THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)

Faculty of Engineering & Technology

DEPARTMENT COMPUTER SCIENCE & INFORMATION TECHNOLOGY

BACHELOR OF TECHNOLOGY IN INFORMATION TECHNOLOGY – BTECH ICT M2

EIT 4213: DATA STRUCTURES

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: FEBRUARY/MARCH 2012
TIME: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Answer Booklet*

This paper consist of **FIVE** questions in **TWO** sections **A** & **B**
Answer question **ONE (COMPULSORY)** and any other **TWO** questions
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

SECTION A (COMPULSORY)

QUESTION ONE (30 MARKS)

a) (i) Define the term data structure

(ii) Clearly describe the TWO types of data structures. As you describe give an example for for each type.

(iii) Outline the operations that can asserted on any data structure (10 marks)

b) (i) Define the term algorithm (10 marks)
(ii) In your own experience in today life where do you think you apply the concept of algorithms? Discuss with an example (4 marks)

c) Define the term data type and hence give the properties that characterized any data type (4 marks)

d) (i) Define the term array and give its general properties
(ii) Outline the specific properties that distinguish an array in a programming language of your choice (8 marks)

e) (i) What do the terms time efficiency and space efficiency mean with reference to an algorithm? Discuss.

(ii) What are the other parameters of concern when it comes to measuring time efficiency (3 marks)

f) Define the term recursion and explain its importance (3 marks)

SECTION B (Answer any two questions)

QUESTION TWO

a) (i) What is a linked list? Explain

(ii) Outline the properties of the linked list abstract data type. (7 marks)

b) Give the properties of a singly – linked list (3 marks)

c) Write a Java class to implement a single node singly – linked list whose data element is an integer (6 marks)

d) What distinguishes a singly – linked list from doubly-linked list? (4 marks)

QUESTION THREE

a) (i) What do we mean by the term stack? Define
(ii) Briefly explain the TWO stack fundamentals operations namely pop and push (3 marks)

b) Using a Java class implement the stack data structure

c) (i) Define the term Abstract Data Type (ADT) and hence give its properties
(ii) What does an ADT contract entail? Outline
(iii) What do we require when implementing an ADT? Briefly explain (7 marks)

d) Briefly explain each of the following terms as used in ADT:
i) Constructors
ii) Accessors
iii) Transformers (6 marks)

QUESTION FOUR

a) The merge sort algorithm is stated as follows:
If we are required to sort an array, we can divide the array into two sub-arrays of about equal length, sort each sub-array separately, and finally merge the two sub-arrays

Write a method that accepts an unsorted integer array and uses the above algorithm to sort the array

b) The basic operation of the insertion sort is the insertion of a single element into a sequence of sorted elements so that the resulting sequence is still sorted. The process is illustrated below for array of five integers. The original array is shown in (i).

(i)	235	45	182	205	390
(ii)	45	235	182	205	390
(iii)	45	182	235	205	390
(iv)	45	182	205	235	390

Write a method that accepts as a parameter an array of integers and use this algorithm to sort the elements in the array (10 marks)