UNIVERSITY OF SRI JAYEWARDENEPURA

B.Sc. (General) Degree First Year

First Semester Terminal Course Unit Examination – September 2023

CSC 107 2.0 Introduction to Computer Programming

Duration: Two (02) hours

Answer all questions.

Question 1 (25 marks)

(a) Explain why we need computer programs and computer programming languages.

[06 Marks]

(b) Compare and contrast compilers and interpreters.

[06 Marks]

(c) Write the outputs of the following C code segments.

i.
```
printf(" \they are \"sea\\n\\turtles\'");
```

[02 Marks]

ii.
```
int a = 5, b = 6, c = 11;
printf(" %d \n", a & c );
printf(" %d \n", b | c );
printf(" %d \n", a ^ c );
```

[03 Marks]

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iii.
```
int i = 3;
for ( ; i<100; i*=i)
     printf(" %d ", i);
```

[03 Marks]

iv.
```
int i=0, j=0;
for ( i=1; i<4; i++)
{
     for (j=0; j<(i/2); j++)
          printf(" %d ", j);
     for (j=(i/2)+1; j<=i; j++)
          printf(" %d ", j);
     printf("\n");
}
```

[05 Marks]

Question 2 (25 marks)

(a) Fibonacci sequence is defined as follows.

$$F_n = F_{n-1} + F_{n-2}$$

Where $F_0 = 1$ and $F_1 = 1$

Write a user-defined function named **fibN(int n)** to calculate and print up to n^{th} term **(F_0 to F_n)** in the Fibonacci sequence. You may use function recursions or loops where necessary.

[13 Marks]

(b) Write a user-defined function to find and return the second largest number in a given array. The function prototype is given below.

int find2ndMax(int numbers[], int size);

[12 Marks]

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Question 3 (25 marks)

(a) The following C code is supposed to find and return the maximum of a given integer array. However, it does not compile and shows **08 errors**. Apart from the compilation errors, there are **02 logical errors**. Identify both logical and syntax errors in the given code segment and **rewrite** the correct code. **Underline each correction clearly.**

```
int findMaxOfN(int, int)

int main()
{
      int a [] = {10, 34, 42, 65, 3, 5};
      int max;
      int n = sizeof(a)/ sizeof(max);
      findMaxOfN ( a[], &n );
      printf(" Max value in the array is %d ", max);
      return 0;
}

void findMaxOfN (int a[], int n);
{
      int max = 0;
      for ( ; 0<n; n--)
            if (max>a[n])
                  max = a[n];
      return max;
}
```

[10 Marks]

(b) The following C code segment is supposed to find and print whether the given angles represent a triangle or not. If they represent a triangle, it should display whether it is an equilateral triangle, an isosceles triangle, a right triangle, an isosceles right triangle or a normal triangle. It compiles without any error messages. However, it does not provide the intended output when running. Identify those errors and rewrite the correct codes (you should make **a minimum number of changes** to the given code to produce the intended output). **Underline each correction clearly**.

Note: if it is not a triangle, no other triangle types should be printed. Thus, no more conditions need to be checked. Moreover, if it is an equilateral triangle, it should not be considered as an isosceles triangle.

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```
conts int TRUE = 1, FALSE = 0;
int angleA=90, angleB=90, angleC=0;
int isATriangle, isAnEquilateralTriangle,
isAnIsoscelesTriangle, isARightTriangle,
isAnIsoscelesRightTriangle;

if((angleA < 0 && angleB < 0 && angleC < 0) &&
                        (angleA + angleB + angleC != 180))
      isATriangle = FALSE;
else
      isATriangle = TRUE;

if(angleA == angleB || angleB == angleC)
      isAnEquilateralTriangle = FALSE;
else
      isAnEquilateralTriangle = TRUE;

if(angleA == angleB && angleB == angleC && angleA == angleC)
      isAnIsoscelesTriangle = TRUE;
else
      isAnIsoscelesTriangle = FALSE;

if(angleA == 90 && angleB == 90 && angleC == 90)
      isARightTriangle = TRUE;
else
      isARightTriangle = FALSE;

if(isARightTriangle || isAnIsoscelesTriangle)
      isAnIsoscelesRightTriangle = FALSE;
else
      isAnIsoscelesRightTriangle = TRUE;

if(isATriangle != TRUE)
      printf(" It is no a Triangle ");

if(isAnEquilateralTriangle)
      printf(" It is an Equilateral Triangle ");

if(isAIsoscelesTrangle)
      printf(" It is an Isoscele Triangle ");

if(isARightTriangle)
      printf(" It is a Right Triangle ");

if(isAnIsoscelesRightTriangle)
      printf(" It is an Isoscele Right Triangle ");
```

[15 Marks]

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Question 4 (25 marks)

The Department of Metrology has 50 regional centers across the island. Each center has a unique ID number between 1 and 50. Usually, these centers collect four measures, namely temperature, humidity, rainfall, and wind speed daily and send them to the Department. The Department is supposed to produce the daily weather report and the summary report based on the above data. Moreover, the Department is expecting to extend its coverage to many regions and a few other measures in the near future. Thus, it is necessary to replace the current manual report generation process with an extensible computerized system.

Assumed that the Department has asked you to write a C program to automate the above functions including the report generation. Your program should be easily updated to handle any number of data centers. Moreover, your program should be modular enough to scale it in the future. Further, you need to demonstrate good programming practices in your program. It is **not necessary** to write a menu driven program. Furthermore, you may assume that your program is capable of reading and storing data for a single day only.

Steps

i. Declare suitable constants to represent the above four weather measures.

ii. Identify and declare suitable function prototypes for the above scenario.

iii. Declare suitable 2D array to store the above weather data.

iv. Implement the following user-defined functions.

- to read weather data
- to print the daily weather report
- to print the summary weather report.
- to find and return maximum temperature, minimum humidity, total rainfall, and the average wind speed.

v. Call the defined functions appropriately where necessary to accomplish the above tasks.

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```
Enter center ID                 : 21
Enter date (yyyy mm dd)         : 2023 08 25
Enter temperature (C)           : 28
Enter humidity (%)              : 65
Enter rainfall (ml)             : 50
Enter wind speed (km/h)         : 7

Do you want to add another (Y/N) ? : Y
```

Figure 1: **A sample of the input screen**

Daily Weather Report (25-08-2023)

Center ID	Tempurature (C)	Humidity (%)	Rainfall (ml)	Wind (km/h)
01	29	50	180	200
....	....	....	....	....
21	25	60	900	0
....	....	....	....	....

Figure 2: **A sample of the daily weather report**

Summary Weather Report

```
Maximum Tempurature (C)   :   34
Minimum Humidity (%)      :   26
Total Rainfall (ml)       :   3534
Average wind speed (km/h) :   4.28
```

Figure 3: **A sample of the summary weather report**

**** END OF PAPER ****

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