CONFIDENTIAL

UTM UNIVERSITI TEKNOLOGI MALAYSIA

SCHOOL OF COMPUTING
Faculty of Engineering

FINAL EXAMINATION
SEMESTER I, SESSION 2020/2021

PART II: PROGRAMMING

COURSE CODE : SECJ/SCSJ 1013
COURSE NAME : PROGRAMMING TECHNIQUE I
SECTION : 1 – 10 & 15
DATE/ DAY : 9 FEBRUARY 2021 (TUESDAY)
START : 11.30 AM

INSTRUCTIONS TO THE STUDENTS:

- Read the problem and instructions carefully.
- You are given **TWO HOUR FIFTEEN MINUTES** to complete the test inclusive of the submission of your program (**1 hour 45 minutes to answer** the question, **15 minutes to submit** the partial answer, and **15 minutes to submit** the final answer).
- Write your particular (**Name, Matrics_No, Section and Lecturer Name**) in your program as a comment.
- 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.
- A candidate who is suspected of cheating in examinations is liable to disciplinary action including (but not limited to) suspension or expulsion from the University. All materials and or devices which are found in violation of any examination rules and regulation will be confiscated.

IMPORTANT NOTES:

- All the **COMMENT STATEMENTS** in the submitted program **WILL NOT BE EVALUATED**.

SUBMISSION PROCEDURE:

- Only the source code is required for the submission and the source code's file shall be named as follows: ***Name_ matricsNo_section.cpp*** (i.e. *AinaAli_A20EC018_01.cpp*).
- You do not need to compress the file.
- Submit the source code file via the **UTM's e-learning system**.

Question [65 Marks]

Write a complete C++ program. The program uses various types of structured data developed to calculate the salary of each employee and the total salary to be paid for each department. The program should perform the following tasks:

Task 1: Declare a structure named **`Employee`**, with the following members: **(3 marks)**

a) Name
b) Department
c) Basic salary
d) Number of overtime hours worked in one month
e) Overtime pay
f) Total salary including overtime pay

Task 2: Write a function named **`readInput`**. **(14 marks)**

a) It receives an array of **`Employee`** of type **`struct`**.
b) The function should read data from the given input file named **`input.txt`**. The file contains employees' department, basic salary, number of overtime hours worked in one month, and name. **Figure 1** shows an example of data that can be used to test the program.
c) Assuming you do not know, the number of employees. Calculate the number of employees available in the company based on the number of employee records found in the input file.
d) The function should return the number of employees calculated in (c).

```
Production 2500 27 Salman Ali
Quality 1800 45 Hanif Haikal
Production 2000 53 Rashid Abu
Production 1800 58 Halim Hashim
Quality 2400 35 Hani Imran
Engineering 2300 27 Arina Hakim
Accounting 2500 36 Anuar Omar
Quality 1900 33 Zarith Zaid
Engineering 2350 52 Rania Hassan
Engineering 2250 44 Buhari Burhan
Quality 2250 38 Citra Shari
Accounting 2250 36 Amir Arshad
Accounting 2180 41 Daud Kasim
Engineering 2500 35 Sofian Saad
Accounting 2450 29 Alisa Azman
```

Figure 1: Sample data in the input file "**`input.txt`**"

Task 3: Write a function named **`determineRate`**. **(6 marks)**

a) It takes the department name as an input parameter.
b) The function should return an overtime rate based on the information given in **Table 1**.

Table 1

Department	Overtime Rate (RM per hour)
Quality	11.5
Production	10.0
Accounting	12.5
Engineering	15.0

Task 4: Write a function named **`displayOutput`**. **(11 marks)**

a) This is a non-returning function.

b) It takes an array of **`Employee`** of type **`struct`** and the number of employees calculated in Task 2 as input parameters.

c) The function should display employees' names, department, basic salary, number of overtime (OT) hours worked in one month, monthly overtime (OT) pay, and monthly salary. The formula for calculating monthly overtime (OT) pay and monthly salary is as follows:

Monthly overtime (OT) pay = Overtime rate × Number of overtime hours worked

Monthly salary = Monthly overtime pay + Basic salary

d) **Figure 2** shows an example of the output that will be displayed on the screen based on the data in the input file "**`input.txt`**" shown in **Figure 1**.

```
-------------------------------------------------------------------------
NAME                DEPARTMENT     BASIC(RM)   OT(HOUR)   OT PAY(RM)   SALARY(RM)
-------------------------------------------------------------------------
Salman Ali          Production      2500.00      27      270.00      2770.00
Hanif Haikal        Quality         1800.00      45      517.50      2317.50
Rashid Abu          Production      2000.00      53      530.00      2530.00
Halim Hashim        Production      1800.00      58      580.00      2380.00
Hani Imran          Quality         2400.00      35      402.50      2802.50
Arina Hakim         Engineering     2300.00      27      405.00      2705.00
Anuar Omar          Accounting      2500.00      36      450.00      2950.00
Zarith Zaid         Quality         1900.00      33      379.50      2279.50
Rania Hassan        Engineering     2350.00      52      780.00      3130.00
Buhari Burhan       Engineering     2250.00      44      660.00      2910.00
Citra Shari         Quality         2250.00      38      437.00      2687.00
Amir Arshad         Accounting      2250.00      36      450.00      2700.00
Daud Kasim          Accounting      2180.00      41      512.50      2692.50
Sofian Saad         Engineering     2500.00      35      525.00      3025.00
Alisa Azman         Accounting      2450.00      29      362.50      2812.50
-------------------------------------------------------------------------
```

Figure 2: Expected output for Task 4

Task 5: Write a function named **`displayAnalysis`**. **(17 marks)**

a) This is a non-returning function.

b) It takes an array of **`Employee`** of type **`struct`** and the number of employees calculated in Task 2 as input parameters.

c) The function should display departments' names, total monthly overtime (OT) pays, and total monthly salary.

d) **Figure 3** shows an example of the output that will be displayed on the screen based on the data in the input file "**`input.txt`**" shown in **Figure 1**.

```
------------------------------------------------------------------------
DEPARTMENT                TOT. OT PAY(RM)              TOT. SALARY(RM)
Production                   1380.00                      7680.00
Quality                      1736.50                     10086.50
Engineering                  2370.00                     11770.00
Accounting                   1775.00                     11155.00
------------------------------------------------------------------------
```

Figure 3: Expected output for Task 5

Task 6: Write a **`main`** function to perform the following tasks: **(5 marks)**

a) Declare one-dimensional array variable with 50 elements for a structure type **`Employee`**.

b) The function may need to call the functions that are defined in the previous task to produce the output as shown in **Figure 4**. ***Note:*** Please use proper output formatting.

c) **Figure 4** shows the complete output that will be displayed on the screen based on the data in the input file "**`input.txt`**" shown in **Figure 1**.

```
------------------------------------------------------------------------------
NAME              DEPARTMENT     BASIC(RM)  OT(HOUR)  OT PAY(RM)  SALARY(RM)
------------------------------------------------------------------------------
Salman Ali        Production      2500.00       27      270.00      2770.00
Hanif Haikal      Quality         1800.00       45      517.50      2317.50
Rashid Abu        Production      2000.00       53      530.00      2530.00
Halim Hashim      Production      1800.00       58      580.00      2380.00
Hani Imran        Quality         2400.00       35      402.50      2802.50
Arina Hakim       Engineering     2300.00       27      405.00      2705.00
Anuar Omar        Accounting      2500.00       36      450.00      2950.00
Zarith Zaid       Quality         1900.00       33      379.50      2279.50
Rania Hassan      Engineering     2350.00       52      780.00      3130.00
Buhari Burhan     Engineering     2250.00       44      660.00      2910.00
Citra Shari       Quality         2250.00       38      437.00      2687.00
Amir Arshad       Accounting      2250.00       36      450.00      2700.00
Daud Kasim        Accounting      2180.00       41      512.50      2692.50
Sofian Saad       Engineering     2500.00       35      525.00      3025.00
Alisa Azman       Accounting      2450.00       29      362.50      2812.50
------------------------------------------------------------------------------
DEPARTMENT                TOT. OT PAY(RM)              TOT. SALARY(RM)
Production                   1380.00                      7680.00
Quality                      1736.50                     10086.50
Engineering                  2370.00                     11770.00
Accounting                   1775.00                     11155.00
------------------------------------------------------------------------------
```

Figure 4: Complete output for the data from the input file "**`input.txt`**"

Task 7: List all function prototypes. **(4 marks)**

Task 8: You must ensure your program fulfill the following criteria: **(5 marks)**

a) The program is able to run.

b) All required header files are included.