



TECHNICAL UNIVERISTY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY

UNIVERSITY EXAMINATION FOR:
BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY
(BSIT)

ICS 2105: DATA STRUCTURES & ALGORITHM

END OF SEMESTER EXAMINATION

SERIES: AUGUST 2013

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*

This paper consists of **FIVE** questions. Attempt question **ONE** and any other **TWO** questions

Maximum marks for each part of a question are as shown

This paper consists of **THREE** printed pages

Question One (Compulsory)

a) Define the following terms:

(i) Program

(ii) Data structure

(iii) Data type

(3 marks)

b) Briefly discuss the general properties of any algorithm

(3 marks)

c) (i) What do the terms time efficiency and space efficiency mean with reference to an algorithm?
Discuss. **(6 marks)**

(ii) Why is it that we cannot sue real time to measure time efficiency **(2 marks)**

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

d) (i) Define a list ADT **(2 marks)**

(ii) State any TWO advantages of using a list ADT **(2 marks)**

(iii) By use of a high level language write codes that declares a linear list, the list elements to be 1, 2, 3, 4, 5 and 6. The program should also display the indices with corresponding elements as follows. **(9marks)**

$$V[0] = 1 \quad V[1] = 2 \quad V[2] = 3 \quad V[3] = 4 \quad V[4] = 5 \quad V[5] = 6$$

Question Two

- a) (i) Explain what is meant by “divide-and-conquer” strategy. **(6 marks)**
 (ii) Briefly explain the **THREE** types of run time analysis of an algorithm. **(3 marks)**
- b) (i) 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 an array of five integers. The original array is shown in (i)

(i)	235	45	482	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 uses this algorithm to sort the elements in the array **(9 marks)**

(ii) Compute the complexity of the insertion sort algorithm above **(2 marks)**

Question Three

- a) What is the balanced binary tree **(2 marks)**
- b) Assume visiting a node is printing its label, what would be the output from the following traversal strategies. **(12 marks)**
 (i) In order
 (ii) Pre order
 (iii) Post order

- c) Give any **THREE** importance of using a tree ADT data structure (3 marks)
- d) What is a complete binary tree? Explain using a suitable example (3 marks)

Question Four

- a) Describe the ADT stack and give any **THREE** examples of application of the ADT in both system and application programming. (6 marks)
- b) Write a pseudo code that explain the insertion in a stack data structure (6 marks)
- c) Describe the following stack operations (2 marks)
- (i) Pop
 - (ii) Push
- d) Write a pseudo code that explains the detection of a stack ADT (6 marks)

Question Five

- a) (i) What is hashing? (2 marks)
(ii) List any **TWO** objectives of hashing (2 marks)
- b) (i) Define the term array (2 marks)
(ii) Outline **THREE** reasons when an array should be the ADT choice to store data. (3 marks)
- c) Write a statement that store the value 75 in the third element of an array Ann (2 marks)
- d) Write a statement that passes the value of the third of array Ann to a variable called a. (2 marks)
- e) Using a high level language provide codes that implements an array that holds the value (3, 12, 5, 2, 10) and prints the greatest value of the array. (7 marks)