CHUKA   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

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

COMP 301: DATA STRUCTURES AND ALGORITHMS

STREAMS:Y3S1   **TIME: 2 HOURS**

DAY/DATE: WEDNESDAY 6/12/2017   **11.30 A.M – 1.30 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)A programmer wants to store 1000 data items in a 64 bit computer. The programmer needs to determine memory requirements before making a selection of the data structure to use. Compute the memory requirement for storing the above data using:

  (i) Array   [3 Marks]
  (ii) Singly Linked list   [3 Marks]
  (iii) Doubly linked list   [3 Marks]

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

(c)Using a flow-chart, represent the algorithm for a pop operation in a stack   [3 Marks]

(d)Under what circumstances would a programmer prefer linked list over an array.[4 Marks]

(e)Differentiate between:

   (i)Breadth first search and depth first search   [2 Marks]

 (ii)Abstract data type and data structure   [2 Marks]

(iii)Enqueue and Dequeue operations in a queue [2 Marks]

(f)Illustrate how a stack can be applied when converting a decimal number 175 into its binary equivalent [3 Marks]

(g)Illustrate how a linked list can be used to represent a stack [3 Marks]

SECTION B- Answer any TWO questions

Question TWO [20 Marks]

Using the following data: **50, 80, 30, 10, 42, and 15 construct**

    (i)   A balanced binary search tree **[10 marks]**
    (ii)   An heap tree [10 Marks]

Question THREE [20 Marks]

Suppose an email is to be sent after compression using huffman code. The results of the analysis of the frequency of characters in the message are as follows: a-10, b-15, c-30, d-45 and k-50.

(i)Using the frequencies construct an Huffman tree [10 Marks]

(ii)Using the Huffman tree constructed, assign appropriate binary codes to characters **a, b,c,d and k** [10 Marks]

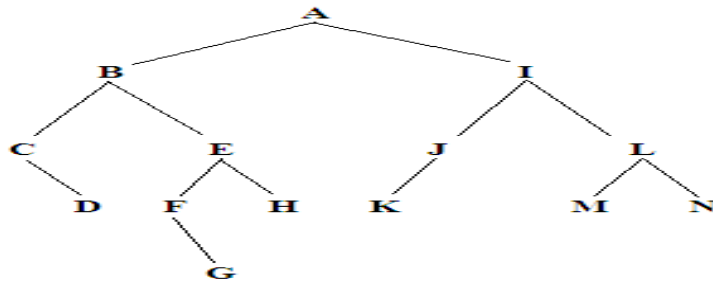## Question FOUR [20 Marks]

Given the following set of data: 50, 70, 34, 55 and 45, 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)Study the tree shown below and provide the results of each traversal method indicated.

(i)Preorder Traversal   [4 Marks]

(ii) In order Traversal   [4 Marks]

(iii)Post order Traversal   [4 Marks]

(b)Using the following data: **50,78,45,26,76,30,55**

 (i) Construct an appropriate hash table   [4 Marks]

  (ii)Using the hash table constructed, illustrate using an example how the hash table will be applied when a user is searching for a particular data.   [4 Marks]