VIT
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

School of Computer Science and Engineering

Fall Semester 2022-2023 Continuous Assessment Test – II

SLOT: F1+TF1

Programme Name & Branch: BCB, BCE, BCI, BCT, BDS, BKT

Course Name & code: Data Structures and Algorithms - BCSE202L

Exam Duration: 90 Min. **Maximum Marks: 50**

Answer Key

Open Book/ Notebook Exam

Part A-5*10=50

Answer ALL Questions

Q. No.	Question	Max Marks	CO	BL
1.	Write the pseudo-code to check whether the given number is palindrome or not using linked list? Illustrate the problem using single and double-linked list with time and space complexity?	10	CO2	BL4

Sol:

(5 M)

```
//Singly Linked List
struct node
  {
     int num;
     struct node *next;
  };
  int palin_check (struct node *p, int count)
  {
     int i = 0, j;
     struct node *front, *rear;
       while (i != count / 2)
     {
        front = rear = p;
//Inc the pointer from position 1 to n/2 – At end check for the equality for rear data
           for (j = 0; j < i; j++)
              front = front->next;
//Dec the pointer from last position to n/2 – At end check for the equality with front data
        for (j = 0; j < count - (i + 1); j++)
              rear = rear->next;
        if (front->num != rear->num)          return 0;
        else    i++;
     }
   return 1;
    }
```

Time Complexity : O(n) and Space Complexity: O(1)

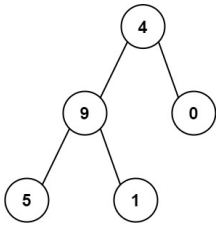
(5 M)

```
//Doubly Linked List
// Function to check if list is palindrome or not
bool isPalindrome(struct Node *left)
{
  if (left == NULL)
    return true;
  // Find rightmost node
  struct Node *right = left;
  while (right->next != NULL)
     right = right->next;
  while (left != right)
  {
```

```
        if (left->data != right->data)
            return false;
         left = left->next;
        right = right->prev;
    }
     return true;
}
```

Time Complexity : O(n) and Space Complexity: O(1)

2. Given a binary tree containing digits from 0-9 only in each node, each root-to-leaf path should represent a number. The root to leaf of [4,9,0,5,1] is given below — 10 — CO4 — BL3



Find the total sum of all root-to-leaf numbers. The root-to-leaf path 4->9->5 represents the number 495. The root-to-leaf path 4->9->1 represents the number 491. The root-to-leaf path 4->0 represents the number 40. Therefore, sum = 495 + 491 + 40 = 1026.

Explain and write a pseudocode for the above binary tree.

Sol:

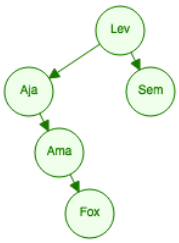
```
//Node Declaration
struct node
{
   int data;
   struct node *left, *right;
};

//allocate new node with given data
struct node* newNode(int data) {
   struct node* node = (struct node*)malloc(sizeof(struct node));
   node->data = data;
   node->left = node->right = NULL;
   return (node);
}
/* Returns sum of all root to leaf paths. The first parameter is root of current subtree, the second
parameter is value of the number formed by nodes from root to this node */
int treePathsSum(struct node *root, int val) {
   if (root == NULL)  return 0;
    val = (val*10 + root->data);
 //if current node is leaf, return the current value of val
  if (root->left==NULL && root->right==NULL)
      return val;
 // recur sum of values for left and right subtree
   return treePathsSum(root->left, val) +
        treePathsSum(root->right, val);
}
 // A wrapper function over treePathsSum()
int treePaths(struct node *root) {
// Pass the initial value as 0 as there is nothing above root
   return treePathsSum(root, 0);
}
int main(){
 treePaths(root)
}
```

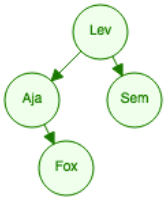
pseudocode – 8 Marks and Explanation – 2 marks

3. In a drawing competition on the day 1 of registration Lev, Aja, Sem, Ama, and Fox are registered. On the day 2 Ama withdraws from the competition, Ada, Asa, Rex, Cal and Wim registered. On the final day Lev followed by Ada quits from the competition, Art, Mac, Pax and Van registered for the competition. Construct a Binary Search Tree with suitable diagram and find the Person who is at first and last. 10 CO4 BL3

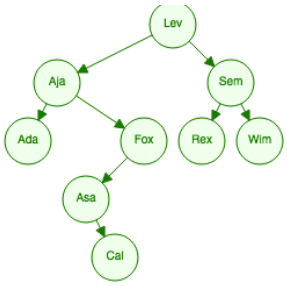
Sol:
Insert: Lev, Aja, Sem, Ama, Fox



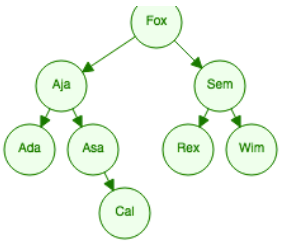
Delete: Ama

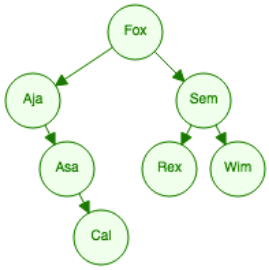


Insert: Ada, Asa, Rex, Cal, Wim

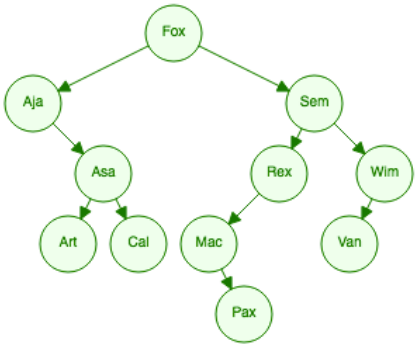


Delete: Lev, Ada



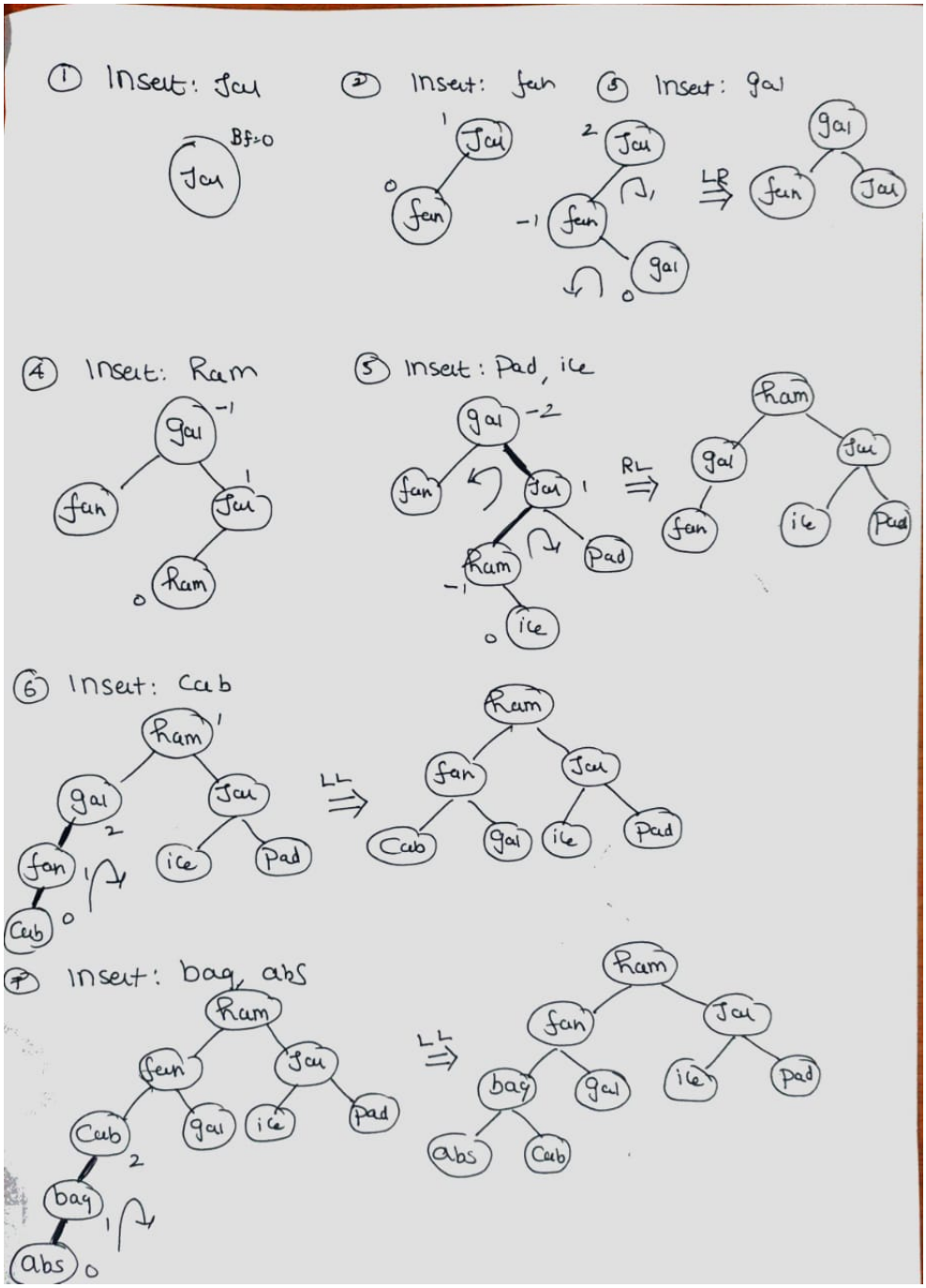


Insert: Art, Mac, Pax and Van

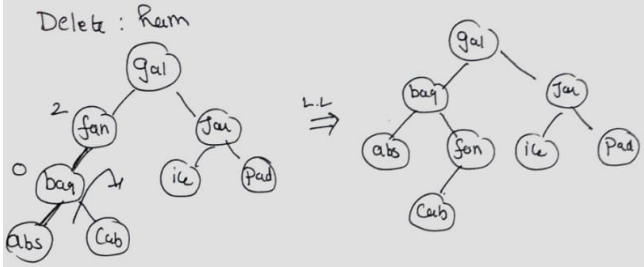


Person at first: Aja and the Person at the last : Wim

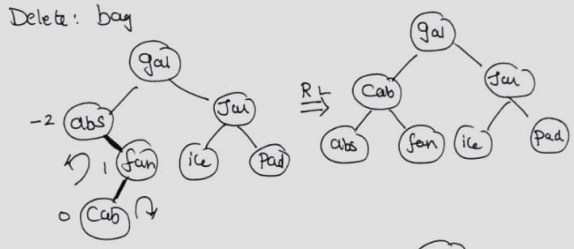
4. Construct an AVL tree with suitable diagram for the dictionary words given below. 10 CO5 BL3
Insert : {jar, fan, gal, ham, pad, ice, cab, bag, abs}
Delete: {ham, bag}
Insert: {van, tag, zee}
Delete: {jar, fan}
Sol:



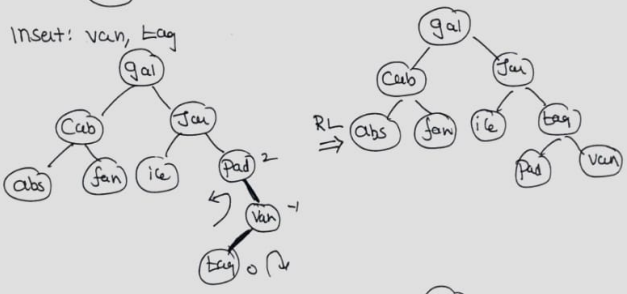
Delete : Ram



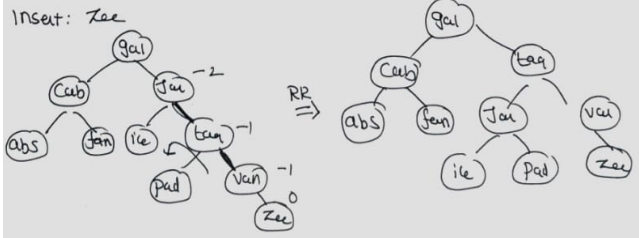
Delete: bag



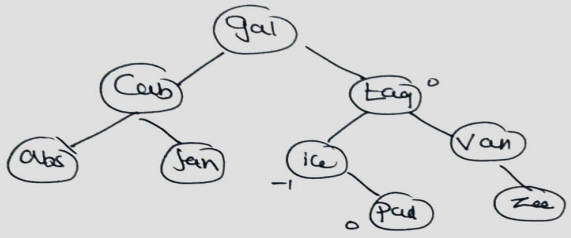
Insert: van, Eag



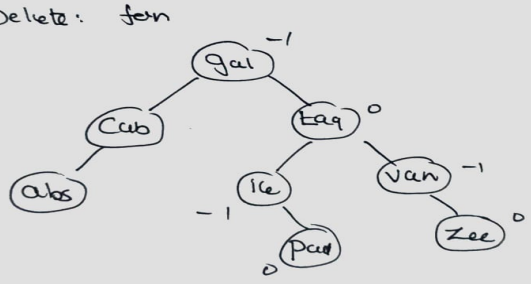
Insert: Zee



Delete: Jan



Delete: fan



5. Sort the given elements by creating a min-heap 45, 24, 73, 36, 65, 87, 94, 18, 88. 5+5 CO5 BL3
Illustrate with necessary diagrams.

Sol: Creating Min-heap (5M) and Sorting (5M)