ASSIGNMENT 3

PROGRAMMING TECHNIQUE 1 (SECJ1013)

SECTION 04, SEM 1 (2024/2025)

INSTRUCTIONS TO THE STUDENTS

- *This assignment must be done **in pairs**, except for students explicitly instructed to complete it individually.*
- *Please check your name in the **Assignment 2 & 3 Groups List**:*

- ***Program Requirements:***
  - ✓ *Your program must strictly follow the input and output formats as specified in the question and examples. Test your program thoroughly using the given input examples and other possible test cases.*
  - ✓ *Plagiarism is strictly prohibited. Students who copy or share their work will receive ZERO marks (both the one who copies and the one who shares).*
  - ✓ *Programs detected as being 100% generated by AI tools will also receive ZERO marks.*
  - ✓ *Include the following details in the comments section of your program:*
    - *Your name and your partner's name (if applicable)*
    - *Matric number(s)*
    - *Date of completion of the assignment.*

SUBMISSION PROCEDURE

- *Submit the assignment **before Thursday, January 23, 2025, at 12:00 AM**.*
- *Only one submission per group is required, which includes two type of files: the source code (the file with the extension .cpp) and the input files (the files with the extension .txt).*
- *Submit your assignment via the UTM e-learning system.*
- *Your submission will be evaluated based on correctness, clarity, formatting, and adherence to the requirements.*

QUESTION

The Tourism Department of Malaysia tracks revenue and visitor data for popular tourist destinations across the country. Each destination is identified by a unique code (e.g., LGH101 for Langkawi Geopark, GNT202 for Genting Highlands). Monthly data on visitor count, ticket revenue, and expenditure on maintenance is recorded. Your task is to create a system that analyzes the data and generates detailed reports for each destination. This assignment assesses your understanding of arrays, functions, control structures, file operations, output formatting, and structured data. You are required to write a complete C++ program to address the problem. The program must perform the following tasks:

Task 1: Define a Structured Data Type

Define a structure to store the following data for each destination:

(a) Destination code.
(b) Destination name.
(c) State.

(d) Monthly data: Visitor count (January to December), Ticket revenue (RM) (January to December), and Maintenance cost (RM) (January to December).
(e) Annual totals (calculated later for visitor count, revenue, and maintenance cost).

Task 2: Read and Validate Input Files

Write a function that:

(a) Checks if the following input files exist:
- destinations.txt: Contains destination codes, one per line.
- visitors.txt, revenue.txt, maintenance.txt: Contain monthly data for visitors, ticket revenue, and maintenance cost, respectively.

(b) Verifies that all files have the same number of lines to ensure data consistency.
(c) Terminates the program with an appropriate error message if any file is missing or inconsistent.
(d) Read data from the input files and store it in an array of Tourist Destination structures.
(e) Dynamically determine the number of tourist destinations based on the number of lines in the files.
(f) Figure 1 shows an example of data in the input files.

```
LGH101  10000 12000 11000 15000 14000 13000 12500 13500 14500 14000 15000 15500
GNT202  8000  9000  8500  12000 11000 10500 10000 11500 12500 12000 13000 13500
MEL303  12000 13000 12500 14000 13500 12800 13000 14000 14500 14200 15000 15500
PEN404  11000 12500 12000 13000 12500 12200 11800 12800 13200 13000 13500 13800
KKF505  9000  10000 9500  11000 10500 10200 10000 11500 12000 11800 12500 13000
TDC606  8500  9500  9000  10500 10000 9800  9500  10800 11500 11200 12000 12500
KTR707  7000  8000  7500  9000  8500  8300  8100  9000  9500  9200  10000 10500
```

destinations.txt **visitors.txt**

```
100000 120000 110000 150000 140000 130000 125000 135000 145000 140000 150000 155000
80000  90000  85000  120000 110000 105000 100000 115000 125000 120000 130000 135000
120000 130000 125000 140000 135000 128000 130000 140000 145000 142000 150000 155000
110000 125000 120000 130000 125000 122000 118000 128000 132000 130000 135000 138000
90000  100000 95000  110000 105000 102000 100000 115000 120000 118000 125000 130000
85000  95000  90000  105000 100000 98000  95000  108000 115000 112000 120000 125000
70000  80000  75000  90000  85000 83000  81000  90000  95000  92000  100000 105000
```

revenue.txt

```
50000 60000 55000 70000 65000 63000 62000 67000 72000 71000 75000 77000
40000 45000 43000 60000 55000 53000 50000 58000 63000 61000 67000 69000
60000 65000 63000 70000 68000 65000 64000 69000 73000 72000 75000 77000
55000 62000 60000 65000 62000 61000 58000 64000 68000 67000 71000 73000
45000 50000 48000 55000 52000 51000 50000 57000 60000 59000 62000 64000
43000 48000 46000 52000 50000 49000 47000 54000 58000 56000 60000 62000
38000 42000 40000 45000 43000 42000 41000 45000 47000 46000 50000 52000
```

maintenance.txt

Figure 1: Sample data in the input files

Task 3: Determine Tourist Destination Details

Write a function that:

(a) Maps each destination code to its corresponding name and state using the table below:

Code Prefix	Destination Name	State
LGH	Langkawi Geopark	Kedah
GNT	Genting Highlands	Pahang
MEL	Melaka Historical City	Melaka
PEN	Penang Hill	Penang
KKF	Kinabalu National Park	Sabah
TDC	Tasik Chini	Pahang
KTR	Kuala Terengganu Beach	Terengganu

(b) Updates the array of Tourist Destination structures with the destination name and state.

Task 4: Perform Data Analysis

Write a function that:

(a) Computes the annual totals for visitor count, ticket revenue, and maintenance cost for each destination.

(b) Calculates the net revenue for each destination using the formula:

Net Revenue = Annual Ticket Revenue - Annual Maintenance Cost

(c) Computes the total visitors, revenue, and maintenance costs for each month across all destinations.

(d) Calculates the average revenue per visitor for each destination.

(e) Calculates the maintenance cost per visitor for each destination.

Task 5: Generate a Tourism Report

Write a function that:

(a) Displays the following data in a formatted table for each destination: Destination code, name, state, annual totals for visitors, revenue, maintenance costs, net revenue, average revenue per visitor, and maintenance cost per visitor.

(b) Displays the following summary statistics:

- The total visitor count across all destinations.
- The total ticket revenue across all destinations.
- The total maintenance costs across all destinations.
- The month with highest visitors and its value.
- The month with lowest visitors and its value.
- The destination with highest net revenue and its value.
- The destination with lowest net revenue and its value.

(c) Figure 2 provides an example of the output displayed on the screen, based on the data from the input files illustrated in Figure 1.

(d) Ensure the output is neatly formatted and easy to read.

```
-------------------------------------------------------------------------------------------------------------------
CODE    NAME                    STATE       VISITORS  REVENUE(RM)  MAINT COST(RM)  NET REV(RM)  AVG REV/VIS  MAINT/VIS(RM)
-------------------------------------------------------------------------------------------------------------------
LGH101  Langkawi Geopark        Kedah        160000     1600000        787000       813000        10.00         4.92
GNT202  Genting Highlands       Pahang       131500     1315000        664000       651000        10.00         5.05
MEL303  Melaka Historical City  Melaka       164000     1640000        821000       819000        10.00         5.01
PEN404  Penang Hill            Penang       151300     1513000        766000       747000        10.00         5.06
KKF505  Kinabalu National Park  Sabah        131000     1310000        653000       657000        10.00         4.98
TDC606  Tasik Chini            Pahang       124800     1248000        625000       623000        10.00         5.01
KTR707  Kuala Terengganu Beach  Terengganu   104600     1046000        531000       515000        10.00         5.08
-------------------------------------------------------------------------------------------------------------------
Total Visitors: 967200
Total Revenue: RM9672000.00
```

```
Total Maintenance Costs: RM4847000.00
Month with Highest Visitors: Month 12 (94300 visitors)
Month with Lowest Visitors : Month 1 (65500 visitors)
Destination with Highest Net Revenue: Melaka Historical City (Melaka)
Destination with Lowest Net Revenue : Kuala Terengganu Beach (Terengganu)
--------------------------------------------------------------------------------------------------------------------------------
```

Figure 2: Example of output

Additional Notes: Please include meaningful comments in your code for clarity.