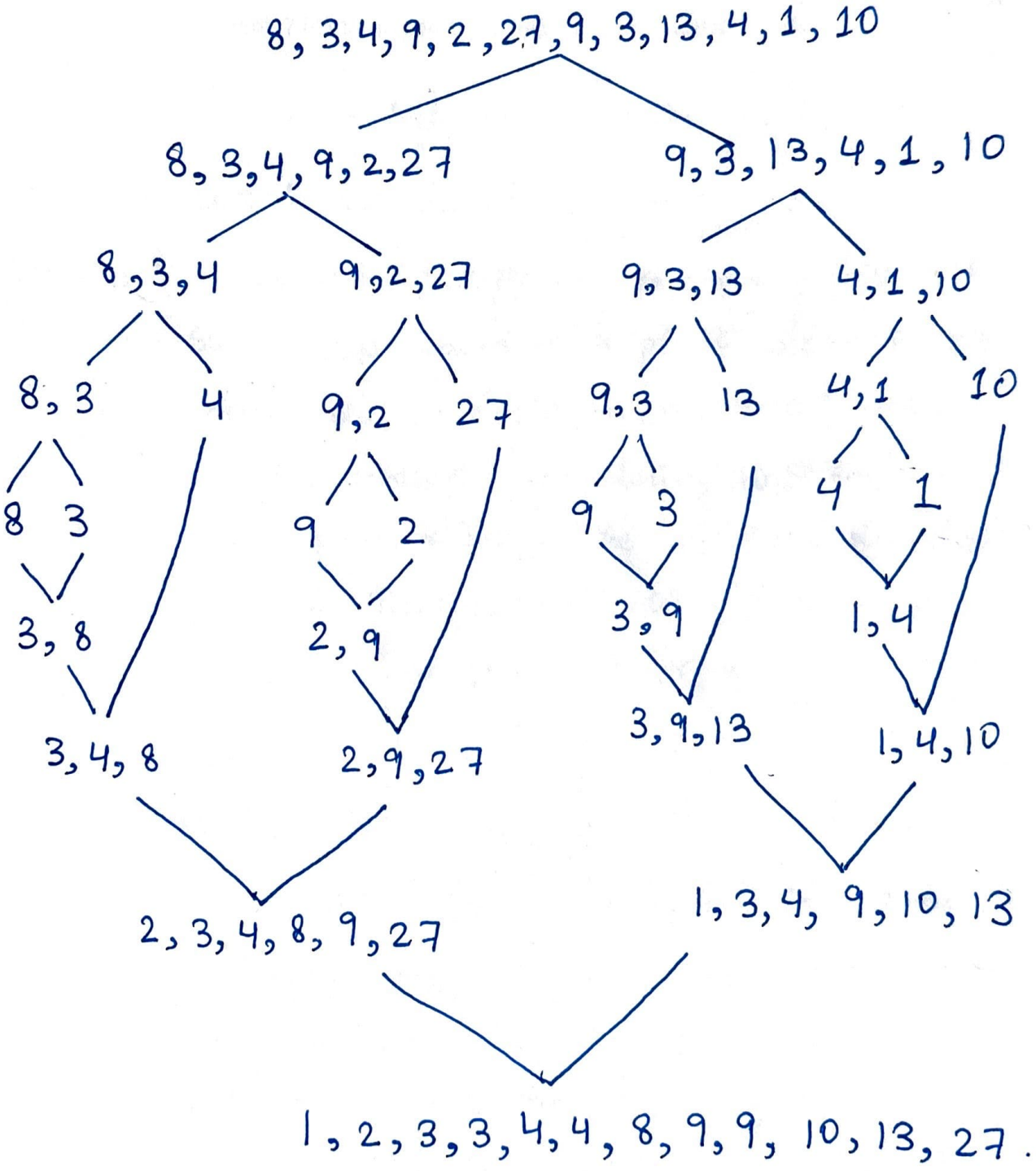
Khushi Choudhary.

Starting from the next page for questions 1, 2 and 3.

1. (50 pts) Sort the list [8, 3, 4, 9, 2, 27, 9, 3, 13, 4, 1, 10] using quicksort and the first element of the list as the pivot. Values equal to the pivot should go to the left. Draw a tree showing the lists provided as input to each recursive call. Don't forget to include empty lists when appropriate.



2. (50 pts) Sort the list [8, 3, 4, 9, 2, 27, 9, 3, 13, 4, 1, 10] using merge sort. Draw a tree showing the lists provided as input to each recursive call. Don't forget to include empty lists when appropriate.



3. Given this definition of stable sort:

> A sorting algorithm is **stable** if, when two elements have equal keys (or values), their relative order in the original list is maintained after sorting.

Is quicksort stable? Is merge sort stable? Explain your reason.

According to the definition of stable sort,

→ Quick sort is Not Stable by Nature.

Reasons:- • It works by partitioning the array into two sub arrays based on a pivot element and recursively sorting them. The elements may be swapped across the array during partitioning, and this swapping can disrupt the relative order of equal elements. Therefore, elements with equal keys may end up in a different order relative to each other after sorting.

→ Merge sort is Stable by Nature.

Reason:- It works by dividing the array into small subarrays, sorting each one and then merging them. During the merge process, when 2 elements are equal, merge sort ensures that the element from left subarray comes before the element from right subarray. This behaviour guarantees that the relative order of equal elements is maintained, making Merge sort inherently stable.