

Military Institute of Science and Technology
B.Sc. in Computer Science and Engineering
Subject: CSE-204, Data Structures and Algorithms-I Sessional
Online-1, Spring 2024, Sec-A

****This Lab Test will achieve CO4****

Time: 1.5 hrs Full Marks: 40

ID:			NAME:		
Marks	Question-1	Question-2	Question-3	Total	Evaluator
	10	10	20	40	

Question-1

You are working on a project to develop a web content management system (CMS) that includes an HTML validator tool. The tool's primary function is to ensure that the HTML code entered by content creators is properly structured. This involves checking that each opening tag has a corresponding closing tag and that the tags are correctly nested. Properly formatted HTML is crucial for rendering web pages correctly in browsers and for maintaining a consistent and professional look for the web content.

Write a C program to check if a given HTML document has properly nested and matched tags. The tags are case-insensitive and can include any alphanumeric characters.

Requirements:

- 1. **Input:** A single string containing HTML tags and other characters.
- 2. **Output:** A single line: "Valid" if the tags are properly nested and matched, "Invalid" otherwise.
- 3. **Constraints:**
 - o The input string can be up to 1000 characters long.
 - o The tags will always be in lowercase (e.g., <p> and <div> and </div>).
 - o The tags should be checked in a nested and sequential manner.

Hint: You can use in-built string functions if needed

Sample Input Output

Input	Output
<div><p></p></div>	Valid
<div><p></div></p>	Invalid
<div><p></p></div>	Valid
<div><p></div>	Invalid

Marking Criteria	Marks
Stack Implementation	6
Condition Checking	3
Input/ Output	1

Question-02: The Triwizard Tournament and the Search for Balanced Teams

In the peaceful village of Codeton, there was a renowned scholar named Professor Alphasort. Known for his expertise in organizing information, the Professor faced his greatest challenge yet: an ancient, enchanted essay. This essay, written in a mix of letters, numbers, and symbols, held a secret message that could only be deciphered if properly sorted. The village council entrusted this task to the Professor, who knew just what to do.

The Challenge: Sorting the Essay

The Professor devised a method to organize the essay and uncover its secrets. He decided to create two magical functions:

- 1. **sortString**: This function would strip the essay of all unnecessary whitespaces and symbols, then arrange the characters in a specific order:
 - Numbers first, sorted by their ASCII values.
 - Letters next, sorted alphabetically, **The order of letters and numbers in the sorted array should be preserved.**See sample input/output for clarification.
- 2. **findValue**: Once sorted, the Professor needed to search for particular characters within the essay. This function would locate the last occurrence of a given character in the sorted essay, returning its position or indicating if the character was absent.

Sample Input Output

Input	Output
Enchanted Essay: "Quote", MiSsiPPI 74 5496 88AAaa A asgard Option : 1	Deciphered Essay: 44567889AAaaAaadegiiiMoPPQrSsstu
Enchanted Essay: "Quote", MiSsiPPI 74 5496 88AAaa A asgard Option: 2 Search:8	Character '8' found at 6
Enchanted Essay: "Quote", MiSsiPPI 74 5496 88AAaa A asgard Option: 2 Search: A	Character 'A' found at 12
Enchanted Essay: "Quote", MiSsiPPI 74 5496 88AAaa A asgard Option: 2 Search: a	Character 'a' found at 14
Enchanted Essay: "Quote", MiSsiPPI 74 5496 88AAaa A asgard Option: 2 Search: J	Character ‘J’ not found

Marking Criteria	Marks
Sorting	5
Searching	3
Input/ Output	2

Question-03: Who Gave the Most Salami?

It's Eid season and you've gone "Salami" hunting. Turns out that you're quite popular and received salami from many of your friends and seniors! Now, you want to see who gave you the highest salami and share a Facebook story about it. To make this easier, you decide to create a small app to track your salamis and find out the maximum salami giver.

However, there's a catch. You can only post a Facebook story once. What if multiple people gave you the highest salami? In that case, you'll choose to post about the person closest to you. You determine closeness by seniority: your batchmates (CSE-23) have the highest priority, followed by CSE-22, CSE-21, and so on.

Your task is to implement the app using a linked list implementation of a priority queue. Each node in the linked list will store three pieces of data: 1) the name of the person, 2) the amount of salami they gave, and 3) their batch information (see Figure). However, if the maximum salami givers turn out to be two members of the same batch, the story will be about the person who gave you the salami first.

Name	Amount	Batch
Rizu bhai	15	20

An example of individual node

Suppose the current priority queue is: (Rizu bhai, 15, 20) -> (Porag bhai, 5, 21)

Then you open the Bkash app and see: (Saifur bhai, 200, 20).

So the current priority queue will be:
(Saifur bhai, 200, 20)->(Rizu bhai, 15, 20) -> (Porag bhai, 5, 21)

After that, you receive: (Kawsar Bhai, 200, 22). So the current priority queue will be:

(Kawsar Bhai, 200, 22)->(Saifur bhai, 200, 20)->(Rizu bhai, 15, 20) -> (Porag bhai, 5, 21)

Now, your task is to implement four functions:

- 1. **Push** - This function will be used to insert a value into your app.
- 2. **Pop** - This function will remove the person who gave the maximum salami.
- 3. **Peek** - This function will return the person who gave the maximum salami without removing them.
- 4. **Count seniors** - This function will print the count of seniors (see Sample Input/Output for reference).

Sample Input/Output	Sample Input/Output (cont.)
<p>Options: 1. Push 2. Pop 3. Peek 4. Count seniors 5. Exit Select your option: 1 Enter name: Rizu bhai Enter salami amount: 15 Enter batch: 20</p> <p>Options: 1. Push 2. Pop 3. Peek 4. Count seniors 5. Exit Select your option: 1 Enter name: Porag bhai Enter salami amount: 5 Enter batch: 21</p> <p>Options: 1. Push 2. Pop 3. Peek 4. Count seniors 5. Exit Select your option: 3 Maximum Salami giver is: (Rizu bhai, 15, 20)</p> <p>Options: 1. Push 2. Pop 3. Peek 4. Count seniors 5. Exit Select your option: 1 Enter name: Saifur bhai Enter salami amount: 200 Enter batch: 20</p> <p>Options: 1. Push 2. Pop 3. Peek 4. Count seniors 5. Exit Select your option: 3 Maximum Salami giver is: (Saifur bhai, 200, 20)</p> <p>Options: 1. Push 2. Pop 3. Peek</p>	<p>4. Count seniors 5. Exit Select your option: 1 Enter name: Kawsar bhai Enter salami amount: 200 Enter batch: 22</p> <p>Options: 1. Push 2. Pop 4. Count seniors 5. Exit Select your option: 3 Maximum Salami giver is: (Kawsar bhai, 200, 22)</p> <p>Options: 1. Push 2. Pop 3. Peek 4. Count seniors 5. Exit Select your option: 4</p> <p>CSE 1 -> 0 CSE 2-> 0 ... CSE 20 ->2 CSE 21 ->1 CSE 22 ->0 CSE 23 ->0</p> <p>Options: 1. Push 2. Pop 3. Peek 4. Count seniors 5. Exit Select your option: 2</p> <p>Options: 1. Push 2. Pop 3. Peek 4. Count seniors 5. Exit Select your option: 3 Maximum Salami giver is: (Saifur bhai, 200, 20)</p> <p>Options: 1. Push 2. Pop 3. Peek 4. Count seniors 5. Exit Select your option: 5</p>

Marking Criteria	Marks	Marking Criteria	Marks
Push()	10	Peek()	02
Pop()	03	ConuntSeniors()	05