

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 (APPLIED. COMP. SCI)

TIME: 2 HOURS

DAY/DATE: MONDAY 15/4/2019

2.30 P.M. – 4.30 P.M.

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) What are the steps to inserting a new item at the head of a linked list [4 Marks]
- (b) Describe how a stack is implemented using linked lists [4 Marks]
- (c) Give **THREE** applications of graphs [3 Marks]
- (d) Using a flow-chart, represent the algorithm for a push operation in a stack [3 Marks]
- (e) 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;
}
```

(f) While giving relevant examples, differentiate between:

(i) Breadth first search and depth first search [4 Marks]

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

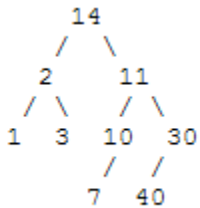
(iii) Enqueue and Dequeue operations in a queue [4

Marks]

**SECTION B- ANSWER ANY TWO QUESTIONS**

**QUESTION TWO [20 MARKS]**

(a) Study the binary tree shown below and then answer questions that follow:



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

(ii) Construct a binary search tree using the data [6 Marks]

(iii) Construct Huffman tree using the data [10 Marks]

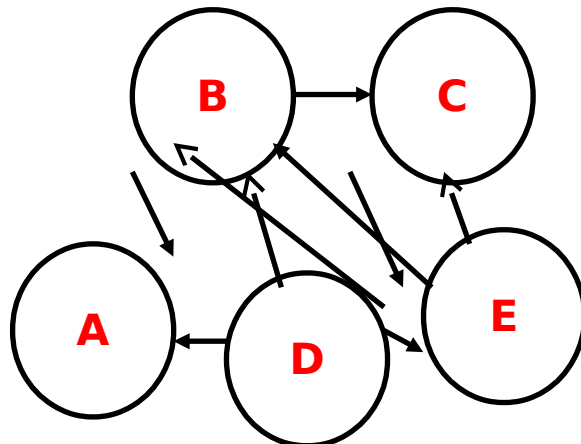
**QUESTION THREE [20 MARKS]**

(a) Using the following data: 65, 63, 76, 45

(i) Construct an heap tree [5 Marks]

(ii) Sort the data using heap sort [5 Marks]

(b) Using the graph below:



- (i) Construct adjacency matrix [5 Marks]
- (ii) Adjacency list [5 Marks]

**QUESTION FOUR [20 MARKS]**

Given the following set of data: 73, 33, 26 and 47, 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]**

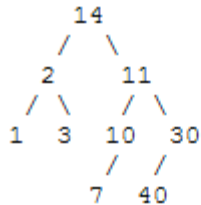
(a) Using the following data: **65,87,53,32,62,46,56,83**

- (i) Construct an appropriate hash table [4 Marks]
- (ii) Using the hash table constructed, illustrate the algorithm for searching item 53

[4

Marks]

(b) Below is a binary tree. Write the order of the nodes visited in:



- (i) In-order traversal [4 Marks]
- (ii) Pre-order traversal [4 Marks]
- (iii) Post order traversal [4 Marks]

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