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: 07BCMS, 07BAIT	**LEVEL:** 7
COURSE: DATA STRUCTURES AND ALGORITHMS 2	**COURSE CODE:** DSA711S
DATE: JUNE 2022	**PAPER:** THEORY
DURATION: 2 HOURS	**MARKS:** 60

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
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INSTRUCTIONS
1. Answer ALL the questions. 2. Read all the questions carefully before answering. 3. Number the answers clearly

THIS QUESTION PAPER CONSISTS OF 4 PAGES
(Including this front page)

Question 1: [Multiple choice Questions -8 Marks]

1.1 Which of the following tree traversal technique visits root node first?

A. InOrder Traversal
B. PostOrder Traversal
C. PreOrder Traversal
D. Level Order Traversal

1.2 A binary tree has n levels where level zero is the level of the root. And n denotes the last level. Given that the root has only one child, what is the minimum number of leaves of level n of the tree

A. 0
B. 1
C. -1
D. 4

1.3 Given a list of elements; 12, 16, 20, 27, 19 inserted into a data structure in that order. An element is deleted using a basic data structure operation. If the deleted element is a 19 the data structure can be a ____?

A. Queue
B. Tree
C. Array
D. Stack

1.4 The following operations performed on a stack of size 5:
Push(DSA),pop(),push(ICG),push(DBF),pop(),push(OPS),pop,pop(),push(PRG). Which of the following statement is correct?

A. Performed smoothly
B. Underflow
C. Overflow
D. Repeated operation

Question 2: [Stack/Queue/Linked-list -**10 Marks**]

2.1 Explain the difference between Queue and Stack? [4]

2.2 What do we call a condition that's occurs when a user try to remove an element from an empty stack? [2]

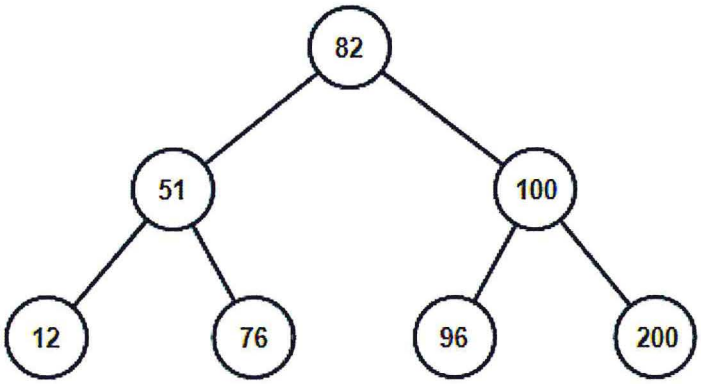
2.3 Which of the following permutations can be obtained in the same order using a stack. Assuming that input is the sequence. 5, 6, 7, 8, 9. In that order? [2]

i. *7, 8, 9, 5, 6*
ii. *5, 9, 6, 7, 8*
iii. *9, 8, 7, 5, 6*
iv. *7, 8, 9, 6, 5*

2.4 The following Five Namibian artist's names: The_Dogg, Gazza, TopCheri, Tate_Buti and BigBen were pushed into a stack in that order. The stack is then popped out four names and each name is inserted in a queue. The two names are deleted from the queue and pushed back on the stack. Now one name is then popped from the stack. What is the popped name of the artist? [2]

Question 3: [BST – **12 Marks**]

3. Study the **Binary Search Tree** below



3.1 Write down all the BST traversals below :

i. Preorder traversal [2]

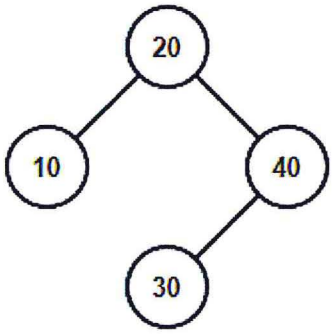
ii. Inorder traversal [2]

iii. Postorder traversal [2]

3.2 Construct a BST for the elements: 9 8 12 16 10. Using post order traversal [6]

Question 4: [AVL Trees – **18 Marks**]

1.1 Study the AVL tree below and write down all possible insertions sequence that produce the following result: [4]



1.2 To an empty AVL tree. Which of the insertions in a) achieve the balance without any rotation?[2]

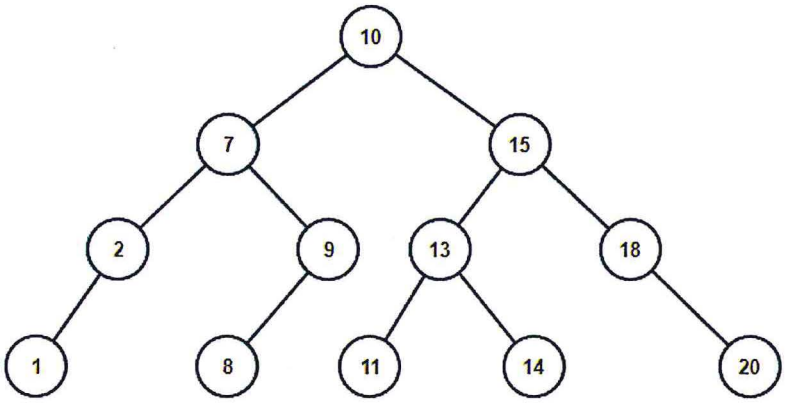
1.3 Is the AVL in a) is balance? state your reason with support the balancing factors involved [4]

1.4 Name and briefly explain any three types of AVL tree rotations [6]

1.5 Differentiate between BST and AVL tree (2)

Question 5: [SPLAY TREE – **12 Marks**]

2. Study the Splay Tree below and answer the questions that follows:



2.1 You are tasked to search for the element 9 in picture above and reconstruct the new Splay Tree after the search operation completed.[10]

2.2 State the type of Splay Tree rotation performed on the above search operation. Hint: [Zig, Zag, Zig-Zag or Zag-Zig] [2]

********** End of Exam**********