# University of Ruhuna - Faculty of Technology

Bachelor of Information & Communication Technology Honours Degree
Level 1 (Semester I) Examination, June/July 2023
Academic Year 2021/2022
Course Unit: ICT1132 - Fundamentals of Computer Programming (Written)

Answer all four (04) questions                    Time Allowed: 2 hours

---

## IMPORTANT INSTRUCTIONS

- This paper contains **four (04)** questions on seven (07) pages.
- The medium of this examination is **English.**
- This is a **closed book** examination.
- Each question carries **equal 100** marks.

---

**Question 01**

a)

i) Briefly describe the relationship between Imperative programming, Structured programming and Procedural programming.

ii) There are **two (02)** main categories of data types in C. List them, giving **two (02)** examples per each category.

b) Write the outputs of the following C code segments.

i)
```c
#include <stdio.h>
int main()
{
  char arr[] = "ICTDegree";
  printf("%s", arr+3);
  return 0;
}
```

ii)
```c
#include<stdio.h>
void main()
{
  printf("%d\n", -15%2);
  printf("%4.3f\n", 1234.56);
  printf( "%.4s\n", "Hello World!" );
}
```

iii)
```
#include<stdio.h>
int main()
{
long int la=5l;
printf("%ld",la);
    return 0;
}
```

iv)
```
#include<stdio.h>
int fun(int);
int main()
{
    int i = fun(10);
    printf("%d\n", --i);
    return 0;
}
int fun(int i){
    return (i--);
}
```

c) Develop a C program to find the summation of the given series: $1/1^2 + 1/2^2 + 1/3^2 + ..... + 1/n^2$ using a **for loop**. Assume that "n" is the last term of the given series and "n" should be taken as a user input from the keyboard.

d) Write a C program to calculate the volume of a Cone. The radius (r) and height (h) values are taken from the keyboard. Formula to calculate the volume of Cone is given below.

$$\text{Volume of cone} = \pi r^2 \frac{h}{3}$$

Define $\pi$ as a constant ($\pi$=3.14) and use relevant library functions in C for the calculations. Output should be formatted to **two decimal** places.

**Question 02**

a)

i) Command line arguments are passed on to your program during the program execution. Briefly describe **two (02)** parameters which are passed into the main function of your program.

ii) What will be the output of the following program (example.c) if it is executed from the command line?

```
Input:
cmd> example Hello! Good Morning

#include<stdio.h>
int main(int argc, char *argv[])
{
    printf("%d %s", argc, argv[2]);
    return 0;
}
```

iii) Develop a C program to input an integer number as a command line argument and check whether the entered number is a prime number or not.
Note: Prime number is a number which is only divisible by itself and 1 and not divisible by any other number.

b) The simplest form of multidimensional array is the two-dimensional array (2D Array). "A", "B" and "C" are 2D arrays of size 3x3 and the contents of "A" and "B" are given below.

| 2 | 3 | 5 |
|---|---|---|
| 1 | 8 | 9 |
| 6 | 7 | 0 |

**A**

| 4 | 5 | 2 |
|---|---|---|
| 9 | 5 | 3 |
| 6 | 4 | 9 |

**B**

i) Write a C program to multiply the content of array "A" and "B" and store it in the array "C". Print the final values of array "C" as a matrix.

ii) Write a C program to get the summation of each row of array "C".

iii) Modify the above code in part (ii) to get the summation of the principal diagonal value of array "C".

# Question 03

a) Compare and contrast Structures and Unions in C according to the criteria given below.

    i)      Keyword
    ii)     Size
    iii)    Memory allocation
    iv)    Accessing members

b) Develop a C program for a bank to manage the account details of their customers. Assume that there are only five (05) customers and write the program according to the following instructions.

    i)      Create a structure called **Account** to store the following details related to a bank account of the customer.
            **Note:** You have to use "**typedef**" keyword to create the structure.

| | |
|---|---|
| Account Number | int |
| Account Type | char[] |
| Balance | double |
| Branch | char[] |

    ii)     Inside the main function, create Account type structure array variable called "**accList[]**".

    iii)    Create a function called "**store**" to store values into members of structure array, "accList[]". The function prototype and the sample values for one member of structure array are given below. You have to take the values for five (05) customers as user inputs through run-time keyboard.

            **void store(Account accList[]);**

            **Sample Values:**

| Account Number | Account Type | Balance | Branch |
|---|---|---|---|
| 1001 | Savings | 85000 | Colombo |

    iv)    Create a function called "**display**" to display the values of structure array of customers. The function prototype is given below.

            **void display(Account accList[]);**

    v)     Invoke the "**display**" function which is created in part (iv), inside the "**store**" function which is created in part (iii).

    vi)    Invoke the "**store**" function which is created in part (iii) inside the main function.

c)

    i)      Briefly state what is a recursive function?

    ii)     Write a C program to find the Greatest Common Divisor (GCD) of two positive integer numbers using a recursive function. The numbers should be taken as user inputs from the keyboard. The expected output of the program is given below.

        Expected Output:

```
Enter first positive integer: 12
Enter second positive integer: 8
GCD of 12 and 8 is 4.
```

## Question 04

a)

    i)      Distinguish **two (02)** differences between pointers and arrays in C.

    ii)     Predict the output of the following C program.

```c
#include <stdio.h>

void fun(int *ptr){
 *ptr = 30;
}

int main(){
        int y = 20;
        int *ptr, a = 10;
        ptr = &a;
        *ptr += 1;
        printf("%d\n", *ptr);
        printf("%d\n", a);
        fun(&y);
        printf("%d", y);
        return 0;
}
```

b) Examine the following C code segment which is used to create a simple calculator using pointers. Fill the blank lines from **Line A** to **Line K** of the program and the relevant details are given as comments.

```c
#include <stdio.h>
int main()
{
    float num1, num2;
    float *ptr1, *ptr2;
    float sum, diff, mult, div;

    _____  Line A    // ptr1 is a pointer to num1 variable.
    _____  Line B    // ptr2 is a pointer to num2 variable.

    printf("Enter any two real numbers: ");
    _____  Line C    // Read the user entered two numbers.

    // Perform arithmetic operations on two numbers.
    sum = _____      Line D  // Perform summation.
    diff = _____     Line E  // Perform subtraction.
    mult = _____     Line F  // Perform multiplication.
    div = _____      Line G  // Perform division.

    // Print the results.
    _____  Line H  // Summation with no fractions.
    _____  Line I  // Subtraction with two decimal points.
    _____  Line J  // Multiplication with two decimal points.
    _____  Line K  // Division with four decimal points.

    return 0;
}
```

c)

i) What do you mean by "Pass by Reference" in functions?

ii) Assume "a" is an integer variable and the value for "a" is taken as user input from the run-time keyboard. Write a separate function to calculate the cube of the variable "a" and invocate the above function within the main function of the program using "**Pass by reference**" method.

**Note:** The cube of a number is the multiplication of the number by itself three (03) times.

d)
   i)  fwrite() function writes specified number of equal-sized data items to an output file. List down **four (04)** parameters of this function.

   ii) The marks of "Computer Programming" subject of ten (10) students are given below within an integer array called "marks". Assume that all the marks are integer values. Develop a C program to store marks of students into a file called "StudentsMarks.txt".
   **Note:** You are allowed to use **only fwrite() function** for writing data into a file.

   int marks[10] = {97, 85, 25, 45, 68, 75, 37, 82, 54, 77};

--------------------------------- End of the Paper----------------------------