



## **UNIVERSITY EXAMINATIONS**

**THIRD YEAR EXAMINATION FOR THE AWARD OF THE DEGREE OF  
BACHELOR OF SCIENCE IN BIOMETRY AND INFORMATICS/**

**MATHEMATICS WITH COMPUTING**

**FIRST SEMESTER 2022/2023**

**[SEPTEMBER-DECEMBER, 2022]**

**COMP 301: DATA STRUCTURES**

**STREAM: Y3S1**

**TIME: 2 HOURS**

**DAY: TUESDAY, 12:00 – 2:00 PM**

**DATE: 06/12/2022**

---

### **INSTRUCTIONS**

- 1. Do not write anything on this question paper.***
- 2. Answer question ONE and any other TWO questions.***

### **QUESTION ONE (30MARKS)**

- (a) Define the terms as used in Data structures. [4marks]
- Array
  - Elementary items
  - Queue
  - Entity set
- b) Clearly elaborate on the execution time cases of data structures. [3marks]
- c) Distinguish between a stack and queue data structure. [4 marks]
- d) Discuss any three characteristics of data structure. [3 marks]
- e) Explain the TWO stack operations namely Pop and Push. [4 marks]
- f) Discuss the measures used to determine the efficiency of an algorithm. [3 marks]
- g) Discuss the following algorithmic approaches. (9 marks)
- Divide and conquer

ii) Dynamic programming

iii) Greedy algorithms

### QUESTION TWO (20MARKS)

a) A good programmer must be able to conceptualize a problem. This he can put down as an algorithm. Algorithm can be expressed in terms of pseudo code or flowcharts.

i) List any four properties of an algorithm (4 marks)

ii) Why is analysis of algorithms important (2 marks?)

iii) What is the difference between a recursion and iteration in program development? Use a high level language examples to make your point clear. (6 marks)

b) (i) What does one require when implementing an ATD? (4marks)

(ii) Differentiate between static and dynamic memory allocation. (4marks)

### QUESTION THREE (20MARKS)

a) Searching algorithms are used to read a particular record from a collection of records, write algorithms to demonstrate the following searching techniques;

i) Selection sort algorithm (4 marks)

ii) Bubble sort (4 marks)

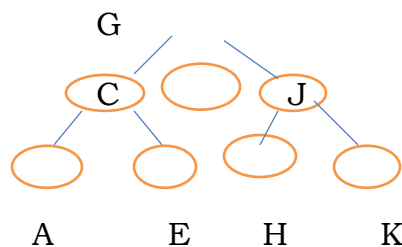
iii) State the most efficient of the two algorithms, justify your answer. (2 marks)

b) List and explain any four properties of a good programming language. (8marks)

c) Explain the divide and conquer sorting algorithm. (2marks)

### QUESTION FOUR (20MARKS)

(a) Give the output of the following binary three traversal; [12 marks]



(i) Pre order

(ii) Post order

(iii) In order

(b) Explain the insertion in a stack data structure. [8 marks]