University of Ruhuna- Faculty of Technology

Bachelor of Engineering Technology Honours Degree

Level 1 (Semester II) Examination, November/December 2023(Academic Year 2021/2022)

Course Unit: TMS1223 Computer Programming Techniques (Theory) Duration: 2 hours

INSTRUCTIONS TO CANDIDATES:

- This paper contains **04 QUESTIONS** in **06 PAGES** including this sheet.
- **ANSWER ALL QUESTIONS.** All questions carry equal marks.
- This is a closed book examination.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- All Examinations are conducted under the rules and regulations of the University.

Q1.

a) State the two (02) differences between compiler and interpreter in computer programming.

(4 marks)

b) Discuss the difference between the **int** and **float** data types in terms of the values they can represent.

(2 marks)

c) Understand the following C program and answer the given questions.

```
#include <stdio.h>
int main() {
    int num1 = 5, num2 = 7, sum;
    sum = num1 + num2;
    // Output statement
    printf ("The sum of %d and %d is: %d\n", num1, num2, sum);
    return 0;
}
```

Code 1

i. Explain the purpose of variable declaration and initialization in the code and list the variables declared with their initial values.

ii. Discuss the significance of **comments** in the code and mention any comments you find.

iii. Mention the included header file and describe its purpose in the code.

iv. Explain the purpose of the **printf()** statement.

(8marks)

d) Write a C program that takes user input for the following information about a book:

Title (string)
Author (string)
Publication Year (integer)
Price (float)

The program should then display this information in an organized manner.

(11 marks)

Q2.

a) Write down **three (03)** main control structures used in C programming language.

(3 Marks)

b) Write down the output of the program given in ***code 2*** below.

```
#include<stdio.h>

int main () {
        int i =1;
        while (i <=5){
                printf ("%d  ", i*i);
                i++;
        }
        return 0;
}
```

Code 2

(4 marks)

c) Write a program that has the same output as the above program (***Code 2***) using a **for** loop instead of the while loop.

(5 marks)

d) Imagine you are creating a program for a vending machine that dispenses beverages. Write a C program that uses a **switch** case to allow the user to select a beverage based on the following menu:

- Coffee
- Tea
- Hot Chocolate

The program should ask the user to enter a number corresponding to their choice. Using a **switch** case, display a message indicating the selected beverage. If the user enters an invalid number, display an error message.

Sample output:

```
Select your beverage:
1. Coffee
2. Tea
3. Hot Chocolate

Enter the number of your choice: 2

You selected Tea.
```

Figure 1

(13 marks)

Q3.

a) Explain the primary purpose of pointers in C programming. (2 marks)

b) State **two (2)** advantages of using pointers in programming. (2 marks)

c) Analyze the following code ***(Code 3)*** and provide the expected output for each **printf** statement. If there are errors, correct them and provide the output of the modified code.

```
#include <stdio.h>
int main() {
   int a = 15, b = 30, *ptrA, *ptrB;
   ptrA = &a;
   *ptrB = b * 2;
   printf("%d is stored in location %u \n", a, &a);
   printf("%d is stored in location %u \n", *&a, &a);
   printf("%d is stored in location %u \n", *ptrA, ptrA);
   printf("%d is stored in location %u \n", *ptrB, &*ptrB);
   printf("%u is stored in location %u \n", ptrA, &ptrA);
   printf("%d is stored in location %u \n", *ptrB, &b);
   *ptrA = 45;
   printf("\nNow a = %d \n", a);
   return 0;
}
```

Code 3

Consider the memory addresses of a, b, ptrA and ptrB as follows.

Address of a: 4908

Address of b: 4904

Address of ptrA: 4900

Address of ptrB: 4896

(15 marks)

d) You are tasked with creating a program to store and display the temperatures of a week. Write a C program that does the following:

i. Declare an array named **temperatures** to store the temperatures of a week (7 days).

ii. Use a loop to input temperatures for each day of the week from the user.

iii. Display the temperatures for each day of the week using a loop.

(6 marks)

Q4.

a) Explain **two (2)** advantages of **sorting** with applications?

(2 marks)

b) Consider the following list of integers.

[4, 2, 7, 1, 3]

Apply the following algorithms to sort this list in ascending order. Clearly indicate the step-by-step breakdown of the algorithms applied to the given list.

i) Bubble sort

(ii) Insertion sort

(iii) Selection sort

(6 marks)

c) Write a program that includes functions to calculate the sum and product (multiplication) of two integers.

(8 marks)

d) Analyze the following code (***Code 4***) and provide the expected output for each **printf** statement.

```
#include <stdio.h>
int main() {
   int x = 5, y = 10;

  // Increment/Decrement Expressions (5 points)
   printf("a. %d\n", x++);
   printf("b. %d\n", --y);
   printf("c. %d\n", x--);
   printf("d. %d\n", ++y);

 // Combined Expressions (5 points)
   printf("e. %d\n", x++ * y);
   printf("f. %d\n", --y + x);

// Boolean Expressions (5 points)
   printf("g. %d\n", x > y || y == x);

 // Final Values (5 points)
   printf("Final x: %d\n", x);
   printf("Final y: %d\n", y);

   return 0;

}
```

Code 4

(9 marks)

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