



**ZIMBABWE EZEKIEL GUTI UNIVERSITY**  
**FACULTY OF HEALTH, SCIENCE AND TECHNOLOGY**

**DEPARTMENT OF DIGITAL TECHNOLOGY**

**EXAMINATION PAPER**

**COURSE CODE** : CDT 105  
**COURSE TITLE** : Design and Analysis of Algorithms  
**SPECIAL REQUIREMENTS** : None  
**DURATION** : 3 Hours  
**LEVEL** : 1.2  
**DATE** : March 2021

**INSTRUCTIONS TO CANDIDATES:**

1. Answer **ALL** Questions in Section A.
2. Answer any **TWO** Questions from Section B.
3. The algorithms should be done using pseudo code.
4. The marks allocation for each question is indicated in **BOLD** font.

**Section A: Answer ALL questions [50 Marks]**

**Question 1**

- a. Define the term Algorithm. [4marks]
- b. Explain the components of a Greedy Algorithm [5 marks]
- c. Explain the two major components that are used to analyse an algorithm. [6 marks]
- d. Distinguish an algorithm from a program. [10 marks]

**Question 2**

- a) Explain the following as being used in design and analysis of algorithms
  - i. Algorithm [2marks]
  - ii. Time complexity [4 marks]
  - iii. Space complexity [4 marks]
  - iv. Worst case analysis [5 marks]
  - v. Best case analysis [5 marks]
  - vi. Average case analysis [5 marks]

**Section B: Answer ANY TWO questions in this section. All Algorithms to be written in Pseudo Code [50 Marks]**

**Question 3**

The Floyd algorithm is regarded as a dynamic programming. Illustrate the algorithm on the following description.

Samanyika, a level 1.2 student doing Digital Technology program is staying at ZEGU campus. He has been tasked by the University's director of ICT to determine the shortest distances that can be applied on the campus wide computer network linking various buildings as follows:

Bindura Hall to Computer Lab	115m
Library to Bindura Hall	65m
Computer Lab to the Security Office (at gate)	45m
Bindura Hall to Security Office (at gate)	123m

**Question4**

Write an algorithm in Pseudo code or Java or C++ that sorts this list: **3,6,1,9,7,3,5,10** using:

- (a) Merge sort. [5 marks]
- (b) Quick sort. [5 marks]
- (c) Bubble sort. [5 marks]
- (d) Insertion sort. [5 marks]

Note: Correct syntax, main method, reference variables and output will be awarded. [5 marks]

**Question 5**

(a) Write an algorithm that searches for 10 in the list **9,8,7,11,5,3,1,13,10,14** using each of the following algorithms.

- (i) Binary search [10 marks]
- (ii) Sequential search [10 marks]

(b) Given a  $n \times n$  matrix multiplying another  $n \times n$  matrix. What is the number of multiplications needed to multiply the two matrices? Using the divide and conquer approach illustrate the idea of Strassen for matrix multiplication algorithm and give the complexity.

[5 marks]

\*\*\*\*\*End of Paper\*\*\*\*\*