**Test Problems**

**You are allowed to use ChatGPT/Claude or any other AI tool for these problems.** In your presentation you should answer the following questions for each problem:

1. How did you use AI to assist you?
2. Did you make any modifications to the AI-suggested code? Why?

**1. Data Structures: Implement a Custom Queue**

1. Write a custom implementation of a queue with the following operations:
   * enqueue: Add an item to the end.
   * dequeue: Remove an item from the front.
   * peek: View the front item without removing it.
   * is\_empty: Check if the queue is empty.
2. Add a feature to support **reversing the queue**.

**2. Algorithm Challenge with Optimizations**

* Implement a function that finds the **longest substring without repeating characters** in a string.
  + Optimize for time complexity.
  + Candidates must explain if and how ChatGPT's suggestions improved their solution.

Example:

**Input:** "abcabcbb"

**Output:** 3 (substring: "abc")

**3. Open-Ended Problem-Solving**

* **Scenario**: "You are designing a small utility to batch process images."
  + Write a program that:
    1. Takes a directory path as input.
    2. Applies a grayscale filter to all images in the directory.
    3. Saves the processed images to a new directory.
  + Include error handling (e.g., non-image files, missing directories).
    1. **Final Problem: Movie & TV Show Recommender using OpenAI API**

**Objective:**

Create a user-friendly application that uses the OpenAI API to provide movie and TV show recommendations. The application should:

* Accept user input through an interface.
* Send the input along with a predefined prompt to OpenAI's API.
* Parse the response and display the top 2 recommended movies and top 2 recommended TV shows.

1. Create a simple user interface (web-based):
   * An input field for the user to type their query (e.g., actor name, director, genre, or basic plot points).
   * A "Submit" button or command to process the query.
2. Use the OpenAI API to get recommendations:
   * **Construct a structured prompt to fetch highly rated movies and TV shows based on the user's input.**
   * The prompt should guide the AI to return separate lists for movies and TV shows.
3. Display the results:
   * Parse the response to extract and display:
     + **Top 2 Movies** (title and a short description).
     + **Top 2 TV Shows** (title and a short description).
   * Show the recommendations clearly and in a user-friendly manner.
4. Handle errors:
   * Invalid API keys.
   * Empty or unclear user queries.
   * Network issues or API errors.

**OpenAI API Key to use in the app:**

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

**Example Input/Output**

**User Input:**  
"Show me movies and TV shows starring Keanu Reeves or about time travel."

**Example Output (UI):**

**Movies:**

1. *The Matrix* - A hacker discovers the truth about reality and his role in the battle against its controllers. (1999)
2. *John Wick* - A retired hitman seeks revenge for the killing of his beloved dog. (2014)

**TV Shows:**

1. *Dark* - A German family drama with a supernatural twist, centered on time travel and its consequences. (2017)
2. *Travelers* - A team of agents from the future takes over the bodies of people in the present to prevent a global catastrophe. (2016)