



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF INFORMATICS AND INNOVATIVE SYSTEMS
DEPARTMENT OF INFORMATION SYSTEMS AND TECHNOLOGY
UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF
BACHELOR OF ACTUARIAL SCIENCE
2nd YEAR 2nd SEMESTER 2017/2018 ACADEMIC YEAR
MAIN CAMPUS

COURSE CODE: SCS 301

COURSE TITLE: DATA STRUCTURES AND ALGORITHMS

EXAM VENUE: STREAM: BSC BUSINESS INFORMATION SYSTEMS

DATE:

EXAM SESSION:

TIME:

2.00 HOURS 150 students

INSTRUCTIONS:

- 1. Answer Question 1 (Compulsory) and ANY other two questions.**
- 2. Candidates are advised not to write on the question paper.**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

QUESTION ONE (30 MARKS)

- a) Define the following terms: [6 Marks]
- (i) Data structures
 - (ii) Algorithm
 - (iii) Recursive function
- b) Briefly discuss the general properties of an algorithm. [3 Marks]
- c) What do the term time efficiency and space efficiency mean with reference to an algorithm. Discuss. [6 Marks]
- d) In algorithm analysis what is the rationale of using the Big O notation. [3 Marks]
- e) Explain the divide and conquer strategy to sorting. [6 Marks]
- f) Explain the three (3) types of run time analysis of algorithms. [6 Marks]

QUESTION TWO (20 MARKS)

- a) Compute the running time for the pseudo code segment below: [4 Marks]

```
For (int i = 0; i < n; i + +)
  For (int j = 0; j < n; j + +)
    { cout << i;
      P = p + i;
    }
```

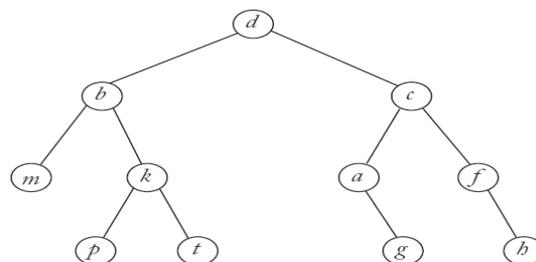
- b) Discuss any four (4) attributes of a good program algorithm. [4 Marks]
- c) Consider the binary tree below show the output of: [5 Marks]
- (i) Pre order
 - (ii) In order
 - (iii) Post order
- d) Describe the fundamental properties of an ADT. [3 Marks]
- e) Using an example illustrate the difference between Pop and Push operations of the stack. [4 marks]

QUESTION THREE (20 MARKS)

- a) Using illustrations explain the difference between balanced and complete binary tree. [6 marks]
- b) Explain any two application areas of the queue data structure in computing. [4 marks]
- c) With the aid of an example explain the Binary Search algorithm. [8 marks]
- d) Differentiate between iteration and recursion. [2 marks]

QUESTION FOUR (20 MARKS)

- (a) Using an example explain the following terms as used in types. [6 marks]
 - i) Size
 - ii) Depth of a node
 - iii) Depth of a tree
- (b) Differentiate between the tree and graph data structure. [4 marks]
- (c) Explain any two application areas of the graph data structure. [4 marks]
- (d) By use of the binary tree below, State and briefly explain the three fundamental orders for traversing a binary tree and list the nodes in each and every order. [6 marks]



QUESTION FIVE (20 MARKS)

- a) Explain the following operations that are done on a linear data structure:
 - i) Sorting [2 Marks]
 - ii) Traversal [2 Marks]
- b) Define the following terms where necessary draw a diagram to illustrate your answer: [6 Marks]
 - (i) Binary tree

(ii) Balanced binary tree

(iii) Depth of a tree

c) Searching algorithms are used to read a particular record from a collection of records:

(i) Explain the bubble sort algorithm [2 Marks]

(ii) Write an algorithm to implement bubble sorting [3 Marks]

b) (i) Explain the selection sort algorithm [2 Marks]

(ii) Write an algorithm to implement the selection sorting [3 Marks]