Lab Task

Question 1.

Suppose there is a game known as “MATCH THE TABLES”, in which the player picks up two tables(each having 5 rows and 5 columns) and matches them. If all entries match, then the tables are said to be identical and the player is declared the winner. Implement this in C++ using template.

Prototype: bool matchTables(const T table1[rows][cols], const T table2[rows][cols]);

Question 2.

Implement a C++ program using template to analyze the performance of cricket players based on their recent match statistics. Use the data to select the top 10 players for the next match based on their performance.

Dataset Description:

You have performance data for 12 cricket players over their recent 10 matches. Each player's performance is recorded as runs scored in each match. You will store this data in a 2D array where each row corresponds to a player, and each column corresponds to the runs scored in a specific match.

Tasks:

1. **Input Data:**
    - Create a 2D array to store the runs scored by 12 players over 10 matches.
    - Prompt the user to input the runs scored by each player in each match.
2. **Compute Statistics:**
    - **Total Runs per Player:** Calculate the total runs scored by each player across all 10 matches.
    - **Average Runs per Match per Player:** Calculate the average runs scored by each player per match.
    - **Best 10 Players:** Select the top 10 players based on their total runs scored across all matches.
3. **Output Data:**
    - Display the total runs and average runs per match for each player.
    - Print the list of the top 10 players based on their total runs scored, sorted in descending order.

Prototype:

T **inputPlayerData**(T runs[][numMatches], int numPlayers);

T **computeStatistics**(const T runs[][numMatches], int numPlayers, T totalRuns[], T avgRuns[]);

T **sortPlayersByTotalRuns**(T totalRuns[], int playerIndices[], int numPlayers);

T **printTop10Players**(const T totalRuns[], const int playerIndices[], int numPlayers);

Question 3.

Develop a program that takes three students' semester GPAs as inputs using a two-dimensional array and computes their CGPAs then finds the student with the lowest CGPA using the template.

Example:

double gpaArray[3][3] = { {3.5, 3.7, 3.9},

{3.2, 3.3, 3.1},

{3.8, 3.6, 3.9} };

Output:

Student 1 CGPA: 3.7

Student 2 CGPA: 3.2

Student 3 CGPA: 3.76667

Student with the lowest CGPA is Student 2 with CGPA: 3.2

Prototype: T computeCGPAsAndFindLowest(const T gpaArray[][numSemesters], int numStudents);

Question 4.

Write a C++ program using template to traverse a 2D matrix in a spiral order and return the result as a single array. You should handle matrices of arbitrary sizes.

Example:

Given the matrix:

$$Array = \begin{bmatrix} 1 & 4 & 7 & 10 \\ 2 & 5 & 8 & 11 \\ 3 & 6 & 9 & 12 \end{bmatrix}$$

The output should be:

$$Result = [1 \quad 4 \quad 7 \quad 10 \quad 11 \quad 12 \quad 9 \quad 6 \quad 3 \quad 2 \quad 5 \quad 8]$$

Prototype: T* spiralOrder(const T matrix[rows][cols], int& size)