ASSIGNMENT 3

PROGRAMMING TECHNIQUE 1 (SECJ1013)

SEM 1 (2024/2025)

INSTRUCTIONS TO THE STUDENTS

- *This assignment can be done **individually or in pairs** (you can choose your own partner).*
- *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 plagiaries 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

- *Only **one submission per pair** (partner) is required, which includes two files: the source code (the file with the extension .cpp) and the input file (input_A3.txt).*
- *Archive both files in one .zip file and name the .zip file as 'A3'.*
- *Submit the assignment .zip file via the UTM's e-learning system.*

QUESTION

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 2023. 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_A3`**" consisting of the list of public universities in Malaysia along with its number of students' intake, enrolment, and output. The read data is 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. **Figure 2** shows the output file of 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.

```
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
UniSZA      3523 9947 2400
UMT   3346 10665 2317
USIM 3675 14781 893
UTHM 4847 16436 4362
UTeM 3148 12370 2428
UMP   2838 9909 2122
UniMAP      4053 13769 2452
UMK   2291 9882 1062
UPNM 1341 3095 1308
```

Figure 1: Input file "**`input_A3.txt`**"

NUMBER OF STUDENTS' INTAKE, ENROLMENT AND OUTPUT
IN PUBLIC UNIVERSITIES (2024)

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
UniSZA	3523	9947	2400
UMT	3346	10665	2317
USIM	3675	14781	893
UTHM	4847	16436	4362
UTeM	3148	12370	2428
UMP	2838	9909	2122
UniMAP	4053	13769	2452
UMK	2291	9882	1062
UPNM	1341	3095	1308
TOTAL	168127	540638	122454
AVERAGE	8406.35	27031.90	6122.70

```
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`**"