THARAKA   **UNIVERSITY**

COLLEGE
(A Constituent College of Chuka University)

UNIVERSITY EXAMINATIONS

SECOND YEAR EXAMINATION FOR THE AWARD OF
DIPLOMA IN COMPUTER SCIENCE

COSC 0243: DATA STRUCTURES AND ALGORITHMS

STREAMS: DIP (COMP SCI)   **TIME: 2 HOURS**

DAY/DATE: TUESDAY 14/04/2020   **8.30 AM – 10.30 AM**

INSTRUCTIONS:

- Answer question **ONE** and **TWO** other questions
- Do not write anything on the question paper
- This is a **closed book exam**, No reference materials are allowed in the examination room
- There will be **NO** use of mobile phones or any other unauthorized materials
- Write your answers legibly and use your time wisely.
- Marks are awarded for clear and concise answers.

SECTION A

QUESTION ONE (30MKS)

a. Define the following concepts in data structures and algorithms   (6mks)
   i.   Data structure
   ii. Data item
   iii. Elementary item

b. Differentiate between compilation time and run time of an algorithm   (4mks)

c. State any four application areas of data structures   (4mks)

d. List three types of trees   (3mks)

    e. Discuss any four characteristics of a good algorithm   (8mks)

    f. Define complexity of an algorithm and explain two aspects the algorithm complexity
                                   (5mks)

SECTION B (Answer any two questions from this section)

QUESTION TWO (20MKS)

    a. Differentiate between a field and a record in data structures   (2mks)

    b. Using an example to add two numbers and display the result, show the steps of creating
        an algorithm   (7mks)

    c. Distinguish between **linear** and **non-linear** data structures   (4mks)

    d. With an aid of a diagram, explain the parts of a binary tree   (7mks)

QUESTION THREE (20MKS)

    a. Define the following terms   (6mks)
        i.   Sparse matrix
       ii.   Record
      iii.   File

    b. Highlight two ways of analyzing an algorithm to determine its efficiency   (4mks)

    c. State and explain briefly any three searching techniques   (6mks)

    d. Write the postfix form of the following expression: (A+B) *(C-D)   (2mks)

    e. Differentiate between stack and queue data structures   (2mks)

QUESTION FOUR (20MKS)

    a. State two basic operations on stack   (2mks)

    b. Define a queue data structure   (2mks)

    c. Distinguish between enqueue and dequeue operations in a queue   (4mks)

d. Define what a binary search tree (BST) is and explain five basic operations of a tree
(12mks)

QUESTION FIVE (20MKS)

a. What is Sorting? provide two examples   (3mks)

b. Given the following set of data: 68,75,47 and 55, illustrate how you would sort the data using:
   i.   Bubble sort   (5mks)
   ii. Merge sort   (5mks)

c. Define the term array and explain any three operations that can be performed on an array
(7mks)