**MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**P.O. Box 972-60200 – Meru-Kenya**

**Tel: 020-2069349, 061-2309217. 064-30320 Cell phone: +254 712524293, +254 789151411**

**Fax: 064-30321**

**Website:** [**www.must.ac.ke**](http://www.must.ac.ke) **Email:** **info@must.ac.ke**

**University Examinations 2016/2017**

SECOND YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF

BACHELOR OF SCIENCE IN COMPUTER SCIENCE AND FORENSICS ,BACHELOR OF SCIENCE IN COMPUTER SCIENCE ,BACHELOR OF SCIENCE IN COMPUTER TECHNOLOGY AND BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

**CCS 3200: DATA STRUCTURES AND ALGORITHMS**

**DATE: DECEMBER 2016 TIME: 2 HOURS**

**INSTRUCTIONS:** *Answer question* ***one*** *and any other* ***two***questions.

**QUESTION ONE (30 MARKS)**

1. Define the term algorithm analysis and discuss the TWO important quantitative metrics of interest in algorithm analysis (6 marks)
2. Define the following terms as used in computing (5 marks)
3. Abstract data type
4. Simple data type
5. Structured data type
6. Pointer data type
7. Algorithm
8. For each of the following two algorithms, give its time complexity in Big-oh notation
9. Algorithm Algol (A)

Input: An array A storing n>=1 integers

Output: The sum of the elements in A

s←A[0]

for i←1 to n-1 do

 s←s + A[i]

 return s

1. Algorithm Algol (A)

Input: An array A storing n>=1 integers

Output:The sum of the prefix sums in A

s←0

{

for i←1 to n-1 do

 s←s + A[0]

for j←1 to i do

s←s + A[j]

}

 return s

1. Discuss any THREE application areas of graphs (6 marks)
2. Using a flow-chart, represent the algorithm for a pop operation in a stack (3 marks)
3. Discuss the searching problem and briefly explain any two searching approaches (4 marks)

**QUESTION TWO (20 MARKS)**

1. Discuss the following types of linked lists
2. Single linkded list
3. Double linkded list
4. Cyclic linked list
5. Study the tree shown below and answer the questions that follow
6. What’s the result of **Preorder Traversal**  (3 marks)
7. What’s the result of **Inorder Traversal** (3 marks)
8. What’s the result of **Postorder Traversal** (3 marks)
9. Using an appropriate example, illustrate how a stack can be used to ensure a program code obeys the syntax rule requirement of every opening brace having a corresponding closing brace. (5 marks)

**QUESTION THREE (20 MARKS)**

1. Discuss the concept of the queue ADT and write algorithms to implement the initialization, Enqueue and Dequeue operations on a queue. (10 marks)
2. Declare an instance of the **QUEUE** in 3(a) above and using appropriate examples, Enqueue three items into the queue and Dequeue two items from the queue (5 marks)
3. Use the following data; **33, 10, 13, 12, 45**

Using a hash key of 8 enter the data in an hash table (5 marks)

**QUESTION FOUR (20 MARKS)**

1. Using the following data: **57, 85, 35, 9, 47, 20, 26, 99, 93, 10.** Starting with 57 and ending with 10, draw the binary search tree that results from inserting the integers (7 marks)
2. Define the sorting problem and write an algorithm that implements selection sort (ascending order). (6 marks)
3. Using the following data: **57, 85, 35, 9, 47, 20, 26, 99, 93, 10** illustrate how the algorithm in (Q 4b) above will sort them in ascending order. (4 marks)
4. Giving an example explain what a recursive function is. (3 marks)

**QUESTION FIVE (20 MARKS)**

1. Showing how a Huffman tree can be used for data compression using Huffman Coding

(5 marks)

1. Write an algorithms that performs the following operations on a graph;
2. Breadth first search (5 marks)
3. Depth first search (5 marks)
4. By the use of a relevant example, demonstrate how a heap tree can be used for sorting a set of data. (5 marks)