



TECHNICAL UNIVERSITY OF MOMBASA

Institute of Computing & Informatics

UNIVERSITY EXAMINATION FOR:

BTIT/SEP 2014Y2S2, BSIT/SEP 2014/J-FT Y2S1, BMCS 14S Y2S2,

BSSC 14S Y2S2

ICS 2105/EIT 4213 DATA STRUCTURES & ALGORITHMS

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2 HOURS

Paper 2

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of Five questions. Attempt Question One and any two other

Do not write on the question paper.

Question 1

- (a) Define the following terms. (4marks)
- (i) Data structures;
 - (ii) Encapsulation
 - (iii) Queue
 - (iv) Abstract Data Type (ADT)
- (b) A good programmer must be able to conceptualize a problem. This he can put down as an algorithm. Algorithms can be expressed in terms of pseudo code or Flowcharts
- (i) List any four properties of an algorithm (4marks)
 - (ii) Why is analysis of algorithms important? (2 marks)
 - (iii) What is the difference between a recursion and iteration in program development? use a high level language examples to make your point clear (4 marks)

- (iv) What is the Big Oh Notation? (2marks)
- (c) (i) Name one disadvantage of Binary Tree Data structure? (2 marks)
- (ii) List any two conditions that should be satisfied when an array type is appropriate for representing an abstract data type. (2 mark)
- (d) Searching algorithms are used to read a particular record from a collection of records, write algorithms to demonstrate the following searching techniques.
- (i) Selection sort algorithm (4marks)
- (ii) Bubble sort (4marks)
- (iii) State the most efficient of the two algorithms, justify your answer. (2marks)

QUESTION 2

- a) Define an array data structure. [2marks]
- b) Justify why one should implement a List over an array ADT. [2marks]
- c) An array contains the following items
 {45, 76, 57, 25, 89, 21, 15,22}
- Using a high level language ,Write a program that contains the following features;
- Initialize an array called *numbers* with the values given above [2 marks]
 - Uses a loop to print all the elements in the array the array [6marks]
 - Write a statement that prints only the first element in the array. [2marks]
 - Write a statement that declares a multi-dimensional array structure called Ali of 3 by 5 elements of type int. [2marks]
 - Give a statement that refers to the 6th element in array Ali: [2marks]
 - Give a statement that passes the value of the 5th element of Ali to a variable called K [2marks]

QUESTION 3.

- a)Define the following terms. Where necessary draw a diagram to illustrate your answer. [8 marks]
- Binary tree
 - Balanced binary tree
 - A binary search tree
 - Depth of a tree
- b)Given the following numbers:
 34 52 9 2 84 6 38 94 65 83
- Create a binary search tree using the given numbers [4 marks]

- ii. Give the result of traversing the tree you have created in *i* above using the *post-order*, *in-order*, and *pre-order* traversal methods.

[6 marks]

c) List any Two applications for the tree data structure?

[2marks]

QUESTION 4.

a) Give two properties that a linear list must adhere to

[2 marks]

b) Write an algorithm that explains a linear list insertion.

[8marks]

c) Write an algorithm that explains the Pop & Push operations in a Stack

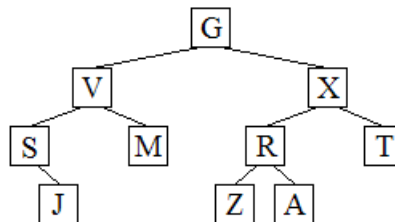
[8 marks]

d) With an illustration differentiate between a doubly linked list and a Circular list

[2marks]

Question Five

- (a) List the order in which the contents of the following tree would be visited, for each of the given traversals:



(i) Preorder

(ii) In order

(iii) Post order

[9marks]

- (b) Consider the following code segment

```
Arr [4] = {6,4,3,1}
```

```
j = 0 , k = 10
```

```
While (j < 4) do
```

```
  If (arr [j] < k) then
```

```
    k =arr [j]
```

```
  Endif
```

```
  j = j+1
```

```
End while
```

```
Display k.
```

- (i) What does the code display, dry run to show your answer

[5marks]

- (ii) Using a high level language, Implement the algorithm in to a program

[4marks]

- (c) Explain Djiksatras algorithm.

[2marks]