Title: Advanced Shell Scripting and Optimization Assignment

Assignment Description:

In this assignment, you will design, optimize, and benchmark a feature-rich shell script that performs a complex task efficiently. The assignment focuses on Linux commands, shell scripting techniques, optimization strategies, and creating a user-friendly experience. It consists of three parts: implementation, optimization, and advanced feature integration.

Part 1: Implementation

Design a shell script that accomplishes the following tasks:

a. Accepts a directory path as an argument.

b. Searches for all files with a specific extension (e.g., .txt) in the given directory and its subdirectories.

c. Generates a comprehensive report that includes file details such as size, owner, permissions, and last modified timestamp.

d. Groups the files by owner.

e. Sorts the file groups by the total size occupied by each owner.

f. Saves the report in a file named "file_analysis.txt".

Implement the following user-friendly features:

a. Create a command-line interface (CLI) with clear prompts and descriptive messages.

b. Provide a help section that explains how to use the script and lists available options.

c. Handle errors by displaying informative error messages and offering possible solutions.

d. Validate user inputs and provide appropriate feedback for invalid or missing arguments.

Part 2: Optimization

Analyze your initial implementation and identify areas for optimization.

Modify your shell script to improve its efficiency and performance while maintaining the same functionality.

Part 3: Advanced Feature Integration

Enhance your shell script with additional advanced features:

a. Implement support for multiple file extensions, allowing users to search for files with various extensions simultaneously.

b. Include an option to filter files based on size, permissions, or last modified timestamp, allowing users to customize their search criteria.

c. Enable the script to generate a summary report that displays total file count, total size, and other relevant statistics.

Submission:

- Submit your shell scripting file(s)
- Write a report (pdf) that covers the design choices, optimization techniques, advanced features, user-friendliness aspects, and their impact on performance. Include a reflection section discussing the lessons learned, difficulties encountered, and potential future improvements.
- Record a video (less than 10 mins, submit the URL of the video only) that shows your implementation and features, and how you optimized your solution.

Assessment:

Your submission will be assessed based on the following criteria:

- Correctness and completeness of the shell script in performing the required tasks.
- Clarity and depth of the explanations provided in the video.
- Demonstrated understanding and utilization of advanced shell scripting techniques.
- Effectiveness of the optimizations implemented and their impact on performance.
- Integration and functionality of the advanced features.
- User-friendliness of the script, including clear prompts, error handling, and help section.
- Quality and coherence of the report.