Week 5 (Introduction to Concurrent Programming)

Instructions

1. Create a folder named `RollNumber_FirstName_LastName` (for example: `1101101_Alice_Bob`
2. Submit a compressed `.zip` file containing solutions to all problems along with the report.

Problem Statement

You are required to implement a C++ program with the following specifications:

1) Read **N** integers (where **N** is defined using `#define`) from a file and store them in a `vector`.
2) In the `main` function, create **M** threads (where **M** is defined using `#define`) using the `pthread` library.
3) Define a shared variable that indicates the current index of the vector (initially set to 0).
4) Implement a function (e.g., `insert`) that reads the element at the current index of the vector and inserts it into a singly linked list.
5) Use **M** threads to insert all elements of the vector into the linked list while preserving the original order.
6) Implement a **verifier function** to confirm that the sequence of elements in the linked list matches the sequence in the vector.
7) Conduct performance evaluation by generating plots under the following conditions:
   (a) Fix **N = 10,00,000** and vary **M** from 1 up to the number of cores on your system.
   (b) Fix **M = 4** and vary **N** over the set $\{10, 100, 1{,}000, 10{,}000, 1{,}00{,}000\}$.

Report Requirements

The report must include:

- The generated plots for both cases.
- A detailed discussion of the observed performance trends.
- An explanation of the underlying reasons for the results obtained.