CONFIDENTIAL

SCHOOL OF COMPUTING
Faculty of Engineering

UNIVERSITI TEKNOLOGI MALAYSIA

FINAL EXAMINATION SEMESTER I, 2018 / 2019

SUBJECT CODE	**: SCSJ 1013**
SUBJECT NAME	**: PROGRAMMING TECHNIQUE I (PAPER II)**
YEAR/COURSE	**: 1 (SCSJ / SCSV / SCSB / SCSR /SCSP)**
TIME	**: 2 HOURS**
DATE/DAY	**: 2nd JANUARY 2019 (WEDNESDAY)**
VENUES	**: MPK 1 – 10 (N28)**

INSTRUCTIONS TO THE STUDENTS:

- This test consists of **TWO** questions. You must answer all the questions.
- References to any resources by any means are strictly prohibited.
- You are given **TWO HOURS** to complete the test inclusive of the submission of your program.
- Both of your programs must follow the input and output as shown in the examples.

MATERIAL FOR THE TEST:

- You are provided with **TWO** source code files and **TWO** input files consists of:
  a) A source code file with errors (`FinalQ1.cpp`) and input file (`input.txt`) for **Question 1.**
  b) A template source code file (`FinalQ2.cpp`) and input file (`data.txt`) for **Question 2**.
- The provided program files should be used as the basis to answer this test.
- Download the files (compressed in ZIP file named `final_practical.zip`) via UTM's e-learning system**.**

SUBMISSION PROCEDURE:

- Only the source code files (*i.e.* the file with the extension **.cpp**) is required for the submission.
- Submit the source code via the **UTM's e-learning system**.

This question booklet consists of 6 pages inclusive of the cover page.

QUESTION 1 – ERROR DEBUGGING **(40 Marks)**

You are given a C++ program (**`FinalQ1.cpp`**) with errors (syntax errors and/ or logical errors, if any). The program using **pointer concept** is developed to calculate the total marks for three tests (Test 1, Test 2 and Test 3) and to determine the grades for 20 students. The student's information are stored in a dynamically allocated array named **`students`**. The program has two functions:

a) A non-value returning function named **`calc_totalMark()`** that calculate the total marks for each student. The function should apply the pointer of total marks and array of coursework marks as function parameters.
   Note: You must use **pointer arithmetic** to access the array for the function.
b) A value returning function named **`deter_grade()`** that determines and returns each student's grade.

Both functions should not display the output of the total marks and/ or grades. The task to display the output must be done in the **`main()`** function. You are required to debug the errors, compile and run the program. Read the data from the provided input text file named **`input.txt`**. The program should produce the output as in **Figure 1**.
Note: Please make sure that you have released the dynamic memory of **`students`** array.

```
1   //FinalQ1.cpp
2   #include <iostream>
3   #include <fstream>
4   #include <iomanip>
5   #define MAX = 20 //Number of students/ characters
6   using namespace std;
7
8   struct info
9   {
10    float course_marks[3]; //Marks for Test1, Test2 and Test3
11    float total_mark;      //Total mark for all tests
12    char grade;            //Grade
13    char name[MAX];        //Name
14  }
15
16  //Function to calculate total mark for all tests
17  void calc_totalMark (float *TM, float CW[])
18  {
19    TM = 0;
```

```
20
21    for (int i = 0; i < 3; i++)
22      TM += *CW; //Use pointer arithmetic to access array
23  }
24
25  //Function to determine the grades
26  void deter_grade (float TM)
27  {
28    if (TM >= 85)
29      return 'A';
30    else if (TM >= 70)
31      return 'B';
32    else if (TM >= 55)
33      return 'C';
34    else if (TM >= 40)
35      return 'D';
36    else
37      return 'E';
38  }
39
40  int main()
41  {
42    int i, j;
43    info *students; //Declare a pointer variable
44    fstream inp;
45
46    //Dynamic memory allocation for students array
47    students[MAX] = new info;
48
49    inp.open("input.txt", ios|in); //Open an input file
50
51    //Read data from text file
52    for (i = 0; i < MAX; i++)
53    {
54      for (j = 0; j < 3; j++)
55        inp >> students[i].course_marks;
56      inp.getline(students[i].name);
57    }
58
59    //Display output on the screen
60    cout << left << setw(26) << " NAME"
61         << setw(7) << "T1"
62         << setw(7) << "T2"
63         << setw(6) << "T3"
64         << setw(8) << "TOTAL"
65         << "GRADE" << endl;
66
67    for (i = 0; i < MAX; i++)
68    {
```

```
69      cout << setw(25) << students[i].name
70           << fixed << setprecision(1);
71      for (j = 0; j < 3; j++)
72        cout << setw(7) << students[i].course_marks;
73
74      //Call a function to calculate total marks
75      calc_totalMark(students[i].total_mark,
76      students[i].course_marks[]);
77
78      //Call a function to determine the grades
79      students[i].grade = deter_grade(students[i].total_mark);
80
81      cout << setw(10) << students[i].total_mark
82           << students[i].grade << endl;
83    }
84
85    //Free dynamic memory for students array
86    delete students[];
87
88    close(inp); //Close the input file
89    return 0;
90  }
```

NAME	T1	T2	T3	TOTAL	GRADE
Hafiz Ali Abdullah	25.5	20.1	30.8	76.4	B
Fatin Anis Abu	14.5	17.8	23.7	56.0	C
Ravindran Selva	20.8	25.6	32.6	79.0	B
Lee Wee Ting	25.8	25.4	34.7	85.9	A
Ahmad Dafi Hakim	10.7	14.6	11.8	37.1	E
Syafiq Hasbullah	27.8	23.5	32.8	84.1	B
Hartini Yaakob	23.9	19.7	27.9	71.5	B
Atiqah Salim	24.0	27.0	31.9	82.9	B
Zahid Amin Rashid	26.7	28.5	34.9	90.1	A
Wong Beng Hee	25.5	23.7	32.3	81.5	B
Hakim Rosli	19.4	24.6	28.6	72.6	B
Amin Hakimi Shafie	24.7	18.3	28.7	71.7	B
Raiqal Ahmad Hadi	19.4	16.5	23.3	59.2	C
Hamimah Hussin	24.6	23.4	27.5	75.5	B
Raudah Kamil	20.8	23.4	27.8	72.0	B
Hassan Hanifah	26.6	25.6	24.3	76.5	B
Shatilla Prabu	15.5	18.5	16.8	50.8	D
Rahman Rahim	29.7	25.6	32.6	87.9	A
Ng Ting Ting	23.7	25.9	28.5	78.1	B
Asri Haziq Talib	23.5	24.6	27.5	75.6	B

Figure 1: Sample output

QUESTION 2 – PROBLEM SOLVING **(60 Marks)**

The Malaysian Meteorological Department (MetMalaysia) is an agency under the Ministry of Energy, Science, Technology, Environment and Climate Change (MESTECC) which is responsible for providing various meteorological, climate and geophysical services to meet the needs of the nation in meteorological, climate and geophysical.

Assumed that you are a UTM practical student currently attached to this agency. You have been asked to write a C++ program to facilitate the agency to keep track the weather data for each month of a year. The program uses a structure below to store the weather data for a particular month:

- Total Rainfall
- Number of rain days per month
- High Temperature
- Low Temperature
- Month Name

There are four tasks already listed to complete the program. You are given a partial complete of C++ program (**`FinalQ2.cpp`**) and a data file (**`data.txt`**). Complete the source code according to the tasks given as follows;

TASK 1:

Read the weather data for each month from the provided input text file named **`data.txt`**. Calculate the average temperature for each month while reading the data file. ***Note:*** Please make sure that the program will only continue reading the file if it is successfully opened, otherwise print the error message and exit the program.

(16 marks)

TASK 2:

Calculate the total rainfall for the year, the average of monthly rainfall and the average temperature of the year.

(12 marks)

TASK 3:

Find the month with the highest and lowest temperatures for the year.

(12 marks)

TASK 4:

Print a weather report which contains all the results from Task 1, Task 2 and Task 3 to the screen as shown in **Figure 2**.

Note: Please use proper output formatting.

(20 marks)

```
Total Rainfall: 2165.90
Average Monthly Rain: 180.49
Highest Temperature: 32.30  (Month 4: April)
Lowest Temperature: 23.90  (Month 1: January)

Month      Rain   Rain days Hi TEMP Lo TEMP Avg TEMP
=========  ====== ========= ======= ======= ========
January    234.60 13        30.40   23.90   27.15
February   112.80 8         31.70   24.30   28.00
March      170.30 13        32.00   24.60   28.30
April      154.80 14        32.30   25.00   28.65
May        171.20 14        32.20   25.40   28.80
June       130.70 12        32.00   25.40   28.70
July       154.40 14        31.30   25.00   28.15
August     148.90 14        31.40   25.00   28.20
September  156.50 13        31.40   24.80   28.10
October    154.60 15        31.70   24.70   28.20
November   258.50 18        31.10   24.30   27.70
December   318.60 18        30.20   24.00   27.10
```

Figure 2: Sample output