CONFIDENTIAL

SCHOOL OF COMPUTING
Faculty of Engineering

UNIVERSITI TEKNOLOGI MALAYSIA

FINAL EXAMINATION

SEMESTER I 2019/ 2020

SUBJECT CODE	**: SECJ/ SCSJ 1013**
SUBJECT NAME	**: PROGRAMMING TECHNIQUE I**
YEAR/COURSE	**: 1 (SECJ/SECR/SECP/SECB/SECV/SCSJ/SCSR)**
TIME	**: 3 HOURS**
DATE	**: 5 JANUARY 2020**

INSTRUCTIONS TO THE STUDENTS:

This exam book consists of two (2) parts:

Part A :	5 Structured Questions	70 marks
Part B:	1 Programming Question	30 marks
	TOTAL	**100 MARKS**

ANSWER ALL THE QUESTIONS AND WRITE THE ANSWERS IN THE ANSWER BOOKLET.

Name	
Matric No.	
Section	
Lecturer's Name	

(This question booklet consists of 11 pages INCLUDING this page)

PART A - STRUCTURED QUESTIONS [70 MARKS]

Answer all the questions and write your answer in the answer booklet.

QUESTION 1 [10 MARKS]

a) Based on the outputs given in **Figure 1**, complete the **Program 1** with appropriate C++ output formatting, i.e. **`setw`**, **`setprecision`**, **`showpoint`**, and **`fixed`**. ***Note:*** one cell represents one space per digit. (7 marks)

Line	Outputs															
10	1	0	4	5	.	2	3		3	3	.	4	4	0	0	
11	1	.	3													
12	1	.	0	5	e	+	0	0	3							
14										1	.	2	5	6		
15				3	3	.	4	4	0							
16	1	0	4	5	.	2										

Figure 1: Outputs for Program 1

```
1   //Program 1
2   #include <iostream>
3   #include <iomanip>
4   using namespace std;
5
6   int main()
7   {
8     float a = 1045.234, b = 1.25551, c = 33.44;
9
10    cout << _____(i)_____ << a << " " << c << endl;
11    cout << _____(ii)____ << b << endl;
12    cout << _____(iii)___ << a << endl;
13
14    cout << _____(iv)____ << _____(v)_____ << b << endl;
15    cout << _____(vi)____ << c << endl;
16    cout << _____(vii)___ << a << endl;
17
18    return 0;
19  }
```

b) Based on the **Program 2** and inputs given in **Table 1**, write the output to be displayed for each of the corresponding codes in **Code 1**, **Code 2**, and **Code 3**. (3 marks)

```
1   //Program 2
2   #include <iostream>
3   #include <iomanip>
4   using namespace std;
5
6   int main()
7   {
8     char w[20];
9
10    cout << "Enter a string: ";
11    // either Code 1, Code 2 or Code 3
12    // will be placed here
13
14    return 0;
15  }
```

Table 1: Codes and inputs for Program 2

Codes	Inputs

`//Code 1`
`cin.getline(w, 10);`
`cout << w << endl;`
	`Final Exam PT1`

`//Code 2`
`cin >> setw(9) >> w;`
`cout << w << endl;`
	`Good Luck!`

`//Code 3`
`cin >> setw(5) >> w;`
`cout << w << endl;`
	`Programming`

QUESTION 2 **[10 MARKS]**

Given four functions named **`functionW`**, **`functionX`**, **`functionY`** and **`functionZ`**, in the **Program 3**. Write the output of the program.

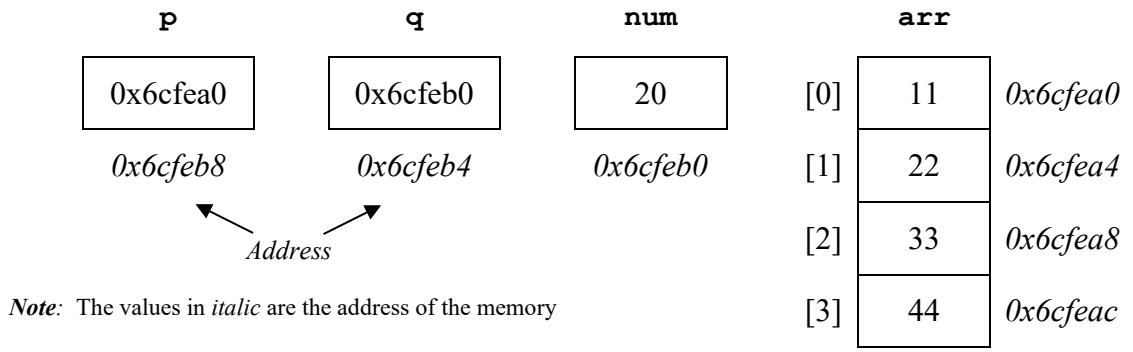
```
1   //Program 3
2   #include <iostream>
3   using namespace std;
4
5   void functionW(int &w1, int w2 = 10) {
6       w1 = w2;
7       w2 = w1 * w2;
8   }
9
```

```
10  int functionX (int x1 = 8, int x2 = 3) {
11      x1 = x2;
12      x2 = x1 * x2;
13      return x1;
14  }
15
16  void functionY(int y) {
17      y = 10;
18  }
19
20  void functionZ(int z []) {
21      z[0] += 10;
22  }
23
24  int main()
25  {
26      int n1 = 2, n2 = 5;
27      int nums [] = {1};
28
29      functionW(n2, n1);
30      cout << "n1 = " << n1 << endl;
31      cout << "n2 = " << n2 << endl;
32
33      functionW(n1);
34      cout << "n1 = " << n1 << endl;
35      cout << "n2 = " << n2 << endl;
36
37      functionX(n2, n1);
38      cout << "n1 = " << n1 << endl;
39      cout << "n2 = " << n2 << endl;
40
41      n1 = functionX();
42      cout << "n1 = " << n1 << endl;
43      cout << "n2 = " << n2 << endl;
44
45      functionY(nums[0]);
46      cout << "nums[0] = " << nums[0] << endl;
47
48      functionZ(nums);
49      cout << "nums[0] = " << nums[0] << endl;
50
51      return 0;
52  }
```

QUESTION 3 **[20 MARKS]**

a) Based on the **Program 4** and memory layout given in **Figure 2** below that utilizes pointers, write the output of the program. (8 marks)

```
1   //Program 4
2   #include <iostream>
3   using namespace std;
4
5   int main()
6   {
7       int *p, *q;
8       int num = 20;
9       int arr[] = {11, 22, 33, 44};
10
11      p = arr;
12      cout << p + 1 << endl;
13      cout << &p << endl;
14      cout << *(p + 3) << endl;
15      cout << arr << endl;
16      cout << ++(*p) << endl;
17
18      q = &num;
19      cout << *q << endl;
20      cout << &q << endl;
21      cout << q << endl;
22
23      return 0;
24  }
```



Note: The values in *italic* are the address of the memory

Figure 2: Memory layout

b) Based on the comments given (**bold** text) in the **Program 5**, complete the program with appropriate C++ statements. ***Note:*** You may need to write more than one C++ statements to answer some of the questions given in the comments. (12 marks)

```
1   //Program 5
2   #include <iostream>
3   using namespace std;
4   const int MAXNAME = 10;
5
6   int main()
7   {
8      int pos;
9      char *name = NULL;
10     int *one = NULL;
11     int *two = NULL;
12     int result;
13
14     //(i) Dynamically allocate memory to the integer pointer
15     //variables named one and two (2 marks)
16     ____________________________________________________________
17
18     //(ii) Dynamically allocate an array with size MAXNAME
19     //to the character pointer variable named name (2 marks)
20     ____________________________________________________________
21
22     cout << "Enter your last name with exactly 10 characters."
23          << endl;
24
25     for (pos = 0; pos < MAXNAME; pos++)
26        //(iii) Read a character using pointer from the keyboard
27        //and insert it into the name array (1.5 marks)
28        ____________________________________________________________
29
30     cout << endl << "Enter two integer numbers" << endl;
31
32     //(iv) Read two integer numbers using pointers
33     //from the user (1.5 marks)
34     ____________________________________________________________
35
36     //(v) Calculate the sum of the two numbers using pointers
37     //and store it in the variable named result (1.5 marks)
38     ____________________________________________________________
39
40     cout << "The sum of the three values is " << result
41          << endl;
42
43     //(vi) Free all dynamically allocated memory (3.5 marks)
44     ____________________________________________________________
45
46     return 0;
47  }
```

QUESTION 4 **[18 MARKS]**

a) Answer the following questions based on the **Program 6**:

```
1   //Program 6
2   #include <iostream>
3   using namespace std;
4
5   int main()
6   {
7      int i, j;
8      int a[3][4] = {32, 21, 43, 54, 32, 12, 1, 59, 38, 80};
9
10     for (i = 0; i < 3; i++)
11     {
12        for (j = 0; j < 4; j++)
13              cout << "a[" << i << "][" << j << "] = "
14                   << a[i][j] << "\t";
15        cout << "\n";
16     }
17     return 0;
18  }
```

i) If the values of **i** and **j** as in the **Table 2**, write the output to be displayed. (3 marks)

Table 2: Values of **i** and **j**

i	**j**
0	1
1	2
2	0
0	3
2	1
2	3

ii) What is total number of values for the second column? (1 mark)

iii) What is total number of values for the last row? (1 mark)

b) Based on the **Program 7**, trace the value of the variables and determine the output of the program. (6 marks)

```
1   //Program 7
2   #include <iostream>
3   #include <cmath>
4   using namespace std;
5
6   int main()
7   {
8     int numbers[3][2];
9
10    for (int i = 0; i < 3; ++i)
11       for (int j = 0; j < 2; ++j)
12            numbers[i][j] = pow((i + j), 2.0);
13
14    for (int i = 0; i < 3; ++i)
15    {
16       for (int j = 0; j < 2; ++j)
17           cout << numbers[i][j] * 5 << "\t";
18       cout << endl;
19    }
20
21    return 0;
22  }
```

c) Based on the comments given (**bold** text) in the **Program 8**, complete the program with appropriate C++ statements. ***Note:*** You may need to write more than one C++ statements to answer some of the questions given in the comments. (7 marks)

```
1   //Program 8
2   #include <iostream>
3   using namespace std;
4
5   int main()
6   {
7       int values[5];     //Array of five integers
8       int count;         //Loop counter
9       int smallest;      //To hold the smallest value
10
11      cout << "\nThis program will ask you to enter five "
12           << "\nvalues, then it will determine the smallest "
13           << "\nof the values you entered." << endl;
14
15      //(i) Get five integer values from the user
16      //using loop (2 marks)
17      _____________________________________________________
18
19      //(ii) Find the smallest value (4 marks)
20      _____________________________________________________
```

```
21
22      //(iii) Display the results (1 mark)
23      ____________________________________________________________
24
25      return 0;
26  }
```

QUESTION 5 **[12 MARKS]**

a) Write a C++ code segment to define a structure type named **`Student`**, with the following members: (4 marks)

`name`	: an array of characters
`weight`	: a float value
`height`	: a float value

b) Write a C++ statement(s) to define a global constant named **`NUM`** that equal to 5 (the number of students). (1 mark)

c) Write a C++ statement(s) to define a global array of structure type **`Student`** named **`stud`** with size **`NUM`**. (1 mark)

d) Define a function named **`getData`** to read five (5) students' data (**`name`**, **`weight`** and **`height`**) from user input and insert it into the array that defined in (c). The function will not have any return value or received any value from **`main()`** function. (6 marks)

PART B - PROGRAMMING QUESTION [30 MARKS]

Given the following incomplete C++ program (**Program 9**). The program using **array of structured data type** is developed to calculate the individuals' point in soccer and to determine the best player. Goals are worth two points and assists are worth one point. The players' information is stored in an array named **`stats`**. The program has a value returning function named **`calcPoints()`** that calculate the total point for each player and determine the best player. The function should use the array of players' information and the number of players as function parameters. Function prototype for this function already given in the program. The function should not display any output. The task to display the output must be done in the **`main()`** function.

You are required to complete the **Program 9** by defining the **`main()`** and **`calcPoints()`** function. Read the data from the input text file named **`input.txt`**.

Note:

i) 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. The example of data in the input file is shown in **Figure 3**.

ii) Let's assume that you don't know the number of data in the input file.

The program should produce the output as in **Figure 4**. Write your answer (ONLY **`main()`** and **`calcPoints()`** function definition) in the answer booklet. ***Note:*** Please use proper output formatting.

```
1   //Program 9
2   #include <iostream>
3   #include <fstream>
4   #include <cstdlib>
5   #include <iomanip>
6   #define SIZE 20     //Maximum number of players/ characters
7   using namespace std;
8
9   struct player
10  {
11     char name[SIZE]; //Player name
12     char team[SIZE]; //Player team
13     int goal;        //Number of goals
14     int assist;      //Number of assists
15     int point;       //Total point
16  };
17
18  //Function prototype
19  int calcPoints (player [], int); //Function to calculate
20                                   //players' point and to
21                                   //determine the best player
```

```
22
23  //Complete the program start from here
24
25
```

```
Bernardo Silva,Manchester City, 5 2
Youri Tielemans,Leicester City, 3 3
Sergio Aguero,Manchester City, 9 2
Sadio Mane,Liverpool, 7 2
James Maddison,Leicester City, 4 2
Raheem Sterling,Manchester City, 7 1
Marcus Rashford,Manchester United, 6 3
Jamie Vardy,Leicester City, 11 2
Mohamed Salah,Liverpool, 6 3
Christian Pulisic,Chelsea, 5 2
Daniel James,Manchester United, 3 2
Tammy Abraham,Chelsea, 10 2
Anthony Martial,Manchester United, 3 3
Mason Mount,Chelsea, 4 1
Roberto Firmino,Liverpool, 3 0
```

Figure 3: Data in the input file "***input.txt***"

```
:: LIST OF PLAYERS ::
Bernardo Silva      Manchester City       5    2    12
Youri Tielemans     Leicester City        3    3    9
Sergio Aguero       Manchester City       9    2    20
Sadio Mane          Liverpool             7    2    16
James Maddison      Leicester City        4    2    10
Raheem Sterling     Manchester City       7    1    15
Marcus Rashford     Manchester United     6    3    15
Jamie Vardy         Leicester City        11   2    24
Mohamed Salah       Liverpool             6    3    15
Christian Pulisic   Chelsea               5    2    12
Daniel James        Manchester United     3    2    8
Tammy Abraham       Chelsea               10   2    22
Anthony Martial     Manchester United     3    3    9
Mason Mount         Chelsea               4    1    9
Roberto Firmino     Liverpool             3    0    6

Best player: Jamie Vardy with 24 points from Leicester City
```

Figure 4: Sample output