Q1 Academic Honesty
1 Point

It is a violation of the Academic Integrity Code to look at any reference material other than your textbook and lecture notes, or to give inappropriate help to someone or to receive unauthorized aid by someone in person or electronically via messaging apps such as WhatsApp. Academic Integrity is expected of all students of Hacettepe University at all times, whether in the presence or absence of members of the faculty. Do NOT sign nor take this exam if you do not agree with the honor code.

Understanding this, I declare I shall not give, use or receive unauthorized aid in this examination.

Signature (Specify your name and surname as your signature)

> Mehmet Taha USTA MTUSTA

While answering the following questions, please consider the implementations that we discussed in our lectures unless stated otherwise.

Q2 LSD Radix Sort
14 Points

Suppose that you want to sort the following array of strings in ascending order by using LSD radix sort (with a radix of 10):

620 696 298 395 568 971 029 041 531 021

Q2.1
7 Points

What is the array immediately after performing key-indexed counting for the first time? Your answer should be **a sequence of strings of 3-digit numbers separated by whitespace**, e.g. 395 021 029 ....

> 620 971 041 531 021 395 696 298 568
> 029

Q2.2
7 Points

What is the array immediately after performing key-indexed counting for the second time? Your answer should be **a sequence of strings of 3-digit numbers separated by whitespace**, e.g. 395 021 029 ....

> 620 021 029 531 041 568 971 395 696
> 298

Q3 MSD Radix Sort
18 Points

Suppose that you want to sort the following array of strings in ascending order by using MSD radix sort (with a radix of 10):

620 696 298 395 568 971 029 041 531 021

Q3.1
6 Points

What is the array immediately after performing key-indexed counting for the first time? Your answer should be **a sequence of strings of 3-digit numbers separated by whitespace**, e.g. 395 021 029 ....

> 971 620 696 568 531 395 298 029 041
> 021

Q3.2
6 Points

What is the array immediately after performing key-indexed counting for the second time? Your answer should be **a sequence**

of strings of 3-digit numbers separated by whitespace, e.g. 395 021 029 ....

> 696 395 298 971 568 041 531 620 029 021

Q3.3
6 Points

What is the array immediately after performing key-indexed counting for the third time? Your answer should be **a sequence of strings of 3-digit numbers separated by whitespace**, e.g. 395 021 029 ....

> 029 298 568 696 395 971 041 531 021 620

Q4 String Search
20 Points

TRUE/FALSE

Q4.1
5 Points

Brute-force substring searching algorithm and Rabin Karp algorithm have the same worst-case time complexity.

○ True

◉ False

Q4.2
5 Points

Knuth-Morris-Pratt (KMP) substring search is an in-place algorithm.

○ True

◉ False

Q4.3
5 Points

Boyer Moore algorithm has the worst-case time complexity $O(MN)$ where M is the length of the string and N is the length of the pattern.

🔘 True

⭕ False

Q4.4
5 Points

Rabin Karp algorithm always returns the correct answer in linear time.

⭕ True

🔘 False

Q5
10 Points

Give an example of inputs (i.e., the string and the pattern) to the Boyer Moore algorithm so that it has the worst-case performance.

> input AABAACAADAABAABA
> search
> AABA

Q6
14 Points

LSD String sort requires a stable sorting algorithm like the count sort to work correctly. Select the input(s) that would still be definitely correct if the sorting algorithm in LSD was not stable.

- [x] EFG, ABC, YAB, BBC, CCD, CBC, FAB
- [ ] ABC, ADB, BAB, ABB, BBA, AAB, BAC
- [x] DBA, ABC, BAB, CBA, ECD, HCD, YBC
- [ ] EGF, ABB, YAB, CCD, FAB, HAB, BAH

Q7
14 Points

For the pattern "BYEBYE" with alphabet {B, E, Y}, complete the dfa array given below by providing the states marked with a question mark (?). You should provide your answer in the row-column order and separated by a single space. For example the first two rows can be written as "1 ? ? 4 ? ? 0 0 ? 0 ? ?".

	0	1	2	3	4	5	6
B	1	?	?	4	?	?	
E	0	0	?	0	?	?	
Y	0	2	0	0	?	0	

```
1 0 0 4 0 0 - 0 0 3 0 0 6 - 0 2 0 0 5 0
```

Q8
10 Points

Given a stream of characters and a pattern select the algorithms that you can use if backing-up in the stream is not allowed (you can't use a buffer as well).

- [x] Rabin Karp Algorithm Monte-Carlo version
- [ ] Rabin Karp Algorithm Las Vegas version
- [x] Knuth-Morris-Pratt Algorithm
- [ ] Boyer-Moore algorithm
- [ ] Brute-force algorithm
- [ ] None of them

Quiz 5 - String Sorting and Substring Search   ● GRADED

STUDENT

Mehmet Taha Usta

TOTAL POINTS

40 / 101 pts

QUESTION 1

Academic Honesty   **1** / 1 pt

QUESTION 2

LSD Radix Sort   **14** / 14 pts

2.1   (no title)   **7** / 7 pts

2.2   (no title)   **7** / 7 pts

QUESTION 3

MSD Radix Sort   **0** / 18 pts

3.1   (no title)   **0** / 6 pts

3.2   (no title)   **0** / 6 pts

3.3   (no title)   **0** / 6 pts

QUESTION 4

String Search   **15** / 20 pts

4.1   (no title)   **0** / 5 pts

4.2   (no title)   **5** / 5 pts

4.3   (no title)   **5** / 5 pts

4.4   (no title)   **5** / 5 pts

QUESTION 5

(no title)   **0** / 10 pts

QUESTION 6

(no title)   **0** / 14 pts

QUESTION 7

(no title)   **0** / 14 pts

QUESTION 8

(no title)   **10** / 10 pts