## ASSIGNMENT 3
## PROGRAMMING TECHNIQUE 1 (SECJ1013)
## SECTION 08, SEM 1 (2024/2025)

**INSTRUCTIONS TO THE STUDENTS**

- *This assignment can be done **individually or in pairs** (you can choose your own partner).*
- *You only need to answer **ONE** question.*
- *Your program must follow the input and output as required in the text and shown in the examples. You must test the programs with (but not limited to) all the input given in the examples.*
- *Plagiarism in any form is **strictly forbidden**. Students who plagiarise the work of other students will receive **ZERO** marks (both parties, students who copied, and students that share their work).*
- *Please include your **name and partner's name (if applicable), matrics number, and date** in the comments section of your program.*

**SUBMISSION PROCEDURE**

- *Please submit this assignment before **January 13, 2024, Monday (12:00 MYT)**.*
- *Only **one submission per pair** (partner) is required, which includes two files: the source code (the file with the extension .cpp).*
- *Submit the assignment via the UTM's e-learning system.*

**QUESTION 1**

Ministry of Higher Education, Malaysia is required to prepare a report of the number of students' intake, enrolment, and output in public universities (2024). Write a complete C++ program to calculate the total and average number of students' intake, enrolment, and output in public universities for 2024 Then, find the highest and lowest number of students' intake, enrolment, and output. Finally, find the range of the number of students' intake, enrolment, and output. Write the program according to the following tasks:

Task 1: Write the definition of function getInput. The function must read inputs from an input file named "`input.txt`" consisting of the list of public universities in Malaysia along with its number of students' intake, enrolment, and output. The read data are then stored in arrays accordingly. **Figure 1** shows the input file of the program. ***Input Validation:*** You should ensure that the program will only continue reading the input file if it is successfully opened, otherwise print the error message and terminate the program.

Task 2: Write the definition of function `calTotal`. This function calculates the sum of elements of an array.

Task 3: Write the definition of function `getLowest`. The function finds the index with the lowest value in the array.

Task 4: Write the definition of function `getHighest`. The function finds the index with the highest value in the array.

Task 5: Using appropriate functions, read inputs from the input file and print it into the output file named "`output.txt`". *Note:* Use proper output formatting.

Task 6: Using appropriate functions, calculate the total and average of students' intake, enrolment, and output. Then, print it into the output file. *Note:* Use proper output formatting.

Task 7: Using appropriate functions, find the highest and lowest number of students' intake, enrolment, and output. Then, print it along with the name of the university into the output file. Finally, find the range of the number of students' intake, enrolment, and output. Then, print it into the output file.

Task 8: You should ensure the program is able to run and display the correct output in the output file.

**Figure 2** shows the output file of the program.

```
UM     8093 27452 6328
USM    7718 30853 6743
UKM    8109 27239 4765
UPM    8706 30670 7082
UTM    7328 31066 6997
UUM    7254 29143 6709
UIAM 10366 31526 5460
UniMAS 5578 16962 4579
UMS    5041 18531 4064
UPSI 5665 21587 11807
UiTM 65207 174755 38576
UMT 3346 10665 2317
USIM 3675 14781   893
UTHM 4847 16436   4362
UTeM 3148 12370   2428
UniMAP 4053 13769 2452
UMK   2291 9882 1062
UPNM 1341 3095 1308
```

**Figure 1:** Input file "`input1.txt`"

```
           NUMBER OF STUDENTS' INTAKE, ENROLMENT AND OUTPUT
                   IN PUBLIC UNIVERSITIES (2023)

    -------------------------------------------------------------
     UNIVERSITY          INTAKE        ENROLMENT         OUTPUT
    -------------------------------------------------------------
        UM                8093           27452            6328
        USM               7718           30853            6743
        UKM               8109           27239            4765
        UPM               8706           30670            7082
        UTM               7328           31066            6997
        UUM               7254           29143            6709
        UIAM             10366           31526            5460
        UniMAS            5578           16962            4579
        UMS               5041           18531            4064
        UPSI              5665           21587           11807
        UiTM             65207          174755           38576
        UMT               3346           10665            2317
        USIM              3675           14781             893
        UTHM              4847           16436            4362
        UTeM              3148           12370            2428
        UniMAP            4053           13769            2452
        UMK               2291            9882            1062
        UPNM              1341            3095            1308
    -------------------------------------------------------------
        TOTAL           161766          540638          117932
        AVERAGE         8987.00        28932.33         6551.78
    -------------------------------------------------------------
    THE LOWEST NUMBER OF STUDENTS' INTAKE    = 1341 (UPNM)
    THE LOWEST NUMBER OF STUDENTS' ENROLMENT = 3095 (UPNM)
    THE LOWEST NUMBER OF STUDENTS' OUTPUT    = 893 (USIM)

    THE HIGHEST NUMBER OF STUDENTS' INTAKE    = 65207 (UiTM)
    THE HIGHEST NUMBER OF STUDENTS' ENROLMENT = 174755 (UiTM)
    THE HIGHEST NUMBER OF STUDENTS' OUTPUT    = 38576 (UiTM)

    THE RANGE OF NUMBER OF STUDENTS' INTAKE    = 63866
    THE RANGE OF NUMBER OF STUDENTS' ENROLMENT = 171660
    THE RANGE OF NUMBER OF STUDENTS' OUTPUT    = 37683
    -------------------------------------------------------------
```

**Figure 2:** Output file "`output.txt`"