CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN APPLIED COMPUTER SCIENCE

ACSC 225: DATA STRUCTURES AND ALGORITHMS

STREAMS: BSC (ACSC) Y2S1 **TIME: 2 HOURS**

DAY/DATE: MONDAY 06/04/2020 **2.30 PM – 4.30 PM**

INSTRUCTIONS:

- **Attempt question ONE (Section A) and any other TWO from Section B**
- **Marks are awarded** for clear and concise answers

SECTION A-Compulsory

Question ONE [30 Marks]

(a)Describe two methods used to represented **TWO** dimensional arrays in memory**[4 Marks]**

(b)Give **THREE** applications of graphs **[3 Marks]**

(c)Describe **THREE** desirable features of an algorithm **[3 Marks]**

(d) What is the order of growth of the running time of the following java function **[4 Marks]**

```
public static int f2(int N)
{
int x = 0;
 for (int i = 0; i < N; i++)
            for (int j = 0; j < i; j++)
             x++;
            return x;
              }
```

(e)While giving relevant examples, differentiate between:

(i) Array and linked list **[4 Marks]**

(ii)Abstract data type and data structure **[4 Marks]**

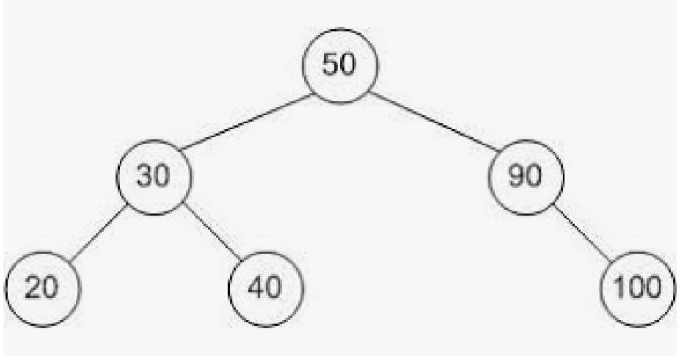
(iii)Pop and Push operations in a stack **[4 Marks]**

(f)Describe **FOUR** basic operations supported by an array **[4 Marks]**

SECTION B- Answer any TWO questions

Question TWO [20 Marks]

Study the tree shown below and then answer questions that follow:



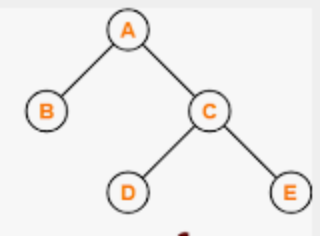
(i)List the root and all the leaves in the tree **[4 Marks]**

(ii)Using the tree data, constructa heap tree **[6 Marks]**

(iii) Using the tree data, constructHuffman tree **[10 Marks]**

Question THREE [20 Marks]

Below is a binary tree.



(a)Illustrate how the nodes are stored in memory using pointers **[5 Marks]**

(b)Write the order of the nodes visited in:

(i) In-order traversal **[5 Marks]**
(ii) Pre-order traversal **[5 Marks]**
(iii) Post order traversal **[5 Marks]**

Question FOUR [20 Marks]

Given the following set of data: 44, 47, 36 and 27.Illustrate how you would sort the data using:
(i)Bubble Sort **[5 marks]**
(ii)Merge Sort **[5 Marks]**
(iii)Quick Sort **[5 Marks]**
(iv)Selection Sort **[5 Marks]**

Question FIVE [20 Marks]

(a)Using the following data: **55, 77, 23, 48, 69,80,39,99**

(i) Construct an appropriate hash table using the hashing function **Data mod 8 [8 Marks]**

(ii)Using the hash table constructed, illustrate the algorithm for searching item 69 **[4 Marks]**

(b)Using the graph below, construct adjacency matrix **[8 Marks]**