**PUNE INSTITUTE OF COMPUTER TECHNOLOGY DHANKAWADI, PUNE**

**Data Structures And Algorithms(DSA)**

**Assignment No. 01**

**Title : Searching And Sorting Algorithms**

**SE-IT-10**  **ACADEMIC YEAR :- 2020-2021**

**Name :- Diptesh Ravindra Varule Roll No :- 23277**

**Source Code :**

//============================================================================

// Name : dsa\_Assignment1.cpp

// Author : Diptesh Varule

// Version : Updating…..

// Copyright : The Cartel

// Description : Hello World in C++, Ansi-style

//============================================================================

#include <iostream>

#include<string.h>

using namespace std;

struct Student{

string name;

int rollNo;

double SGPA;

};

class SEIT{

Student S[15];

int n;

public:

void input(int);//Method to input the student data

void display(int);//Method to display the student data

void rollCall(int);//Bubble Sorting for sorting students according to the roll numbers

void listWithSortedName(int);//insertion sort sorting for alphabetical order

int Partition(int,int);//For the quick sort

void quickSort(int,int);//using quick sort for toppers list

void samemarks(int);//to search the student with their marks

void namesearch(int);//binary search for searching a name in given list

bool validate(string)//validate the name of student

};

//name validation

bool SEIT::validate(string y)

{

bool valid;

for(int j=0;j<y.size();j++){

char s=y[j];

int k=s;

if(k>=65 && k<=90)

{

valid=true;

}

else if(k>=97 && k<=122)

{

valid=true;

}

else if(k==32)

{

valid=true;

}

else {

valid=false;

break;

}

}

return valid;

}

//taking input from the user

void SEIT::input(int n)

{

for (int i=0;i<n;i++){

//input name

cout<<"Enter Full Name : ";

cin.ignore();

string x;

getline(cin,x);

bool check;

check=validate(x);

if(!check){

cout<<"INVALID NAME"<<endl;

cout<<"Re-enter Name : ";

cin.ignore();

getline(cin,x);

}

S[i].name=x;

//input roll no

cout<<"Enter Roll no. : ";

cin>>S[i].rollNo;

//Roll No. Validation

if(S[i].rollNo==0 || S[i].rollNo<0){

cout<<"Roll no. should be greater than zero........."<<endl;

cout<<"Re-Enter Roll NO. : ";

cin>>S[i].rollNo;

}

for(int j=0;j<i;j++){

if(S[j].rollNo==S[i].rollNo) {

cout<<"Roll Numbers should be different"<<endl;

cout<<"Re-Enter Roll NO. : ";

cin>>S[i].rollNo;

}

}

//input SGPA

cout<<"Enter SGPA : ";

cin>>S[i].SGPA;

//SGPA validation

while(S[i].SGPA<0 || S[i].SGPA>10){

cout<<"SGPA must lie between 0 to 10....... "<<endl;

cout<<"Re-Enter the SGPA : ";

cin>>S[i].SGPA;

}

cout<<endl;

}

}

//displaying the info of student

void SEIT::display(int n)

{

cout<<"\nThe Student details are as follows........"<<endl;

cout<<"Sr No.\t STUDENT NAME \t\t ROLL NO. \t SGPA \n";

for(int i=0;i<n;i++){

cout<<(i+1)<<". \t "<<S[i].name<<"\t\t "<<S[i].rollNo<<"\t\t"<<S[i].SGPA<<endl;

}

cout<<"\n";

}

//using bubble sort sorting the information according to roll number

void SEIT::rollCall(int n)

{

int i,j;

bool flag;

Student temp;

for (i = 0; i < n-1; i++)

{flag = false;

for (j = 0; j < n-i-1; j++)

{

if (S[j].rollNo > S[j+1].rollNo)

{

temp=S[j];

S[j]=S[j+1];

S[j+1]=temp;

flag = true;

}

}

if (flag == false)

break;

}

cout<<endl;

}

//insertion sort sorting for alphabetical order

void SEIT::listWithSortedName(int n)

{

int i,j;

string key;

Student temp;

for (i = 1; i < n; i++)

{

temp=S[i];

key = S[i].name;

j = i - 1;

while (j >= 0 && S[j].name > key)

{

S[j + 1] = S[j];

j = j - 1;

}

S[j + 1] = temp;

}

}

//For the quick sort

int SEIT::Partition(int low,int high)

{

double pivot = S[high].SGPA;

Student temp;

int i = (low - 1);

for (int j = low; j <= high- 1; j++)

{

if (S[j].SGPA > pivot)

{

i++;

temp=S[i];

S[i]=S[j];

S[j]=temp;

}

}

temp=S[i+1];

S[i+1]=S[high];

S[high]=temp;

return (i + 1);

}

//using quick sort for toppers list

void SEIT::quickSort(int left,int right){

if(left<right){

int middle=Partition(left,right);

quickSort(left,middle-1);

quickSort(middle+1,right);

}

}

//to search the student with their marks

void SEIT::samemarks(int n)

{

cout<<"Enter the SGPA to search : ";

double y;

cin>>y;

cout<<"STUDENT NAME \t\t ROLL NO \t\t SGPA\n";

for(int i=0;i<n;i++){

if (S[i].SGPA==y){

cout<<S[i].name<<"\t"<<S[i].rollNo<<"\t"<<S[i].SGPA<<endl;

}

}

}

//to search the student with their name;using binary search;

void SEIT::namesearch(int n){

cout<<"Enter the name to search : ";

string y;

cin.ignore();

getline(cin,y);

int left=0,right=n-1;

while(left<=right){

int mid=left+(right-left)/2;

if(y==S[mid].name){

cout<<"Student Found ........"<<endl;

cout<<S[mid].name<<"\t"<<S[mid].rollNo<<"\t"<<S[mid].SGPA<<endl;

int j=mid+1;

while(S[j].name==y){

cout<<S[j].name<<"\t"<<S[j].rollNo<<"\t"<<S[j].SGPA<<endl;

j++;

}

j=mid-1;

while(S[j].name==y){

cout<<S[j].name<<"\t"<<S[j].rollNo<<"\t"<<S[j].SGPA<<endl;

j--;

}

break;

}

else if(y<S[mid].name){

right=mid-1;

}

else{

left=mid+1;

}

}

}

int main() {

SEIT p;

int n;

cout<<"Enter the number of students : ";

cin>>n;

if(n<0 || n==0)

{

cout<<"No of students must be greater than 0....."<<endl;

cout<<"Re-Enter no. of students : ";

cin>>n;

}

p.input(n);

p.display(n);

int z=1;

while(z){

cout<<"Select \n 1.Bubble Sort For Roll NO(Displaying Roll Call) \n 2.Insertion Sort For Name (Namewise list) \n 3.Quick Sort For SGPA(display first ten toppers) \n 4.Linear Search For SGPA \n 5.Binary Search For Name \n 6.Clear the screen \n 7.Exit \n";

int x;

cin>>x;

switch(x){

case 1:p.rollCall(n);

p.display(n);

break;

case 2:p.listWithSortedName(n);

p.display(n);

break;

case 3:p.quickSort(0,n-1);

p.display(n);

break;

case 4: p.samemarks(n);

break;

case 5:p.listWithSortedName(n);

p.namesearch(n);

break;

case 6:system("cls");

break;

case 7: exit(0);

default:cout<<"Enter a valid input !!!";

}

cout<<"Enter 1 To Continue : ";

cin>>z;

}

return 0;

}

**Output :**

Enter the number of students : 0

No of students must be greater than 0.....

Re-Enter no. of students : 8

Enter Full Name : Harsh13 +

INVALID NAME

Re-enter Name : Harsh Thakkar

Enter Roll no. : -2

Roll no. should be greater than zero.........

Re-Enter Roll NO. : 23276

Enter SGPA : 12

SGPA must lie between 0 to 10.......

Re-Enter the SGPA : 9.18

Enter Full Name : Diptesh Varule

Enter Roll no. : 23276

Roll Numbers should be different

Re-Enter Roll NO. : 23277

Enter SGPA : 8.5

Enter Full Name : Snehal Kadam

Enter Roll no. : 23232

Enter SGPA : 9.2

Enter Full Name : Utkarsh Magar

Enter Roll no. : 23243

Enter SGPA : 8.67

Enter Full Name : Sahil Date

Enter Roll no. : 23263

Enter SGPA : 8.65

Enter Full Name : Shweth Shetty

Enter Roll no. : 23270

Enter SGPA : 9.08

Enter Full Name : Diptesh Varule

Enter Roll no. : 23210

Enter SGPA : 7.6

Enter Full Name : Tejas Sonone

Enter Roll no. : 23274

Enter SGPA : 8.5

The Student details are as follows........

Sr No. STUDENT NAME ROLL NO. SGPA

1. Harsh Thakkar 23276 9.18

2. Diptesh Varule 23277 8.5

3. Snehal Kadam 23232 9.2

4. Utkarsh Magar 23243 8.67

5. Sahil Date 23263 8.65

6. Shweth Shetty 23270 9.08

7. Diptesh Varule 23210 7.6

8. Tejas Sonone 23274 8.5

Select

1.Bubble Sort For Roll NO(Displaying Roll Call)

2.Insertion Sort For Name (Namewise list)

3.Quick Sort For SGPA(display first ten toppers)

4.Linear Search For SGPA

5.Binary Search For Name

6.Clear the screen

7.Exit

1

The Student details are as follows........

Sr No. STUDENT NAME ROLL NO. SGPA

1. Diptesh Varule 23210 7.6

2. Snehal Kadam 23232 9.2

3. Utkarsh Magar 23243 8.67

4. Sahil Date 23263 8.65

5. Shweth Shetty 23270 9.08

6. Tejas Sonone 23274 8.5

7. Harsh Thakkar 23276 9.18

8. Diptesh Varule 23277 8.5

Enter 1 To Continue : 1

Select

1.Bubble Sort For Roll NO(Displaying Roll Call)

2.Insertion Sort For Name (Namewise list)

3.Quick Sort For SGPA(display first ten toppers)

4.Linear Search For SGPA

5.Binary Search For Name

6.Clear the screen

7.Exit

2

The Student details are as follows........

Sr No. STUDENT NAME ROLL NO. SGPA

1. Diptesh Varule 23210 7.6

2. Diptesh Varule 23277 8.5

3. Harsh Thakkar 23276 9.18

4. Sahil Date 23263 8.65

5. Shweth Shetty 23270 9.08

6. Snehal Kadam 23232 9.2

7. Tejas Sonone 23274 8.5

8. Utkarsh Magar 23243 8.67

Enter 1 To Continue : 1

Select

1.Bubble Sort For Roll NO(Displaying Roll Call)

2.Insertion Sort For Name (Namewise list)

3.Quick Sort For SGPA(display first ten toppers)

4.Linear Search For SGPA

5.Binary Search For Name

6.Clear the screen

7.Exit

3

The Student details are as follows........

Sr No. STUDENT NAME ROLL NO. SGPA

1. Snehal Kadam 23232 9.2

2. Harsh Thakkar 23276 9.18

3. Shweth Shetty 23270 9.08

4. Utkarsh Magar 23243 8.67

5. Sahil Date 23263 8.65

6. Diptesh Varule 23277 8.5

7. Tejas Sonone 23274 8.5

8. Diptesh Varule 23210 7.6

Enter 1 To Continue : 1

Select

1.Bubble Sort For Roll NO(Displaying Roll Call)

2.Insertion Sort For Name (Namewise list)

3.Quick Sort For SGPA(display first ten toppers)

4.Linear Search For SGPA

5.Binary Search For Name

6.Clear the screen

7.Exit

4

Enter the SGPA to search : 8.5

STUDENT NAME ROLL NO SGPA

Diptesh Varule 23277 8.5

Tejas Sonone 23274 8.5

Enter 1 To Continue : 1

Select

1.Bubble Sort For Roll NO(Displaying Roll Call)

2.Insertion Sort For Name (Namewise list)

3.Quick Sort For SGPA(display first ten toppers)

4.Linear Search For SGPA

5.Binary Search For Name

6.Clear the screen

7.Exit

5

Enter the name to search : Diptesh Varule

Student Found ........

Diptesh Varule 23210 7.6

Diptesh Varule 23277 8.5

Enter 1 To Continue : 7

**Validations And Test Cases :**

