PERFORMANCE

Term	Remarks	Staff Member's Signature
I	V.G	
II		

Exam Seat No._____

THAKUR COLLEGE OF SCIENCE & COMMERCE

NAAC Accredited with Grade "A" (3rd Cycle)

THAKUR TRUSTS

ISO 9001 : 2015 Certified

Degree College

Computer Journal

CERTIFICATE

SEMESTER II **UID No.** _____

Class FYBSc CS **Roll No.** 1738 **Year** 2019-2020

This is to certify that the work entered in this journal is the work of Mst. / ~~Ms.~~ Analkal Suraj Shivkumar who has worked for the year 2019-2020 in the Computer Laboratory.

Teacher In-Charge

Head of Department

Date :_____

Examiner

☆☆ INDEX ☆☆

impetus

impetus 24/01/20

★★ INDEX ★★

No.	Title	Page No.	Date	Staff Member's Signature
08	To Demonstrate the use of Linked list in data structure.	39		
09	To Evaluate Postfix Expression Using Stack.	41	24/01/20	
10	To Evaluate to sort the given data in Quick sort	43		
11	Binary Tree and Traversal	44		
12	Merge Sort	46		

PRACTICAL - 01

AIM:- To Search a number from the list using linear 'Sorted method

THEORY:- SEARCHING and SORTING are different modes or types of data - Structure

* SORTING : To basically SORT the inputed data in the ascending or descending manner.

* SEARCHING : To Search elements elements and to display the same.

* ~~LINEAR SORTED~~, In searching that too in linear Sorted search the data is arranged in ascending to descending order, that is all what it meant by Searching through 'Sorted' that is well arranged data

File Edit Format Run Options Window Help

```
print ("Suraj Anakal \n CS 38\n Batch A")
#LINEAR SORTED

j=0
a=(2,5,24,30,38,54,60)
print(a)
search=int(input("Entre number to be searched:") )
if ((search<a[0]) or (search>a[6])):
    print("Number does not exist")
else:
    for i in range (len(a)):
        if(search==a[i]):
            print("number found at:",i)
            j=1
            break
if(j==0):
    print("Number not found")
```

```
File Edit Shell Debug Options Window Help
Python 3.7.3 (v3.7.3:ef4ec6ed12, Mar 25 2019, 21:26:53) [MSC v.1916 32 bit (Intel)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
========== RESTART: C:\Users\DELL\Desktop\sorted.py ==========
Suraj Anakal
 CS 38
 Batch A
 (2, 5, 24, 30, 38, 54, 60)
 Entre number to be searched:38
 number found at: 4
 >>>
 ========== RESTART: C:\Users\DELL\Desktop\sorted.py ==========
 Suraj Anakal
  CS 38
  Batch A
  (2, 5, 24, 30, 38, 54, 60)
  Entre number to be searched:99
  Number does not exist
  Number not found
  >>>
```

CS

PRACTICAL - 01

AIM :- To search a number from the list using linear 'sorted method

THEORY :- SEARCHING and SORTING are different modes or types of data - Structure

* SORTING : To basically SORT the inputed data in the ascending or descending manner.

* SEARCHING : To search elements elements and to display the same.

* ~~LINEAR SORTED~~, In searching that too in linear sorted search the data is arranged in ascending to descending order, that is all what it meant by searching through 'sorted' that is well arranged data

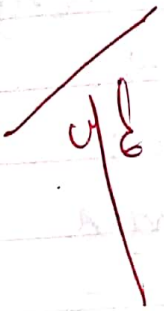

```
File Edit Format Run Options Window Help
print ("Suraj Anakal \n CS 38\n Batch A")
#LINEAR SORTED

j=0
a=(2,5,24,30,38,54,60)
print(a)
search=int(input("Entre number to be searched:") )
if ((search<a[0]) or (search>a[6])):
    print("Number does not exist")
else:
    for i in range (len(a)):
        if(search==a[i]):
            print("number found at:",i)
            j=1
            break
if(j==0):
    print("Number not found")
```

```
File Edit Shell Debug Options Window Help
Python 3.7.3 (v3.7.3:ef4ec6ed12, Mar 25 2019, 21:26:53) [MSC v.1916 32 bit (Intel)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
========== RESTART: C:\Users\DELL\Desktop\sorted.py ==========
Suraj Anakal
 CS 38
 Batch A
(2, 5, 24, 30, 38, 54, 60)
Entre number to be searched:38
number found at: 4
>>>
========== RESTART: C:\Users\DELL\Desktop\sorted.py ==========
Suraj Anakal
 CS 38
 Batch A
(2, 5, 24, 30, 38, 54, 60)
Entre number to be searched:99
Number does not exist
Number not found
>>>
```

Sorted Linear Search:

- The user is supposed to enter data in sorted manner
- User has to given an element for searching through sorted list
- If element is found display with an updation as value is stored from location '0'
- If data or element not found print the same
- In sorted order list of elements we can check the condition that whether the entered number lies from starting point till the last element if not then without any processing we can say number not in the list



29

PRACTICAL - 02

AIM: To Search a number from the list using linear unsorted.

THEORY: The process of identifying or finding a particular record is called searching.

There are two types of search

i) Linear search

ii) Binary search,

the linear search is further classified as Sorted and Unsorted.

Here we will look on the Unsorted linear search

It is also known as sequential search, is a process that checks every element in the list sequential search is a process that checks every elements in the list sequentially until the desired element is found when the elements to be search are not specifically arranged in ascending or descending order.

They are arranged in random manner, that is what it calls unsorted linear search

30

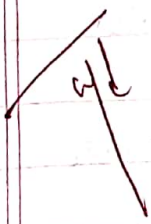
```
print ("Suraj Anakal \n CS 1738\n Batch A")
#LINEAR UNSORTED

j=0
a=(23,9,29,6,10,15)
print(a)
search=int(input("Entre number to be searched") )
for i in range (len(a)):
    if (search==a[i]):
        print ("Number found at",i)
        j=1
        break
if (j==0):
        print("Number not found")
```

```
Python 3.7.3 (v3.7.3:ef4ec6ed12, Mar 25 2019, 21:26:53) [MSC v.1916 32 bit (Intel)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
========== RESTART: C:\Users\DELL\Desktop\LINEAR UNSORTED.py ==========
Suraj Anakal
 CS 1738
 Batch A
 (23, 9, 29, 6, 10, 15)
 Entre number to be searched23
 Number found at 0
 >>>
 ========== RESTART: C:\Users\DELL\Desktop\LINEAR UNSORTED.py ==========
 Suraj Anakal
  CS 1738
  Batch A
  (23, 9, 29, 6, 10, 15)
  Entre number to be searched33
  Number not found
  >>>
```

Unsorted Linear Search:

- The data is entered in random manner
- The user needs to specify the elements to be searches in the entered list.
- Check the condition that whether the entred number matches if it matches then display the location plus increment 1 as data is stored from location zero.
- If all element are checked one by one and element not found then prompt that number is not found.



PRACTICAL - 03

AIM:- To search a number from the given sorted list using binary search

THEORY:- A linary search is also known as a half-interval search is an algorithm used in the computer science to locate a specified value (key) within an array. For the search to binary, the array must be in binary and be sorted in either ascending or descending order.

At each step of the algorithm a comparison is made and the procedure branches into one of two directions.

Specifically, the key value is compared to the middle elements of the array. If the key value is less than or greater than this middle elements, the algorithm knows which half of the array to continue searching in because the array is sorted.

This process is repeated on progressively smaller segments of array until the value is sorted.

Because each step in the algorithm divides the array size in half, a binary search will complete successfully in logarithmic time


```
#SOURCE CODE:
print("FYCS CS ANAKAL SURAJ 1738")
a=[3,4,21,23,25,29,64]
print(a)
search=int(input("Enter Number To Be Searched:"))
l=0
h=len(a)-1
m=int((l+h)/2)
if(search<a[l]) or (search>a[h])):
    print("Does Not Exists")
elif(search==a[h]):
    print("Number Found At:",h)
elif(search==a[l]):
    print("Number Found At:",l)
else:
    while(l!=h):
        if(search==a[m]):
            print ("Number Found At:",m)
            break
        else:
            if(search<a[m]):
                h=m
                m=int((l+h)/2)
            else:
                l=m
                m=int((l+h)/2)
            if(search!=a[m]):
                print("NO Not Found")
                break
```

OUT PUT:

```
>>>
FYCS CS ANAKAL SURAJ 1738
[3, 4, 21, 23, 25, 29, 64]
Enter Number To Be Searched:23
Number Found At: 3

>>>
FYCS CS ANAKAL SURAJ 1738
[3, 4, 21, 23, 25, 29, 64]
Enter Number To Be Searched:60
NO Not Found

>>>
FYCS CS ANAKAL SURAJ 1738
[3, 4, 21, 23, 25, 29, 64]
Enter Number To Be Searched:99
Does Not Exists
```

PRACTICAL - 04

AIM:- To Sort given random data by using bubble Sort.

THEORY:- Sorting is the type in which any random data is sorted, i.e arranged in ascending or descending order.

- Bubble Sort sometimes referred to sinking sort is a simple sorting algorithm that repeatedly steps through the list, compares adjacent elements and swaps them if they are in wrong order.
- The pass through the list is repeated until the list is sorted.
- The algorithm which is a comparision sort is named for the heavy smaller or larger elements "bubble" to the top of the list.
- Although the algorithm is simple, it is too slow as it compare one element to check if condition fails then only swaps otherwise it goes on.

Example:-

(6 1 5 2 4) → (1 6 5 2 4), here algorithm compares the first two elements and get exchange with each i.e 6>1

(1 6 5 2 4) → (1 5 6 2 4) swap 6>5

(1 5 6 2 4) → (1 5 2 6 4) swap 6>2

(1 5 2 6 4) → (1 5 2 4 6) these elements are already

in order (9>5) Algorithm does not swap them

Second Pass :-
(15269) → (15269)
(15269) → (12569) swap 5>2
(12569) → (12569)

Third pass
(12569) It checks and gives the data in sorted order.

#SOURCE CODE:

```
print("FYBSC CS ANAKAL SURAJ 1738")
a=[9,45,55,23,34,39]
for p in range(len(a)-1):
    for c in range(len(a)-1-p):
        if(a[c]>a[c+1]):
            t=a[c]
            a[c]=a[c+1]
            a[c+1]=t
print(a)
```

OUT PUT:

```
>>>
FYBSC CS ANAKAL SURAJ 1738
[9, 23, 34, 39, 45, 55]
```

SOURCE CODE:

```
## Stack ##

print("ANAKAL SURAJ")
class stack:
  global tos
  def __init__(self):
    self.l=[0,0,0,0,0,0,0]
    self.tos=-1
  def push(self,data):

    n=len(self.l)
    if self.tos==n-1:
      print("stack is full")
    else:
      self.tos=self.tos+1
      self.l[self.tos]=data
  def pop(self):
    if self.tos<0:
      print("stack empty")
    else:
      k=self.l[self.tos]
      print("data=",k)
      self.tos=self.tos-1
s=stack()
s.push(10)
s.push(20)
s.push(30)
s.push(40)
s.push(50)
s.push(60)
s.push(70)
s.push(80)

s.pop()
s.pop()
s.pop()
s.pop()
s.pop()
s.pop()
s.pop()
s.pop()
```


PRACTICAL - 05

Aim:- To demonstrate the use of stack

Theory:- In computer science, a stack is an abstract data type that screen as a collection of elements with two principle operation push, which adds an elements to the collection and pop recently added element that was not yet removed. The order may be LIFO or FILO (Last In First out) (First In Last out).

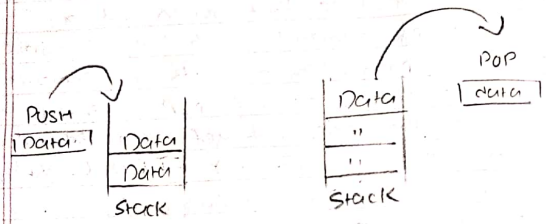
The three basic operations are performed in the stack

* **PUSH:-** It adds an item in the if then the stack is full then it is said to be over flow condition.

* **POP:-** Removes an item from the stacks, the items are popped in the reverses order in which they are pushed. If the stack is empty, then it is said to be underflow condition.

* **Peek or TOP:-** Returns top elements of the stack.

* Is Empty : Returns true if stack is empty else false.



Last-in - First-out

OUTPUT:

```
ANAKAL SURAJ
stack is full
 data= 70
 data= 60
 data= 50
 data= 40
 data= 30
 data= 20
 data= 10
 stack empty
```

SOURCE CODE:

```
## Queue add and Delete ##

class Queue:
  global r
  global f
  def __init__(self):
    self.r=0
    self.f=0
    self.l=[0,0,0,0,0,0]
  def add(self,data):
    n=len(self.l)
    if self.r<n-1:
      self.l[self.r]=data
      self.r=self.r+1
    else:
      print("Queue is full")
  def remove(self):
    n=len(self.l)
    if self.f<n-1:
      print(self.l[self.f])
      self.f=self.f+1
    else:
      print("Queue is empty")
Q=Queue()
Q.add(30)
Q.add(40)
Q.add(50)
Q.add(60)
Q.add(70)
Q.add(80)
Q.remove()
Q.remove()
Q.remove()
Q.remove()
Q.remove()
Q.remove()
```

OUTPUT:

```
Queue is full
30
40
50
60
70
Queue is empty
```


PRACTICAL-06

AIM:- To demonstrate Queue add and delete

THEORY:-

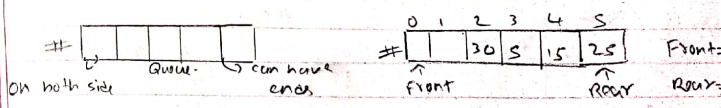
Queue is a linear data structure where the first element is inserted from one end is called REAR and deleted from the outer end is called FRONT

Front points to the beginning of the queue follows the FIFO (First in First out) structure. According to its FIFO structure element inserted first will also be removed first.

In a queue, one end is always used to insert data (enqueue) and the other is used to delete data (dequeue) because queue is open at both of its end, Enqueue() can be termed as add() ~~in queue i.e~~ adding a element in a queue. Dequeue() can be termed as delete or Remove i.e deleting or removing the elements.

Front is used to get the front data item from a queue.

Rear is used to get the last item from a queue.

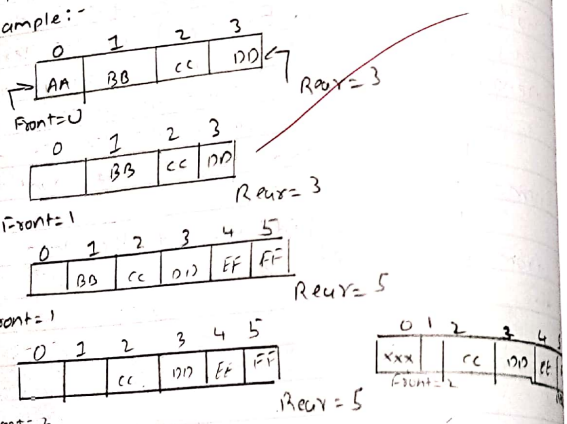


PRACTICAL-07

AIM:- To demonstrate the use of circular queue is data structure.

THEORY:- The queue that we implement using an array suffer from one limitation. In that implementation there is a possibility that the queue is reported as full, even though is actuality there might be empty slots at the beginning of the queue. In circular queue as circular queue, then in that we keep on adding the element to the queue and reach the end of the array. The next element is stored in the first slot of the array

Example:-



SOURCE CODE:

```
#(circular queue)
class Queue:
  global r
  global f
  def __init__(self):
    self.r=0
    self.f=0
    self.l=[0,0,0,0,0,0]
  def add(self,data):
    n=len(self.l)
    if self.r<=n-1:
      self.l[self.r]=data
      print("data added:",data)
      self.r=self.r+1
    else:
      s=self.r
      self.r=0
      if self.r<self.f:
        self.l[self.r]=data
        self.r=self.r+1
      else:
        self.r=s
        print("Queue is full")
  def remove(self):
    n=len(self.l)
    if self.f<=n-1:
print("data removed:",self.l[self.f])
      self.f=self.f+1
    else:
      s=self.f
      self.f=0
      if self.f<self.r:
        print(self.l[self.f])
        self.f=self.f+1
      else:
        print("Queue is empty")
        self.f=s
Q=Queue()
Q.add(44)
Q.add(55)
Q.add(66)
Q.add(77)
Q.add(88)
Q.add(99)
Q.remove()
Q.add(66)
```

OUTPUT :

```
data added: 44
data added: 55
data added: 66
data added: 77
data added: 88
data added: 99
data removed: 44
```

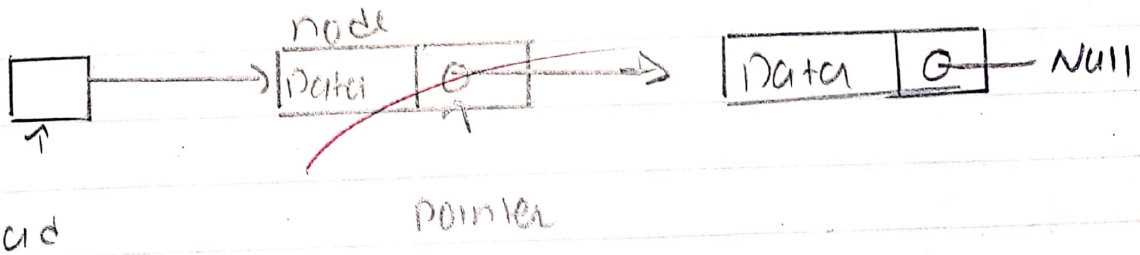
PRACTICAL - 08

AIM:- To Demonstrate the use of Linked list in data structure.

Theory:- A linked list is a sequence of the data structure. Linked list is a sequence of links which contains items. Each link contains a connection to another link.

- **Link** - Each link of linked list can store a data called an element.
- **NEXT:-** Each link of a linked list can store a link to the next link called NEXT.
- **LINKED:-** A linked list contains link to the first link called first.

Representation of Linked List:



* TYPES OF Linked List:

- Simple.
- Doubly
- Circular

* Basic Operator

- Insertion
- Deletion
- Display
- Search
- Delete


```
##LINKLIST##
print("ANAKALSURAJ 1738")
class node:
    global data
    global next
  def __init__(self,item):

  self.data=item
      self.next=None
   class linkedlist:
     global s
     def __init__(self):
       self.s=None
      def addL(self,item):
        newnode=node(item)
        if self.s==None:
          self.s=newnode
        else:
         head=self.s
         while head.next!=None:
           head=head.next
          head.next=newnode
       def addB(self,item):
          newnode=node(item)
          if self.s==None:
            self.s=newnode
          else:
            newnode.next=self.s
            self.s=newnode
        def display(self):
          head=self.s
          while head.next!=None:
            print (head.data)
             head=head.next
            print (head.data)
      start=linkedlist()
      start.addL(50)
      start.addL(60)
      start.addL(70)
      start.addL(80)
      start.addB(40)
      start.addB(30)
      start.addB(20)
      start.display()

        OUTPUT:
        ANAKAL SURAJ 1738
         20
         30
         40
         50
         60
         70
         80
```

PRACTICAL-09

AIM:- To Evaluate Postfix Expression Using Stack.

Theory:- Stack is an (ADT) and work on LIFO (Last-In-First-Out) i.e Push and Pop operations. A postfix expression is a collection of operatory and operands in which the operators is placed after the operands.

* **Steps to be followed:**

- Read all Symbols on by one from left to right in the given postfix expression.
- If the reading symbol is operand then push it on to the stack.
- If the reading symbol is operator i.e (+, −, *, /, // etc) then perform Two operations and store the two popped operands in two different variables (operand 1 and operand 2)
- Then perform reading symbol operation using operand 1 and operand 2 and push result back on to the stack.
- Finally, Perform a pop operation and display the popped value as final result.

```
##Postfix##
print("ANAKAL SURAJ 1738")
def evaluate(s):
  k=s.split()
  n=len(k)
  stack=[]
  a=[]
  for i in range(n):
    if k[i].isdigit():
      stack.append(int(k[i]))
    elif k[i]=='+':
      a=stack.pop()
      b=stack.pop()
      stack.append(int(b)+int(a))
    elif k[i]=='-':
      a=stack.pop()
      b=stack.pop()
      stack.append(int(b)-int(a))
    elif k[i]=='*':
      a=stack.pop()
      b=stack.pop()
      stack.append(int(b)*int(a))
    else:
      a=stack.pop()
      b=stack.pop()
      stack.append(int(b)/int(a))
  return stack.pop()
s="2 3 9 * +"
r=evaluate(s)
print("The evaluated value is:",r)
```

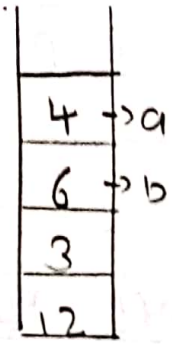
OUTPUT:

```
ANAKAL SURAJ 1738
The evaluated value is: 29
```

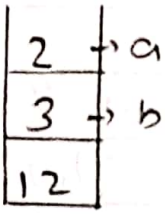
Value of Postfix Expression

S = 12 3 6 4 - + *

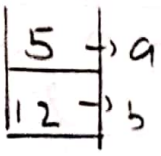
Stack :



b-a = 6 - 4 = 2 // store again in stack



b+a = 3 + 2 = 5 // store result in stack



b * a = 12 * 5 = 60

Scanned by CamScanner

PRACTICAL-10

AIM:- To evaluate i.e to sort the given data in Quick Sort.

Theory:-

-> Quick Sort is an efficient sorting algorithm, type of of divide and Conquer algorithm. It picks an elements as pivot and partitions the given array around the picked pivot

-> There are many different version of quick Sort that pick pivot in different types.

a) Always pick the first element as pivot point
b) Always pick the last element as pivot
c) Pick a random element as pivot
d) Pick median as the pivot point

-> The key process in quicksort is partition(). Target of partition is given an array and an element x of array as pivot, put x at its current position in sorted array and put all smaller element before x and put all the greater element (greater than x) after x.

- All this should be done in the liner times

```
##QUICK SORT##

print("ANAKAL SURAJ 1738")
print("The Quick sort is:")
def quickSort(alist):
   quickSortHelper(alist,0,len(alist)-1)
def quickSortHelper(alist,first,last):
   if first<last:
      splitpoint=partition(alist,first,last)
      quickSortHelper(alist,first,splitpoint-1)
      quickSortHelper(alist,splitpoint+1,last)
def partition(alist,first,last):
   pivotvalue=alist[first]
   leftmark=first+1
   rightmark=last
   done=False
   while not done:
      while leftmark<=rightmark and alist[leftmark]<=pivotvalue:
         leftmark=leftmark+1
      while alist[rightmark]>=pivotvalue and rightmark>=leftmark:
         rightmark=rightmark-1
      if rightmark<leftmark:
         done=True
      else:
         temp=alist[leftmark]
         alist[leftmark]=alist[rightmark]
         alist[rightmark]=temp
   temp=alist[first]
   alist[first]=alist[rightmark]
   alist[rightmark]=temp
      return rightmark
alist=[9,36,3,23,45,67,87,99,30]
print(alist)


========== RESTART: C:\Users\DELL\Documents\Quick Sort.py ==========
ANAKAL SURAJ 1738
The Quick sort is:
[3, 9, 23, 30, 36, 45, 67, 87, 99]
>>>
```

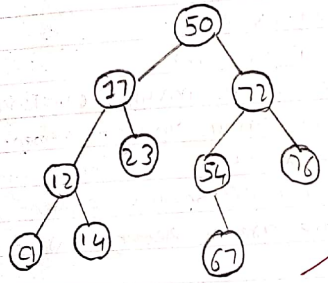
PRACTICAL 17

Aim:- Binary Tree and Traversal

Theory:- A Binary tree is a special type of a tree in which every node or vertex has either no child or one child node or two child node.

A binanary tree is an important class of data structure in which a node can have at most two children

Diagramatic Representation of Binary Search Tree



Traversal is a process to visit all the node of tree and may print their value to. The are 3 ways which we use to traverse tree

SOURCE CODE:

```
#Binary Tree and Traversal
print("ANAKAL SURAJ 1738")
class Node:
    global r
    global l
    global data
    def __init__(self,l):
        self.l=None
        self.data=l
        self.r=None
class Tree:
    global root
    def __init__(self):
        self.root=None
    def add(self,val):
        if self.root==None:
            self.root=Node(val)
        else:
            newnode=Node(val)
            h=self.root
            while True:
                if newnode.data<h.data:
                    if h.l!=None:
                        h=h.l
                    else:
```

```
                h.l=newnode
                print(newnode.data,"Added On Left Of",h.data)
                break
            else:
                if h.r!=None:
                    h=h.r
                else:
                    h.r=newnode
                    print(newnode.data,"Added On Right Of",h.data)
                    break
    def preorder(self,start):
        if start!=None:
            print(start.data)
            self.preorder(start.l)
            self.preorder(start.r)
    def inorder(self,start):
        if start!=None:
            self.inorder(start.l)
            print(start.data)
            self.inorder(start.r)
    def postorder(self,start):
        if start!=None:
            self.postorder(start.l)
            self.postorder(start.r)
            print(start.data)
T=Tree()
```

```
80
70
10
60
15
12
78
85
88
Inorder:
10
12
15
60
70
78
80
85
88
100
Postorder:
12
15
60
10
78
```

70
88
85
80
100

```
T.add(100)
T.add(80)
T.add(70)
T.add(85)
T.add(10)
T.add(78)
T.add(60)
T.add(88)
T.add(15)
T.add(12)
print("Preorder:")
T.preorder(T.root)
print("Inorder:")
T.inorder(T.root)
print("Postorder:")
T.postorder(T.root)
```

OUTPUT:

```
>>>
ANAKAL SURAJ 1738
80 Added On Left Of 100
70 Added On Left Of 80807
12 Added On Left Of 15
Preorder:
100
```

INORDER

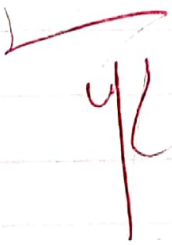
PREORDER

POSTORDER

In-Order :- The left-Subtree is visited 1st then the root and later the right Sub tree. We should always remember that every node may represent a subtree itself output produced is sorted key values in ASCENDING ORDER.

PRE-ORDER : The root node is visited ~~1st~~ 1st then the left subtree and finally the right Subtree

POST-Order : The root node is visited last left Subtree, then the rightsubtree and finally root node.



PRACTICAL - 22

Aim:- Merge Sort.

Theory:-

Merge sort is a sorting technique based on divide and conquer technique with the worst-case time complexity being O(n log n), it one of the most respected algorithm.

It first divide the array into equal halves and the combines them in a sorted manner.

Merge sort divide input array in two halves, calls itself for two and then merge the two sorted halves, The merge() function is used for merging 2 halves. The merge (arr, l, m, r) is a key process that assume that arr [l...m] and arr [m+1...r] are sorted and merges the two sorted sub-array into one

SOURCE CODE:

```
#MergeSort
print("ANAKAL SURAJ 1738")
def sort(arr,l,m,r):
    n1=m-l+1
    n2=r-m
    L=[0]*(n1)
    R=[0]*(n2)
for i in range(0,n1):
        L[i]=arr[l+i]
for j in range(0,n2):
        R[j]=arr[m+1+j]
i=0
    j=0
    k=l
while i<n1 and j<n2:
if L[i]<=R[j]:
arr[k]=L[i]
i+=1
        j+=1
        k+=1
 else:
arr[k]=R[j]
        j+=1
        k+=1
while i<n1:
arr[k]=L[i]
i+=1
        k+=1
while j<n2:
arr[k]=R[j]
        j+=1
        k+=1
defmergesort(arr,l,r):
if l<r:
        m=int((l+(r-1))/2)
    mergesort(arr,l,m)
    mergesort(arr,m+1,r)
    sort(arr,l,m,r)
    arr=[12,23,34,56,78,45,86,98,42]
    print("Before Mergesort\n",arr)
    n=len(arr)
    mergesort(arr,0,n-1)
    print("After Mergesort\n",arr)
```

OUTPUT:

```
>>>
ANAKAL SURAJ 1738
Before Mergesort
[12, 23, 34, 56, 78, 45, 86, 98, 42]
After Mergesort
[12, 23, 34, 56, 42, 45, 78, 86, 98]
```