CS-1002 Programming Fundamentals Spring - 2023

[Assignment – 04] **Section (A,B,J)** **[Total Marks 100]**

FAST university wants to launch **bus transportation service** for students and faculty. The fleet of buses will travel across Islamabad city, and FAST requires a system to track the fuel consumption and distance traveled by each bus per month.
To fulfill this requirement, a **C++ program** needs to be developed that takes daily fuel consumption and distance traveled data for each bus and stores it in a multi-dimensional array. The program should provide a menu of options to the fleet manager for the following tasks:

1. Finding the **total fuel consumption** and **distance** traveled for each bus.
2. Finding the **average fuel efficiency** for each bus and **display** its details.
3. Finding the bus with the **highest fuel efficiency** and **display** its details.
4. Calculating the **total fuel cost for each bus** and the **average speed** for each bus.
5. Calculate the **total fuel consumption and distance** traveled for all buses in a given month.
6. Calculate the **total revenue** generated by the bus transportation service for a given month, based on the number of passengers (assume) and the fare charged per passenger (assume).
7. Find the bus with the **lowest fuel efficiency** and **display** its details.
8. **Sort** the data based on certain criteria, such as sorting by bus number or fuel efficiency.

Each of these tasks should be implemented as a **separate function** that takes the **multi-dimensional array** as input and returns the desired output. The main function should call these functions based on the **MANAGER'S MENU CHOICE** and display the results.

Also implements,

9. **Error handling**: The program should be able to handle invalid user inputs, such as non-numeric values, negative numbers, and out-of-range values. Ensure that the program does not crash if the user inputs incorrect data. For example, the program could ask the user to re-enter data if they enter a negative fuel consumption value.
10. **Data validation:** The program should ensure that the fuel consumption and distance traveled values entered by the user are within a reasonable range. For example, the fuel consumption should not be greater than the fuel tank capacity (assume), and the distance traveled should not be greater than the maximum distance a bus can travel on a full tank.
11. **User Authentication:** Add user authentication to restrict access to the program to authorized personnel (Fleet Manager) only. This would help prevent unauthorized access and ensure the security of the data.
12. **User-friendly interface:** The program should have a simple and intuitive interface that is easy for the fleet manager to use, even if they have little technical expertise.
13. **Console** background color and text color change functionality.
14. **Menu** should be center aligned to screen.
15. **Loading** screen should be provided for each screen, or function. Like processing bar, loading bar, or working bar with percentage.

For example, the program could have the following functions:

1. **readData:** Reads in n daily fuel consumption and distance traveled figures for each bus from the user and stores them in the multi-dimensional array data.
2. **totalFuelConsumption**: Returns the total fuel consumption for the n days and the given bus number.
3. **totalDistanceTraveled**: Returns the total distance traveled for the n days and the given bus number.
4. **minFuelEfficiency**: Returns the bus number with the lowest fuel efficiency.
5. **avgFuelEfficiency**: Returns the average fuel efficiency for the given bus number.
6. **maxFuelEfficiency**: Returns the bus number with the highest fuel efficiency.
7. **totalFuelCos**t: Returns the total fuel cost for the n days and the given bus number, based on the fuel price per gallon.
8. **avgSpeed**: Returns the average speed for the given bus number, based on the time taken to travel the distance traveled.
9. **fleetSort**: Sort the data based on certain criteria, such as sorting by bus number or fuel efficiency.
10. **LoadingBar**: print loading bar.
11. **printData**: Prints out the fuel consumption and distance traveled figures for each bus for each day.

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Instructions.

[1] Submission Format:

- **[a]** You have to solve it on Microsoft Visual Studio. Write your name, roll number, on top program using proper comments. Submit only .cpp file of your program. Assignment_4_Rollnumber.cpp file.
- **[b]** For example (Assignment_4_22I-1234.cpp)

[2] Submit the **Assignment_4_22I-1234.cpp file** on Google Classroom within the deadline.

[3] Submission other than Google classroom (e.g. Email etc.) Will not be accepted.

[4] The student is solely responsible to check the final file for issues like corrupt file, virus in the file, mistakenly exe sent.

[5] If instructor cannot download the file from Google classroom due to any reason it will lead to zero marks in the assignment.

[6] Deadline to submit assignment is **7th May 2023 11:59 PM.**

[7] Assignment submitted after the deadline will be marked DIRECT ZERO.

[8] You are supposed to submit your assignment on **Google Classroom (Classroom Tab Only, Not Lab).**

[9] Correct and timely submission of the assignment is the responsibility of every student; hence no relaxation will be given to anyone.

[10] For timely completion of the assignment, start as early as possible.

[11] Plagiarism is not allowed. If found plagiarized, you will be awarded zero marks in all the assignments.

NOTE:

- **[a]** Consider the corner cases while programming. What if the user enters any number other than the menu ids, the program should end?
- **[b]** Display appropriate messages where needed. Keep in mind you have to make **software to assist the user**.
- **[c]** Display appropriate table with correct format and styling.