Data Structures Assignment – 2

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Class : MCA – 3

Subject : Data Structure

Q 1 . Linear Search

```
#include<iostream>
using namespace std;

class Linear{
    public:
    int arr[10];
     int i = 0;

    Linear(){
        getData();
    }

    void getData(){
        i = 0;
        cout << "Enter Values In array : ";
        while(i != 10){
            cin >> arr[i];
            i++;
        }
    }

    int getNumber(){
        int n;
        cout << "Enter Values You want to Search : ";
        cin >> n;
```

```
        return n;
    }

    int linearsearch(int n) {
        i = 0;
        while(i != 10){
            if(arr[i] == n) {
                return i;
            }
        i++;
        }
        return -1;
    }
};

int main(){
    Linear l;
    char ch;
    while(1){

        int search = l.getNumber();
        int result = l.linearsearch(search);
        if(result < 0) cout << "Value Not Present in Array List." << endl;
        else cout << "Search Value Located At " << result << " index of the array" << end
l;
        cout << "Press /'c/' for continue search (Any other character than /'c/' will exi
t the Program) : ";
        cin >> ch;
        if(ch != 'c')
            exit(0);
    }
}
```

Output :

PS E:\MCA\MCA SEM 3\DS\40%> .\linear.exe

Enter Values In array : 21

12

34

8

5

40

39

20

11

1

Enter Values You want to Search : 12

Search Value Located At 1 index of the array

Press /'c/' for continue search (Any other character than /'c/' will exit the Program) : c

Enter Values You want to Search : 34

Search Value Located At 2 index of the array

Press /'c/' for continue search (Any other character than /'c/' will exit the Program) : c

Enter Values You want to Search : 21

Search Value Located At 0 index of the array

Press /'c/' for continue search (Any other character than /'c/' will exit the Program) : c

Enter Values You want to Search : 1

Search Value Located At 9 index of the array

Press /'c/' for continue search (Any other character than /'c/' will exit the Program) : c

Enter Values You want to Search : 5

Search Value Located At 4 index of the array

Press /'c/' for continue search (Any other character than /'c/' will exit the Program) : z

Q 2 . Binary Search

```
#include<iostream>
using namespace std;

class Binary{
    public:
    int arr[10];
     int i = 0;

    Binary(){
        getData();
    }

    void getData(){
        i = 0;
        cout << "Enter Values In array : ";
        while(i != 10){
            cin >> arr[i];
            i++;
        }
    }

    int getNumber(){
        int n;
        cout << "Enter Values You want to Search : ";
        cin >> n;
        return n;
    }

    int binarySearch(int n) {
        i = 0;
        int j = 9;
        while(j >= i){
            int k = (i+j)/2;
            if(arr[k] < n){
                i = k + 1;
            }
            else if (arr[k] > n) {
                j = k - 1;
            }
            else{
                return k;
            }
        }
        return -1;
    }
};
```

```
int main(){
    Binary l;
    char ch;
    while(1){

        int search = l.getNumber();
        int result = l.binarySearch(search);
        if(result < 0) cout << "Value Not Present in Array List." << endl;
        else cout << "Search Value Located At " << result << " index of the array" << end
l;
        cout << "Press /'c/' for continue search (Any other character than /'c/' will exi
t the Program) : ";
        cin >> ch;
        if(ch != 'c')
            exit(0);
    }
}
```

Output :

PS E:\MCA\MCA SEM 3\DS\40%> .\Binary.exe

Enter Values In array : 10

12

14

18

19

22

47

49

62

81

Enter Values You want to Search : 12

Search Value Located At 1 index of the array

Press /'c/' for continue search (Any other character than /'c/' will exit the Program) : c

Enter Values You want to Search : 31

Value Not Present in Array List.

Press /'c/' for continue search (Any other character than /'c/' will exit the Program) : c

Enter Values You want to Search : 62

Search Value Located At 8 index of the array

Press /'c/' for continue search (Any other character than /'c/' will exit the Program) : m

Q 3 . Expression Tree

```
#include<iostream>
#include<cstring>
using namespace std;

class Stack {

    class Value {
        public:
        string data;
        Value *Next;

        Value(char n) {
            data = n;
            Next = NULL;
        }
    };

    Value *top;
    int size, count;

    public:

    Stack(int size)
    {
        if (size < 1)
            size = 5;
        this->size = size;
        count = 0;
        top = NULL;
    }

    bool isFull(){
        return (count >= size);
    }

    bool isEmpty(){
        return !top;
    }

    void push(char n){
        if(isFull()){
            cout << "Overflowed" << endl;
            return;
        }
        Value *val = new Value(n);
```

```
        val->Next = top;
        top = val;
        count++;
    }

    void edit(char n){
        if(isEmpty()) {
            cout << "UnderFlowed" << endl;
        }
        top->Next->data += n;
        string poped = pop();
        top->data += poped;
    }

    string pop() {
        string lastdelete = top->data;
        top = top->Next;
        count--;
        return lastdelete;
    }

    void display() {
        if(isEmpty())
            cout << "Empty" << endl;
        else
            cout << top->data << endl;
    }

    bool isOperator(char c)
    {
        if (c == '+' || c == '-' || c == '*' || c == '/' || c == '^') return true;

        return false;
    }
};

int main(){
    char Post_Expresion[] = "ab+cd/+efg*-*";
    int i = 0,length = strlen(Post_Expresion);
    Stack s(length);

    while(Post_Expresion[i] != '\0') {
        if(s.isOperator(Post_Expresion[i])){
            s.edit(Post_Expresion[i]);
        }
        else {
            s.push(Post_Expresion[i]);
        }
        i++;
    }
```

```
    s.display();
    return 0;
}
```

Output :

PS E:\MCA\MCA SEM 3\DS\40%> .\Expression.exe

a+b+c/d*e-f*g

Q 4 . Binary Search Tree

```
#include<iostream>
using namespace std;

struct tree{
    int data;
    tree *left,*right;
};

// method declaration
void menu(struct tree *);
struct tree * construct(struct tree *);
void preorder(struct tree *);
void postorder(struct tree *);
void inorder(struct tree *);
void minmax(struct tree *,int []);
void searching(struct tree *);
bool advancesearch(struct tree *,int);
struct tree * insert(struct tree *);
struct tree * deleteNode(struct tree *,int);
struct tree * minfromRight(struct tree * );

int main(){
    struct tree *head = NULL;
    menu(head);
    return 0;
}


void menu(struct tree *head) {
    int listen = 0;
    while(1){
        cout << endl << "1. Create Tree" << endl << "2. PreOrder Traversal" << endl << "3
. PostOrder Traversal" << endl << "4. InOrder Traversal" << endl << "5. Insertion" << end
l << "6. Searching" << endl << "7. Find Minimum & Maximum" << endl << "8. Deletion" << en
dl << "9. Exit"  << endl << "Enter Your Choice : ";
        cin >> listen;
        switch (listen)
        {
        case 1:
            head = construct(head);
            break;
        case 2:
            preorder(head);
            break;
        case 3:
            postorder(head);
            break;
```

```
        case 4:
            inorder(head);
            break;
        case 5:
            head = insert(head);
            break;
        case 6:
            searching(head);
            break;
        case 7:
        {
            int m[2] = {head->data};
            minmax(head,m);
            cout << "Minimum From Tree is : " << m[0] << endl;
            cout << "Maximum From Tree is : " << m[1] << endl;
        }
        break;
        case 8:
            {
                int value;
                cout << "Enter The Number You want to delete : ";
                cin >> value;
                head = deleteNode(head,value);
            }
            break;
        case 9:
            exit(0);
        default:
            cout << "Select Valid Options." << endl;
            menu(head);
        }
    }
}

void preorder(struct tree *head) {
    struct tree *temp;
    temp = head;
    if(temp == NULL)
        return;

    cout << temp->data << " ";
    preorder(temp->left);
    preorder(temp->right);
}

void postorder(struct tree *head) {
    struct tree *temp;
    temp = head;
    if(temp == NULL)
        return;
```

```
    postorder(temp->left);
    postorder(temp->right);
    cout << temp->data << " ";
}

void inorder(struct tree *head) {
    struct tree *temp;
    temp = head;
    if(temp == NULL)
        return;

    inorder(temp->left);
    cout << temp->data << " ";
    inorder(temp->right);
}

void minmax(struct tree *head,int m[]) {
    struct tree *temp;
    temp = head;
    if(temp == NULL)
        return;

    preorder(temp->left);
    if(temp->data < m[0])
        m[0] = temp->data;
    if(temp->data > m[1])
        m[1] = temp->data;
    preorder(temp->right);
}

void searching(struct tree *head) {
    bool found = false;
    int getNum;
    cout << "Enter the Number You want to find from tree : ";
    cin >> getNum;

    if(head == NULL) {
        cout << "The Tree is Empty." << endl;
        return;
    }
    found = advancesearch(head,getNum);
    if(found)
        cout << "The Number You searching is present in the tree" << endl;
    else
        cout << "The Number You searching is not present in the tree" << endl;
}

bool advancesearch(struct tree *head,int getNum) {
    struct tree *temp;
```

```
    temp = head;
    bool found = false;
    if(temp == NULL)
        return false;

    advancesearch(temp->left,getNum);
    if(temp->data == getNum) {
        return true;
    }
    advancesearch(temp->right,getNum);
    return false;
}

struct tree * construct(struct tree *head) {
    int i = 0;
    cout << "Total Data You Want : ";
    cin >> i;
    while(i > 0) {
        head = insert(head);
        i--;
    }
    return head;
}

struct tree * insert(struct tree *head) {
    bool target = false;
    int input;
    struct tree *n,*temp;
    temp = head;
    cout << "Enter Value : ";
    cin >> input;
    n = (struct tree *)malloc(sizeof(struct tree));

    if(head == NULL){
        head = n;
    }
    else {
        while(!target) {
            if(temp->data > input && temp->left != NULL){
                temp = temp->left;
            }
            else if(temp->data < input && temp->right != NULL ) {
                temp = temp->right;
            }

            if((temp->data < input && temp->right == NULL) || (temp-
>data > input && temp->left == NULL)) {
                target = true;
            }
        }
```

```
        if(temp->data < input) {
            temp->right = n;
        }
        else {
            temp->left = n;
        }
    }
    n->data = input;
    n->left = n->right = NULL;
    return head;
}

struct tree * deleteNode(struct tree* head, int deletethis) {
    struct tree *temp;
    temp = head;
    if (temp == NULL)
        return temp;

    if (deletethis < temp->data)
        temp->left = deleteNode(temp->left, deletethis);

    else if (deletethis > temp->data)
        temp->right = deleteNode(temp->right, deletethis);

    else
    {
        if (temp->left == NULL)
        {
            struct tree *temp2 = temp->right;
            free(temp);
            return temp2;
        }
        else if (temp->right == NULL)
        {
            struct tree *temp2 = temp->left;
            free(temp);
            return temp2;
        }

        struct tree* temp2 = minfromRight(temp->right);

        temp->data = temp2->data;

        temp->right = deleteNode(temp->right, temp2->data);
    }
    return temp;
}

struct tree * minfromRight(struct tree* temp) {
    struct tree* current = temp;
```

```
    while (current && current->left != NULL)
        current = current->left;

    return current;
}
```

Output :

PS E:\MCA\MCA SEM 3\DS\40%> .\BST.exe

1. Create Tree

2. PreOrder Traversal

3. PostOrder Traversal

4. InOrder Traversal

5. Insertion

6. Searching

7. Find Minimum & Maximum

8. Deletion

9. Exit

Enter Your Choice : 1

Total Data You Want : 5

Enter Value : 4

Enter Value : 2

Enter Value : 3

Enter Value : 7

Enter Value : 5

1. Create Tree

2. PreOrder Traversal

3. PostOrder Traversal

4. InOrder Traversal

5. Insertion

6. Searching

7. Find Minimum & Maximum

8. Deletion

9. Exit

Enter Your Choice : 2

4 2 3 7 5

1. Create Tree

2. PreOrder Traversal

3. PostOrder Traversal

4. InOrder Traversal

5. Insertion

6. Searching

7. Find Minimum & Maximum

8. Deletion

9. Exit

Enter Your Choice : 3

3 2 5 7 4

1. Create Tree

2. PreOrder Traversal

3. PostOrder Traversal

4. InOrder Traversal

5. Insertion

6. Searching

7. Find Minimum & Maximum

8. Deletion

9. Exit

Enter Your Choice : 4

2 3 4 5 7

1. Create Tree

2. PreOrder Traversal

3. PostOrder Traversal

4. InOrder Traversal

5. Insertion

6. Searching

7. Find Minimum & Maximum

8. Deletion

9. Exit

Enter Your Choice : 5

Enter Value : 6

1. Create Tree

2. PreOrder Traversal

3. PostOrder Traversal

4. InOrder Traversal

5. Insertion

6. Searching

7. Find Minimum & Maximum

8. Deletion

9. Exit

Enter Your Choice : 4

2 3 4 5 6 7

1. Create Tree

2. PreOrder Traversal

3. PostOrder Traversal

4. InOrder Traversal

5. Insertion

6. Searching

7. Find Minimum & Maximum

8. Deletion

9. Exit

Enter Your Choice : 6

Enter the Number You want to find from tree : 5

The Number You searching is present in the tree

1. Create Tree

2. PreOrder Traversal

3. PostOrder Traversal

4. InOrder Traversal

5. Insertion

6. Searching

7. Find Minimum & Maximum

8. Deletion

9. Exit

Enter Your Choice : 7

Minimum From Tree is : 2

Maximum From Tree is : 7

1. Create Tree

2. PreOrder Traversal

3. PostOrder Traversal

4. InOrder Traversal

5. Insertion

6. Searching

7. Find Minimum & Maximum

8. Deletion

9. Exit

Enter Your Choice : 8

Enter The Number You want to delete : 5

1. Create Tree

2. PreOrder Traversal

3. PostOrder Traversal

4. InOrder Traversal

5. Insertion

6. Searching

7. Find Minimum & Maximum

8. Deletion

9. Exit

Enter Your Choice : 4

2 3 4 6 7

1. Create Tree

2. PreOrder Traversal

3. PostOrder Traversal

4. InOrder Traversal

5. Insertion

6. Searching

7. Find Minimum & Maximum

8. Deletion

9. Exit

Enter Your Choice : 2

4 2 3 7 6

1. Create Tree

2. PreOrder Traversal

3. PostOrder Traversal

4. InOrder Traversal

5. Insertion

6. Searching

7. Find Minimum & Maximum

8. Deletion

9. Exit

Enter Your Choice : 9