

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

**THIRD YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR
OF SCIENCE IN COMPUTER SCIENCE**

COMP 301: DATA STRUCTURES

STREAM: COMP. SC Y3S1

TIME: 2 HOURS

DAY/DATE: TUESDAY 16/12/2014

2.30 P.M – 4.30 P.M

INSTRUCTIONS:

1. Answer question 1 in section A and any other **TWO** from section B
2. Marks are awarded for clear and concise answers
3. Note that only Question ONE (Section A) and the first TWO attempted questions in section B will be marked.

SECTION A-COMPULSORY

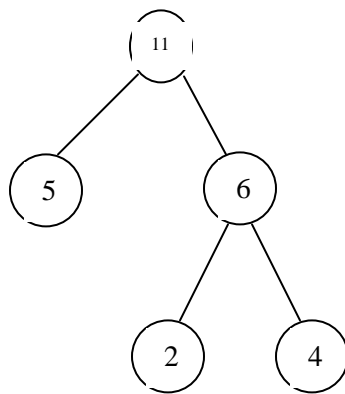
QUESTION ONE- (30 MARKS)

- (a) Give **TWO** limitations of representing linear structures in memory using pointers and **TWO** advantages of the same . **[4 Marks]**
- (b) Using a diagram, differentiate between a weighted graph and disconnected Graph **[4 marks]**
- (c) Differentiate between Bubble sort and selection sort **[4 marks]**
- (d) Differentiate between;
 - i. Abstract data type and Data structure **[2 Marks]**
 - ii. Pre-order traversal and post-order traversal **[2 Marks]**
 - iii. pointer and array data types in relation to how they store their elements **[2 Marks]**
- (e) While giving an illustration, describe the operation of a hash table **[4 Marks]**
- (f) Using an example, describe a binary sorted search tree **[4 marks]**

- (g) How are graph algorithms applied in routing problems [2 marks]
- (h) How can Huffman tree be used to perform data compression during communication [2 Marks]

QUESTION TWO-(20 MARKS)

- (a) What are the key characteristics of the following types of linked lists
 - (i) Singly linked list [2 marks]
 - (ii) Doubly linked list [2 marks]
- (b) Compute a weighted Path length for the following Huffman tree [3 Marks]



- (c) (i) Declare a struct type in C++ that contains one pointer that points to a variable containing a float data type and one integer field and an integer array field of size 5. [5 marks]
- (ii) Declare a variable of the structure declared in c(i) above and assign it 'address of variable B' and a constant 16 to its integer field [2 marks]
- (d) The Merge-sort algorithm can be described in general terms as consisting of **THREE** steps. Using a pseudocode, describe **THREE** steps of merge sort [6 Marks]

QUESTION THREE

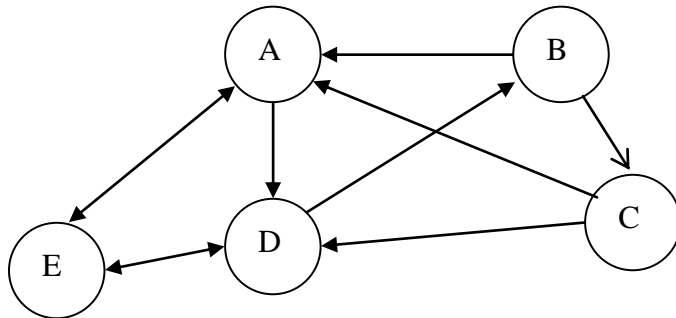
- (a) (i) What is the function of **REAR** and **FRONT** variables in relation to QueueADT [2 marks]
- (ii) Define **ADT QUEUE** class with **TWO** operations; **Enqueue** and **Dequeue** and **TWO** variables **Front** and **Rear** [8 marks]
- (iii) Declare an instance of the ADT **QUEUE** in a (ii) above [2 Marks]

- (b) Using the following Keys/weights; 15,11,8,4,10,12,14,17 construct
- (i) Huffman tree [4 Marks]
 - (ii) Hash table [4 Marks]

QUESTION FOUR-(20 MARKS)

- (a) Abstract ADT STACK using a class with the following members [10 Marks]
- (i) TOP
 - (ii) PUSH()
 - (iii) POP()
 - (iv) Constructor

- (b) Write down the adjacency matrix for the graph below [6 marks]



- (c) Write a recursive function that can be used to compute x^n [4 marks]

QUESTION FIVE-(20 MARKS)

- (a) Sort the data 29,54,19,89, 9 using
- (i) Bubble sort [5 Marks]
 - (ii) Quick sort [5 Marks]
 - (iii) Selection sort [5 Marks]
- (b) Using a Queue, simulate the operation of Breadth first search [5 Marks]
-