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: JULY 2022	**PAPER:** THEORY
DURATION: 2 HOURS	**MARKS:** 60

SECOND OPPORTUNITY /SUPPLEMENTARY EXAMINATION QUESTION PAPER	
EXAMINER(S)	**Mr. S TJIRASO** **Mr. R MUSUTUA**
MODERATOR:	**Mr. L HAINGURA**

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 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. 4

B. 12

C. 8

D. None of the above

1.2 Given a list of elements; 3, 12, 6,16,9 inserted into a data structure in that order. An element is deleted using a basic data structure operation. If the deleted element is 9, the data structure cannot be a _____?

A. Queue

B. Tree

C. Graph

D. None of the above

1.3 Given the following tree. Give the **Preorder** traversal?
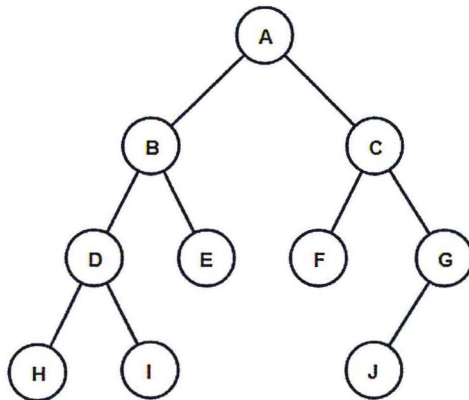
A. ABDHIECGFJ

B. HDIBEAFCJG

C. HIDEBFJFCA

D. ABDHIECFGJ

1.4 If the node to be deleted has _____ we delete the node and attach the left subtree to the deleted node's parent.

A. Only a left subtree

B. Only a right subtree

C. No children

D. Has no children

**Question 2**: [Stack/Queue/Linked-list -**11 Marks**]

    2.1 Define a Queue, mention various operations on Queue [3]

    2.2 Define a graph. How is it different from a Tree ?[3]

    2.3 Explain the concept of singly-linked list with example [3]

    2.4 The following Five Soccer Players 'names3: Pogba, Messi, Mane, Ronaldo and Salah 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 are names of players left in the stack? [2]

Question 3: [BST – **15 Marks**]

    3.1 Construct a Binary Search Tree (BST) for the following elements: 12, 76, 51, 96, 200, 100 82. Using POSTORDER Traversal technique [7]

    3.2 Mention any two operations on BST [2]

    3.3 Use Insertion sort algorithm to sort the array below: 4,3,2,10,12,1,5,6. Show content for each step [6]

Question 4: [AVL Trees – **14 Marks**]

    1.1 Study the AVL tree below and write down any two possible insertions sequence that produce the following result: [2]
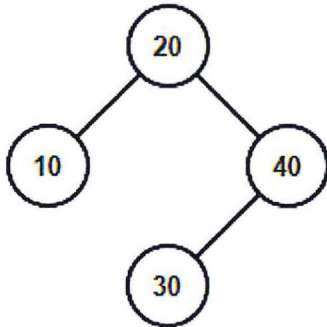
    1.2 To an empty AVL tree. Which of the insertions in a) achieve the balance without any rotation?[2]

    1.3 Is the AVL in a) is balance? state your reason with support the balancing factors involved [2]

    1.4 Name and briefly explain the two types of AVL tree rotations [4]

    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:
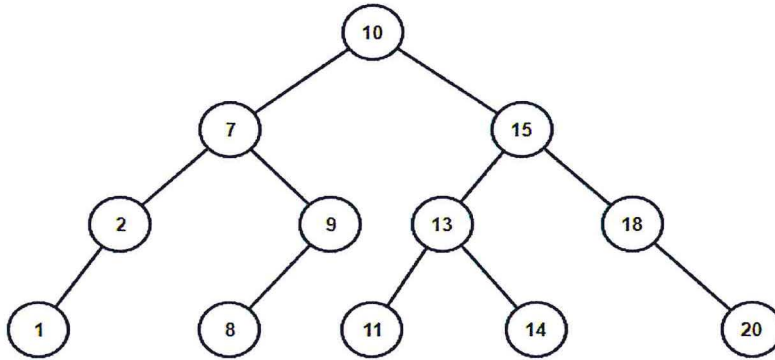
2.1 You are tasked to search for the element 13 in picture above and reconstruct the new Splay Tree after the search operation completed.[10]

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