Data Structure and Algorithm Lab Experiment

Binary Search Tree

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The Psuedo code:

- First we ask the user for characters or numbers.
- Then we insert the elements into the binary search tree.
- Then we ask user for inorder, postorder or preorder.
- Then we print the elements of the desired code.

The Code:

```
# include <stdio.h>
# include <conio.h>
# include <stdlib.h>

typedef struct BST {
  int data;
  struct BST *lchild, *rchild;
} node;

void insert(node *, node *);
void inorder(node *);
void preorder(node *);
void postorder(node *);
node *search(node *, int, node **);

typedef struct BST1 {
```

```
  char data[100];
  struct BST1 *lchild1, *rchild1;
} node1;

void insert1(node1 *, node1 *);
void inorder1(node1 *);
void preorder1(node1 *);
void postorder1(node1 *);
node1 *search1(node1 *, char, node1 **);

void main() {
  int choice,ch;
  char ans = 'N';
  int key;
  node *new_node, *root, *tmp, *parent;
  node *get_node();
  root = NULL;

  int choice1;
  char ans1 = 'N';
  char key1[100];
  node1 *new_node1, *root1, *tmp1, *parent1;
```

```
node1 *get_node1();
root1 = NULL;
//clrscr();
printf("\n****Program For Binary Search Tree**** ");

printf("\nEnter your choice : ");
printf("\n1. for numbers and 2. for characters : ");
scanf("%d",&ch);
if(ch==1)
{
do {
  printf("\n1.Create");
  printf("\n2.Search");
  printf("\n3.Recursive Traversals");
  printf("\n4.Exit");
  printf("\nEnter your choice :");
  scanf("%d", &choice);

  switch (choice) {
  case 1:
    do {
       new_node = get_node();
```

```
      printf("\nEnter The Element ");
      scanf("%d", &new_node->data);

      if (root == NULL) /* Tree is not Created */
        root = new_node;
      else
        insert(root, new_node);

      printf("\nWant To enter More Elements?(y/n)");
      ans = getch();
    } while (ans == 'y');
    break;

  case 2:
    printf("\nEnter Element to be searched :");
    scanf("%d", &key);

    tmp = search(root, key, &parent);
    printf("\nParent of node %d is %d", tmp->data, parent->data);
    break;

  case 3:
```

```
      if (root == NULL)
        printf("Tree Is Not Created");
      else {
        printf("\nThe Inorder display : ");
        inorder(root);
        printf("\nThe Preorder display : ");
        preorder(root);
        printf("\nThe Postorder display : ");
        postorder(root);
      }
      break;
    }
} while (choice != 4);
}
else if(ch==2)
{
    do {
   printf("\n1.Create");
   printf("\n2.Search");
   printf("\n3.Recursive Traversals");
   printf("\n4.Exit");
   printf("\nEnter your choice :");
```

```
scanf("%d", &choice1);

switch (choice1) {
case 1:
  do {
    new_node1 = get_node1();
    printf("\nEnter The Element ");
    scanf("%s", &new_node1->data);

    if (root1 == NULL) /* Tree is not Created */
      root1 = new_node1;
    else
      insert(root1, new_node1);

    printf("\nWant To enter More Elements?(y/n)");
    ans1 = getch();
  } while (ans1 == 'y');
  break;

case 2:
  printf("\nEnter Element to be searched :");
  scanf("%s", &key1);
```

```
    tmp1 = search1(root1, key1, &parent1);
    printf("\nParent of node %d is %d", tmp1->data, parent1->data);
    break;

  case 3:
    if (root1 == NULL)
      printf("Tree Is Not Created");
    else {
      printf("\nThe Inorder display : ");
      inorder1(root1);
      printf("\nThe Preorder display : ");
      preorder1(root1);
      printf("\nThe Postorder display : ");
      postorder1(root1);
    }
    break;
  }
} while (choice1 != 4);
}
else
{
```

```
      printf("Wrong choice!!");
    }
  }
  /*
   Get new Node
   */
  node *get_node() {
    node *temp;
    temp = (node *) malloc(sizeof(node));
    temp->lchild = NULL;
    temp->rchild = NULL;
    return temp;
  }
  /*
   This function is for creating a binary search tree
   */
  void insert(node *root, node *new_node) {
    if (new_node->data < root->data) {
      if (root->lchild == NULL)
        root->lchild = new_node;
      else
        insert(root->lchild, new_node);
```

```
  }

  if (new_node->data > root->data) {
    if (root->rchild == NULL)
      root->rchild = new_node;
    else
      insert(root->rchild, new_node);
  }
}
/*
 This function is for searching the node from
 binary Search Tree
 */
node *search(node *root, int key, node **parent) {
  node *temp;
  temp = root;
  while (temp != NULL) {
    if (temp->data == key) {
      printf("\nThe %d Element is Present", temp->data);
      return temp;
    }
    *parent = temp;
```

```
    if (temp->data > key)
      temp = temp->lchild;
    else
      temp = temp->rchild;
  }
  return NULL;
}
/*
 This function displays the tree in inorder fashion
 */
void inorder(node *temp) {
  if (temp != NULL) {
    inorder(temp->lchild);
    printf("%d ", temp->data);
    inorder(temp->rchild);
  }
}
/*
 This function displays the tree in preorder fashion
 */
void preorder(node *temp) {
```

```
  if (temp != NULL) {
    printf("%d ", temp->data);
    preorder(temp->lchild);
    preorder(temp->rchild);
  }
}

/*
 This function displays the tree in postorder fashion
 */
void postorder(node *temp) {
  if (temp != NULL) {
    postorder(temp->lchild);
    postorder(temp->rchild);
    printf("%d ", temp->data);
  }
}


node1 *get_node1() {
  node1 *temp1;
  temp1 = (node1 *) malloc(sizeof(node1));
```

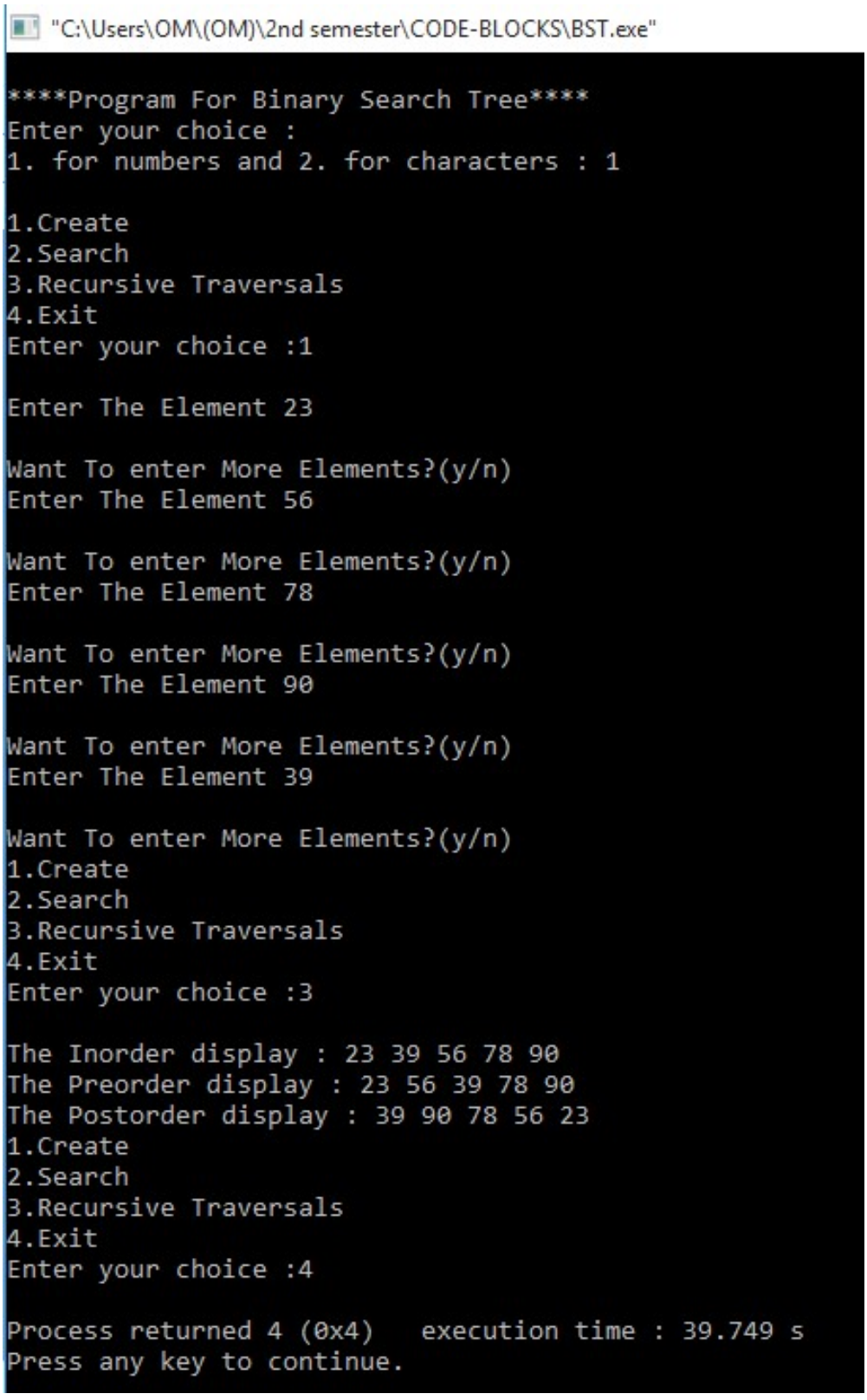
```
  temp1->lchild1 = NULL;
  temp1->rchild1 = NULL;
  return temp1;
}
/*
 This function is for creating a binary search tree
 */
void insert1(node1 *root1, node1 *new_node1) {
  if (strcmp(new_node1->data,root1->data)<0) {
    if (root1->lchild1 == NULL)
      strcpy(root1->lchild1,new_node1);
    else
      insert(root1->lchild1, new_node1);
  }

  if (strcmp(new_node1->data,root1->data)>0) {
    if (root1->rchild1 == NULL)
      strcpy(root1->rchild1,new_node1);
    else
      insert(root1->rchild1, new_node1);
  }
}
```

```
/*
 This function is for searching the node from
 binary Search Tree
 */
node1 *search1(node1 *root1, char key1, node1 **parent1) {
  node1 *temp1;
  strcpy(temp1,root1);
  while (temp1 != NULL) {
    if (strcmp(temp1->data,key1)==0) {
      printf("\nThe %d Element is Present", temp1->data);
      return temp1;
    }
    strcpy(*parent1,temp1);

    if (strcmp(temp1->data,key1)>0)
      strcpy(temp1,temp1->lchild1);
    else
      strcpy(temp1,temp1->rchild1);
  }
  return NULL;
}
/*
```

```
 This function displays the tree in inorder fashion
 */
void inorder1(node1 *temp1) {
  if (temp1 != NULL) {
     inorder1(temp1->lchild1);
     printf("%s ", temp1->data);
     inorder1(temp1->rchild1);
  }
}
/*
 This function displays the tree in preorder fashion
 */
void preorder1(node1 *temp1) {
  if (temp1 != NULL) {
     printf("%s ", temp1->data);
     preorder1(temp1->lchild1);
     preorder1(temp1->rchild1);
  }
}

/*
 This function displays the tree in postorder fashion
```

```
 */
void postorder1(node1 *temp1) {
  if (temp1 != NULL) {
    postorder1(temp1->lchild1);
    postorder1(temp1->rchild1);
    printf("%s ", temp1->data);
  }
}
```

The Output:


"C:\Users\OM\(OM)\2nd semester\CODE-BLOCKS\BST.exe"
****Program For Binary Search Tree****
Enter your choice :
1. for numbers and 2. for characters : 1
1.Create
2.Search
3.Recursive Traversals
4.Exit
Enter your choice :1
Enter The Element 23
Want To enter More Elements?(y/n)
Enter The Element 56
Want To enter More Elements?(y/n)
Enter The Element 78
Want To enter More Elements?(y/n)
Enter The Element 90
Want To enter More Elements?(y/n)
Enter The Element 39
Want To enter More Elements?(y/n)
1.Create
2.Search
3.Recursive Traversals
4.Exit
Enter your choice :3
The Inorder display : 23 39 56 78 90
The Preorder display : 23 56 39 78 90
The Postorder display : 39 90 78 56 23
1.Create
2.Search
3.Recursive Traversals
4.Exit
Enter your choice :4
Process returned 4 (0x4) execution time : 39.749 s
Press any key to continue.