



**NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY**

Faculty of Computing and Informatics

Department of Computer Science

QUALIFICATION : Bachelor of Computer Science, Bachelor of Informatics	
QUALIFICATION CODE: 07BACS, 07BAIF	LEVEL: NQF 6
COURSE: Data Structures and Algorithms	COURSE CODE: DSA610S
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DURATION: 3 Hours	MARKS: 100

SECOND OPPORTUNITY/SUPPLEMENTARY EXAMINATION QUESTION PAPER	
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THIS QUESTION PAPER CONSISTS OF 4 PAGES
(Excluding this front page)

INSTRUCTIONS

1. Respond to ALL problems in sections A, B and C.
2. Use the examination script booklet provided.
3. Each section must be started on a new page.
4. NUST examination rules and regulations apply.
5. Follow instructions in the examination script booklet.
6. Write clearly and neatly.

SECTION A: Multiple Choice

[20 marks]

- Respond to ALL problems in this section.
- Select the best option in each of the problems in this section.
- Your responses must be written in the answer booklet provided.
- Marks to each question or part of question are given in [].

Problem A1

Which one of the below mentioned data structures is a linear data structure?

- A. Binary tree
- B. Binary search tree
- C. Graph
- D. Queue

[2 marks]

Problem A2

Which of the following statements is true?

Statement A: A binary tree is always a binary search tree.

Statement B: A binary search tree is a graph.

- A. Statement A is true, and Statement B is false.
- B. Statement A is false, and statement B is true.
- C. Both Statement A and Statement B are true.
- D. Both Statement A and Statement B are false.

[2 marks]

Problem A3

Which of the following algorithms makes use of the divide and conquer approach to solving a problem?

- A. Binary search tree
- B. Binary search
- C. Program
- D. Graph

[2 marks]

Problem A4

Which of the following operations can be performed on a graph?

- A. Insertion-adding an element to the graph
- B. Deletion-removing an element from the graph
- C. Search-look for an element in a given graph
- D. All of the above

[2 marks]

Problem A5

An algorithm can be represented using the following.

- A. Pseudo code
- B. Flow chart
- C. None of the above
- D. Both A and B

[2 marks]

Problem A6

If the number of records to be sorted is small, then _____ sorting can be efficient.

- A. Binary
- B. Insertion
- C. Selection
- D. Bubble

[2 marks]

Problem A7

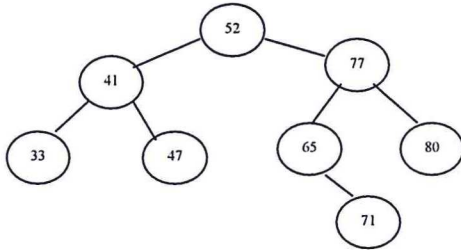
Given a binary search tree, which traversal type would print the values in the nodes in sorted order?

- A. Pre-order
- B. Post-order
- C. In-order
- D. level order

[2 marks]

Problem A8

After deleting the key 77, which key replaces it if the tree is to maintain its binary search property?



- A. 41
- B. 47
- C. 80
- D. 52

[2 marks]

Problem A9

If T is a binary search tree storing 128 elements. What is the biggest possible height of T?

- A. 125 or 126
- B. 127 or 128
- C. 129 or 130
- D. 131 or 132

[2 marks]

Problem A10

Bubble sort is similar to selection sort in the sense that

- A. Both algorithms compare every element of the list with its predecessor only if the predecessor of the given element exists.
- B. Both algorithms sort the list by pushing the biggest or the smallest element to the extreme end of the list.
- C. Both algorithms are used in the binary search algorithm.
- D. None of the above answers.

[2 marks]

SECTION B

[20 marks]

- *Respond to ALL problems in this section*
- *Clearly mark each of the following assertions as true (T) or false (F)*
- *Your responses must be written in the answer booklet provided.*
- *Marks to each question or part of question are given in [].*

Problem B1

A doubly-linked list is a linear data structure.

[2 marks]

Problem B2

It is not sensible to discuss depth-first and breath-first searches in linear data structures. [2 marks]

Problem B3

A stack follows a LIFO (last-in-first-out) rule.

[2 marks]

Problem B4

Push and pop operations are associated with queue data structure.

[2 marks]

Problem B5

Probabilistic complexity represents the probability of an algorithm processing input in a specific time.

[2 marks]

Problem B6

An algorithm is needed for every useful computer program.

[2 marks]

Problem B7

Arrays can store homogeneous data elements.

[2 marks]

Problem B8

Big-O and Big- Θ (Big-Theta) are both asymptotic notations.

[2 marks]

Problem B9

A queue is a first-in-last-out (FILO) data structure.

[2 marks]

Problem B10

Singly-linked lists and doubly-linked lists have no root node.

[2 marks]

SECTION C

[60 marks]

- Respond to ALL problems in this section.
- Your responses must be written in the answer booklet provided.
- Marks to each question or part of question are given in [].

Problem C1

[20 marks]

The following sequence of numbers needs to be sorted in descending order: 17,14,11,15,18,12,10,13,9,16. Copy and complete the table below.

	Selection Sort
Sequence after 1 swap	
Sequence after 2 swaps	
Sequence after 3 swaps	
Sequence after 4 swaps	

Problem C2

[10 marks]

Binary search was used to search for an element in a list of elements. The element searched was found at position 3 after visiting 3 elements (including element at position 3). Assume the position numbers start at position 1.

- Give the number of elements that were in the list if no rounding was necessary in the calculations. [3 marks]
- Give the number of elements that were in the list if rounding down was necessary three times in the calculations. [7 marks]

Problem C3

[30 marks]

Given the following sequence of keys: 63 28 51 53 80 35 57 61 42 81;

- Construct a binary search tree (BST), start with the first key in the sequence (63) as the root and proceed from left to right of the sequence. [10 marks]
- Give the pre-order traversal of the BST. Your answer should be a sequence of 10 integers, separated by whitespace. [10 marks]
- Give the in-order traversal of the BST. Your answer should be a sequence of 10 integers, separated by whitespace. [10 marks]

******End of Paper******