

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DIPLOMA IN COMPUTER SCIENCE

COSC 0243: DATA STRUCTURES AND ALGORITHM

STREAMS: DIP. COMP SCI. Y2S2

TIME: 2 HOURS

DAY/DATE: TUESDAY 21/09/2021

11.30 A.M. – 1.30 P.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. Record [2 marks]
- iii. Array [2 marks]

b. Explain Worst Case notation in Linear Search Algorithm [3 marks]

c. Define Sorting, provide two examples [4 marks]

d. State and Explain two ways of analysing an algorithm to determine its efficiency [4 marks]

e. Describe four properties that a good algorithm should possess [4 marks]

f. Write the stack overflow condition [4 marks]

g. A hash table of length 10 uses open addressing with hash function $h(k)=k \bmod 10$, and linear probing. After inserting 6 values into an empty hash table, the table is as shown below.

0	
1	
2	42
3	23
4	34
5	52
6	46
7	33
8	
9	

Calculate the key values that could have been inserted in the table [5 marks]

SECTION B [Answer Any Two Questions Only]

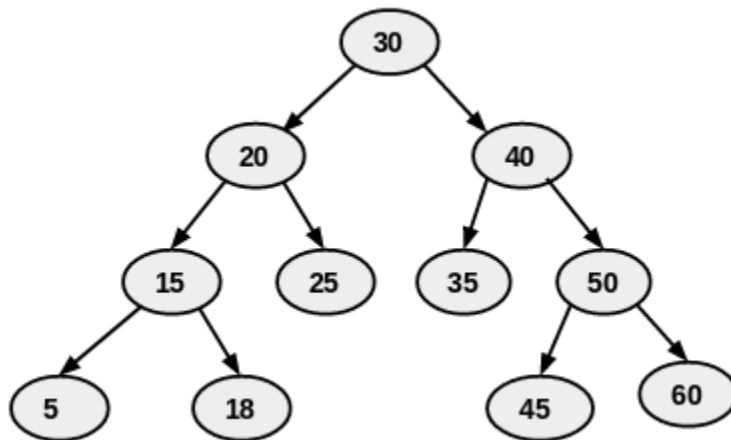
Question Two [20 marks]

a. With appropriate examples, explain the following Operations that can be performed on an Array

- i. Traversing [4 marks]
- ii. Insertion [4 marks]
- iii. Sorting [4 marks]
- iv. Searching [4 marks]
- v. Deletion [4 marks]

Question Three [20 marks]

a. List the nodes of the tree below in preorder, postorder, and breadth-first/in-order [10 marks]



- b. Describe four common orders of growth in Big “O” notation along with descriptions and examples where possible. [10 Marks]

Question Four (20 marks)

- a. Write the syntax in C for creating a node in the singly linked list [10 marks]
b. List the steps used in Binary Search [5 marks]
c. Implement the following set of values {5, 1, 6, 2, 4, 3} in ascending order using Bubble sort {5, 1, 6, 2, 4, 3} [5 marks]

Question Five (20 marks)

- a. Create an Algorithm for a linear array, for calling 10no.students and calculate length of the algorithm [8 Marks]
b. Explain the following data structures and provide three examples of each
i. Linear data structures [6 marks]
ii. Non-linear data structures [6 marks]
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