Problem Statements for the Period of 2nd December to 9th December, 2022

1. Playlist

Create a command line application that implements a Playlist data structure.
A playlist data structure receives a song as input and adds it to the playlist, to be played later. The application must support the following functionalities:

i. User can create multiple playlists
ii. User can give names to playlists
iii. User can print out all the playlists
iv. User can add a song to any of the playlists
v. User can perform “next” and “previous” operations on any of the playlists
vi. User can perform the “play “operation on any of the playlists. The result of the play operation is the name of the currently playing song being printed on the terminal
vii. User can seek the playlist by n songs at a time
viii. User can toggle the loop mode in any of the playlists? When the toggle mode is on, performing the next operation on the last song a playlist will result in the first song being played. When the toggle mode is disabled, the next operation on the last song will result in “No more songs to play” being printed on the screen

Note: You cannot use any standard library data structures like Vectors or Lists in the solution. You must implement a linked list as a part of the solution

2. Census

The government of Assam is planning to undertake a population census exercise this year. Field officers have been going from house to house, collecting data about the population demographics and they are now ready to tally their results. But before they do, they want to ensure that the application they use works correctly.

You have been tasked with creating a data aggregation application for the census.

Create a command line application using linked lists that allows:

1. Adding the demographic details of an individual to the application. Demographic information includes: Name, Religion, City, Age, Mother Tongue, Gross Annual Income, and Number of vehicles (two and four-wheelers) that the individual owns
2. Aggregating the overall data for any of the numeric fields and reporting statistics like average, total, min, and max.
3. Reporting the top k individuals in terms of the data in any of the numeric fields. e.g., Printing the 10 individuals with the highest Gross Annual Income

4. Perform aggregation by groups. e.g. Reporting the top k individuals with the highest Gross Annual Income who also speak the Assamese Language or the Oldest Christian Woman in the state

When the application starts up, seed it with randomly generated data for 10,000 individuals. For name, religion, city, and mother tongue you can create a static array with a finite number of elements and randomly pick one for the seeding phase. For generating data for discrete data like Income, age, or the number of vehicles owned make sure you use sensible ranges. e.g., Age should be between 0-122, Income between 10,000 and 1,000,000, etc.

Note:

1. You cannot use any standard library data structures like Vectors, Lists, or Priority queues in the solution. You cannot use any standard library implementations of sort, max, and min in the solution. You must implement a linked list as a part of the solution
2. You can use Maps/HashMaps to perform the grouping operations. Although, solving the problem without using Maps/HashMaps will earn you extra credit.

3. Sorted Linked List

Implement a Linked list that remains in sorted order regardless of the order of insertion. The sorted linked list has the following features:

i. You can initialize it with a sort direction, 1 or -1, where 1 denotes a strictly increasing sorting order and -1 denotes a strictly increasing sorting
ii. You can insert an item from the linked list
iii. You can remove an item with a particular value from the linked list
iv. If you encounter any duplicates you must increase the count field of a node to indicate the same
v. When deleting a node with a count greater than 1, then you must decrement the count by one. You should only delete an element from the list when the count becomes 0.

Note: You cannot use any standard library data structures like Vectors or Lists in the solution. You must implement a linked list as a part of the solution