

360



# MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS  
2022/2023 ACADEMIC YEAR

First YEAR 1<sup>ST</sup> SEMESTER EXAMINATIONS

**BACHELOR OF SCIENCE IN**

**Computer Science, mathematics, physics, information technology, education technology**

**COURSE CODE: BCS 111 / BIT 112**

**COURSE TITLE: INTRODUCTION TO PROGRAMMING**

**DATE: 13/12/2022**

**TIME: 08:00-10:00PM**

:

---

## INSTRUCTIONS TO CANDIDATES

Answer Question **ONE (1)** and Any **OTHER 2** questions

Ensure your answers/ideas are clearly expressed

All your answers must be clearly numbered

Write in ink. Rough work can be done in pencil and will not be marked. Cross out any rough work. Calculators, phones, tablets, computers not allowed

TIME: 2 Hours 20 Minutes (20 minutes for reading and choosing questions)

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 07 Printed Pages. Please Turn Over. ►

1  
4

## QUESTION ONE: COMPULSORY QUESTION

[20 MARKS]

(a) Define the following terms as used in Computer programming. [4 Marks]

- (i) Program
- (ii) Function
- (iii) Constant
- (iv) Data type

(b) With illustration, explain what is a **runtime error** as used in Computer programming. [2 Marks]

(c) Write a function that returns **Least Common Multiple (LCM)** of two integers it receives as parameters [5 Marks]

(d) What would be the exact output of the code segment below. [2 Marks]

```
1  int a = 5;
2  float b = --a + 0.25 * 9 + a--;
3  printf("a = %d\t", a);
4  printf("b = %.1f", b);
```

(e) Declare and initialize with arbitrary values an array that can store programming marks of 5 students. [2 Marks]

(f) Consider the code below

```
1  int i = 0;
2  do{
3      if (i < 5 || (i > 5 && i % 2 == 0)){
4          printf("%d ", i);
5          //break;
6      }
7      i += 2;
8  }while(i <= 10);
9  }
```

(a) Rewrite the do... while loop in the code above as a for loop. [3 Marks]

(b) What would be the output of the code above. [2 Marks]

## QUESTION TWO

[20 MARKS]

- (a) The  $n^{\text{th}}$  number in the Tribonacci sequence is given by

$$F_n = F_{n-1} + F_{n-2} + F_{n-3} \quad \text{for} \quad F_0 = 0 \quad F_1 = 1 \quad \text{and} \quad F_2 = 1$$

write a C program that will receive an integer  $n$  from the user and display the first  $n$  Tribonacci numbers. [4 Marks]

- (b) With illustration, explain what is a dangling else as used in a C programming language. [2 Marks]

- (c) With illustrations, highlight **TWO** types of comments used by C programmers. [4 Marks]

- (d) With illustration, explain what is a **syntax error** as used in Computer programming. [2 Marks]

- (e) Using a while loops, write a code excerpt that will give the output below. [6 Marks]

```
*
 *
  *
   *
    *
     *
```

- (f) What is a compiler as used in computer programming. [2 Marks]

## QUESTION THREE

[20 MARKS]

- (a) In a neural network, a sigmoid activation function is defined as

$$f(x) = \frac{1}{1 + e^{-x}}$$

where  $e$  is a mathematical constant whose value is **2.7128**. Write a function that receives a value  $x$  calculates and returns the output of the sigmoid function.

*Hint: Use `pow(x, y)` function of the `math.h` library.* [4 Marks]

- (b) The **Greatest Common Divisor(GCD)** of two numbers is a number less of equal to the minimum number in the set, and can divide the two numbers without getting a remainder

- (i) Write definition of a function **minimum** that returns the minimum number between the two integers it receives as parameters. [4 Marks]

- (ii) Write the function `gcd` that returns the GCD of two integers it receives as parameters. Re-use the function defined in (i) above. [4 Marks]
- (iii) Write the main function, prompt the user to enter two integers, call the `gcd` function defined in (ii) to calculate the GCD and display the results. Your program output should match sample format shown below. [4 Marks]

Example Output - User input underlined

```

Enter First Number : 12
Enter Second Number: 15
-----
GCD of 12 and 15 = 3
-----

```

- (c) Write a recursive function that calculates and return factorial of non-negative integer it receives as a parameter. [4 Marks]

#### QUESTION FOUR

[20 MARKS]

- (a) Distance  $d$  between two points  $P_1(x_1, y_1)$  and  $P_2(x_2, y_2)$  in a 2D space is given by

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

using `sqrt(x)` function of `math.h` library, write a program that will read radius of a circle from the keyboard as an integer, the `x` and `y` coordinates of the centre of a circle and `x` and `y` coordinates of a point and determine if the point is within a circle or outside the circle. [10 Marks]

- (b) What would be the output of the code below. Explain.

```

1 #include <stdio.h>
2 int main()
3 {
4     int a = 10;
5     for( ; a > 5 ; )
6         a -= 1;
7     printf("%d\t", a);
8 }
```

[2 Marks]

- (c) The value of  $\pi$  can be approximated as

$$\pi = \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{2n - 1}$$

using a while loop, write a program that can estimate  $\pi$  using the series above where  $n$  is the number of times the estimation is improved [5 Marks]

(d) State **FOUR** rules that variable names must observe. [4 Marks]