Optimization Methods - Final Project

In the previous assignments, students implemented a column generation approach to solve the Linear Relaxation of the Traveling Salesman Problem (TSP). In this final project, the objective is to embed the column generation approach into a complete branch-and-price algorithm to solve the TSP.
The objective of this assignment is to implement a C++ program using IBM CPLEX to solve the TSP with a branch-and-price approach. Students are required to:

- Integrate the column generation approach into a branch-and-price framework.
- Solve the TSP using the proposed branch-and-price approach.
- Validate the solution obtained using at least 100 different TSP instances.
- Deliver a comprehensive report.
- Submit the source code of the implemented program.

A Resources

The following resources are provided to assist students in completing the assignment:

- TSP instances in the folder *assets/data/*.
- Sample code snippets for reading data files and building the TSP model in the folder *assets/tspcode/*.
- IBM CPLEX documentation and tutorials.
- Assignment guidelines and requirements in *NEXXUS* platform.

B Submission Guidelines

Students are required to submit the following deliverables by the specified deadline:

- A comprehensive report in PDF format detailing the implementation, solution process, and results.
- A zip file containing the source code of the implemented program.

The report must include the following sections:

1. Introduction: Briefly describe the Traveling Salesman Problem and its significance.
2. Branch-and-Price Approach: Explain the concept of branch-and-price and its application in solving the TSP.
3. Implementation: Describe the implementation of the branch-and-price approach in C++ with IBM CPLEX.
4. Solution Process: Explain the process of solving the TSP model with branch-and-price and validating the solution.
5. Results: Present the results obtained using tables, graphs, and visualizations for at least 100 different TSP instances.
6. Conclusion: Summarize the key findings and insights from the assignment.
7. References: Include any references used in the assignment.

Note that the report should be well-structured, clearly written, and properly formatted. The source code should be well-documented and organized for easy understanding. Late submissions will not be accepted.