

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

**SECOND YEAR EXAMINATION FOR THE AWARD OF DIPLOMA IN
COMPUTER SCIENCE**

COSC 0243: DATA STRUCTURES AND ANALYSIS OF ALGORITHM

STREAMS: DIP. COMP. SCI Y2S2

TIME: 2 HOURS

DAY/DATE: THURSDAY 25/03/2021

8.30 A.M. – 10.30 A.M

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.

SECTION A

Question one (30 marks)

a. Define the Following Terms:

- i. Data Structure (2 marks)
- ii. Algorithm (2 marks)
- iii. Stack (2 marks)

b. Differentiate cycle, path, and circuit in Graph data structures (6 marks)

c. Define an array of pointer and explain with a relevant example (6 marks)

d. Define a Linked Lists and Implement it as a self-referential structure (4 marks)

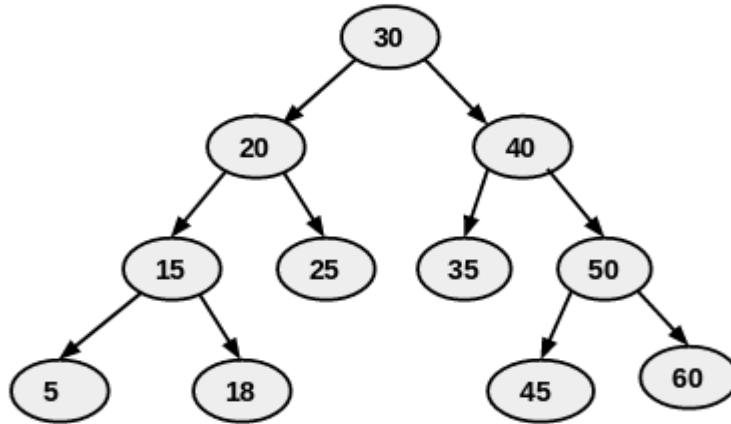
e. With an appropriate example, explain a sparse matrix (4 marks)

f. Distinguish a file structure from a storage structure (4 marks)

SECTION B (ANSWER TWO QUESTIONS ONLY)

QUESTION TWO (20 MARKS)

- a. List and Explain the FOUR Common orders of growth in Big “O” Notation (8 marks)
- b. List the nodes of the tree below in preorder, postorder, and breadth-first/in-order (12 Marks)



QUESTION THREE (20 MARKS)

- a. The keys 12, 18, 13, 2, 3, 23, 5 and 15 are inserted into an initially empty hash table of length 10 using open addressing with hash function $h(k) = k \text{ mod } 10$ and linear probing
 - i. Calculate resultant hash values (8 marks)
 - ii. Create resultant hash table (8 marks)
- b. Distinguish Linear and Non-linear data structures (4 marks)

QUESTION FOUR (20 MARKS)

- a. Using Java, write an Algorithm for a linear array, for calling 10 students and calculate length of the algorithm (10 marks)
- b. Explain three asymptotic notations used in data structures and algorithms. (6 marks)
- c. Differentiate between compilation time and run time of an algorithm (4 marks)

QUESTION FIVE (20 MARKS)

- a. Describe four properties that an algorithm should possess (4 marks)
- b. Define what is a pointer and write the syntax of declaring pointers (4 marks)
- c. Distinguish between enqueue and dequeue operations in a queue. (4 marks)
- d. List & Explain any four application areas of data structures (8 marks)