# Practical Manual

**Class : SYBSc IT** **Sem : III**

**Subject : Data Structures**

PRACTICAL NO.:1(A)

AIM: Write a program to store the elements in 1-D array and perform the operations like searching, sorting, reversing the elements.

PROGRAM CODE:

```
#include<stdio.h>

#include<conio.h>

intsize,val;

void disp(int size);

void sort(int size);

void reverse(int size);

void search(intval,int size);

intarr[20];

intmain()

{

inti,ch;

printf("Enter the size of array : ");

scanf("%d",&size);

for(i=0;i<size;i++)

{

scanf("%d",&arr[i]);

}

do

{

printf("\n****Main Menu****\n");
```

```
printf("1.Display\n");
printf("2.Sorting\n");
printf("3.Reverse\n");
printf("Enter your Choice : ");
scanf("%d",&ch);
switch(ch)
{
case 1:disp(size);
break;
case 2:sort(size);
break;
case 3:reverse(size);
break;
case 4:printf("Enter value to be search : ");
scanf("%d",&val);
search(val,size);
break;
}
}
while(ch!=4);
getch ();
return 0;
}
void search(intval,int size)
```

```
{
inti;
for(i=0;i<size;i++)
{
if(arr[i]==val)
{
printf("Value is found at %d position.",i);
break;
}
}
if(i==size)
{
printf("Value is not found.");
}
}
void disp(int size)
{
inti;
printf("Given Array :\n");
for(i=0;i<size;i++)
{
printf("%d\n",arr[i]);
}
}
```

```
void sort(size)
{
inti,j;
for(i=0;i<size;i++)
{
for(j=0;j<size-i-1;j++)
{
if(arr[j]>arr[j+1])
{
int temp;
temp=arr[j];
arr[j]=arr[j+1];
arr[j+1]=temp;
}
}
}
printf("Sorted Array : \n");
for(i=0;i<size;i++)
{
printf("%d \n",arr[i]);
}
}
void reverse(size)
{
```

```
inti,j,temp;
j=size-1;
i=0;
while(i<j)
{
temp=arr[i];
arr[i]=arr[j];
arr[j]=temp;
i++;
j--;
}
printf("Reverse order : \n");
for(i=0;i<size;i++)
{
printf("%d \n",arr[i]);
}
}
```

OUTPUT :

```
Enter the size of array : 4
1
2
3
4

****Main Menu****
1.Display
2.Sorting
3.Reverse
Enter your Choice : 1
Given Array :
1
2
3
4

****Main Menu****
1.Display
2.Sorting
3.Reverse
Enter your Choice : 2
Sorted Array :
1
2
3
4

****Main Menu****
1.Display
2.Sorting
3.Reverse
Enter your Choice : 3
Reverse order :
4
3
2
1
```

PRACTICAL NO.:1(B)

AIM : Read the two arrays from the user and merge them and display the elements in sorted order.

PROGRAM CODE:

```
#include<stdio.h>

#include<conio.h>

intmain()

{

int arr1[20],arr2[20],arr3[40];

inti,j,k,size1,size2,temp;

printf("Enter the array size of array 1 :");

scanf("%d",&size1);

printf("Enter the element in arra 1 :\n");

for(i=0;i<size1;i++)

{

scanf("%d",&arr1[i]);

}

printf("Enter the size of array 2 : ");

scanf("%d",&size2);

printf("Enter the element in array2 : \n");

for(j=0;j<size2;j++)

{

scanf("%d",&arr2[j]);
```

```
}
for(i=0;i<size1;i++)
{
for(j=0;j<size1-i-1;j++)
{
if(arr1[j]>arr1[j+1])
{
temp=arr1[j];
arr1[j]=arr1[j+1];
arr1[j+1]=temp;
}
}
}
for(i=0;i<size2;i++)
{
for(j=0;j<size2-i-1;j++)
{
if(arr2[j]>arr2[j+1])
{
temp=arr2[j];
arr2[j]=arr2[j+1];
arr2[j+1]=temp;
}
}
```

```
}
/* printf("Sorting array 1\n");
for(i=0;i<size1;i++)
{
printf("%d \n",arr1[i]);
}
printf("Sorting array 2\n");
for(i=0;i<size2;i++)
{
printf("%d \n",arr2[i]);
}*/
i=0;
j=0;
k=0;
while(i<size1 && j<size2)
{
if(arr1[i]<arr2[j])
{
arr3[k]=arr1[i];
i++;
k++;
}
else
{
```

```
arr3[k]=arr2[j];
j++;
k++;
}
}
while(i<size1)
{
arr3[k]=arr1[i];
i++;
k++;
}
while(j<size2)
{
arr3[k]=arr2[j];
j++;
k++;
}
printf("merged array \n");
for(k=0;k<size1+size2;k++)
printf("%d \n",arr3[k]);
getch();
return 0;
}
```

OUTPUT :

```
Enter the array size of array 1 :4
Enter the element in arra 1 :
2
4
6
8
Enter the size of array 2 : 4
Enter the element in array2 :
1
3
5
7
merged array
1
2
3
4
5
6
7
8
```

PRACTICAL NO.:1(C)

AIM : write a program to perform the Matrix addition, Multiplication, Transpose operation.

PROGRAM CODE :

```
#include<stdio.h>
#include<conio.h>
int arr1[20][10],arr2[20][10],arr3[20][10];
int r1,c1,r2,c2;
void addition(int r1,int r2,int c1,int c2);
void multiplication(int r1,int r2,int c1,int c2);
void transpose1(int r1,int c1);
void transpose2(int r2,int c2);
void main()
{
inti,j,k,choice;
printf("Enter the matrix 1 size : \n");
scanf("%d %d",&r1,&c1);
printf("Enter the element in matrix 1 : \n");
for(i=0;i<r1;i++)
{
for(j=0;j<c1;j++)
scanf("%d",&arr1[i][j]);
}
```

```
printf("Matrix 1 : \n");
for(i=0;i<r1;i++)
{
for(j=0;j<c1;j++)
{
printf("%d \t",arr1[i][j]);
}
printf("\n");
}
printf("Enter the matrix 2 size :");
scanf("%d %d",&r2,&c2);
printf("Enter the element in matrix 2 : \n");
for(i=0;i<r2;i++)
{
for(j=0;j<c2;j++)
scanf("%d",&arr2[i][j]);
}
printf("Matrix 2 : \n");
for(i=0;i<r2;i++)
{
for(j=0;j<c2;j++)
{
printf("%d \t",arr2[i][j]);
}
```

```
printf("\n");
}
do
{
printf("******* Main Menu******* \n");
printf("1.Addition\n");
printf("2.Multiplication\n");
printf("3.transpose 1\n");
printf("4.transpose 2\n");
printf("Enter your chioce : ");
scanf("%d",&choice);
switch(choice)
{
case 1 : addition(r1,r2,c1,c2);
break;
case 2: multiplication(r1,r2,c1,c2);
break;
case 3: transpose1(r1,c1);
break;
case 4 : transpose2(r2,c2);
break;
}
}while(choice>0);
getch();
```

```
}
void addition(int r1,int r2,int c1,int c2)
{
inti,j;
if(r1==r2 && c1==c2)
{
printf("Addition of matrix :\n");
for(i=0;i<r1;i++)
for(j=0;j<r2;j++)
arr3[i][j]=arr1[i][j]+arr2[i][j];
for(i=0;i<r1;i++)
{
for(j=0;j<c1;j++)
{
printf("%d \t",arr3[i][j]);
}
printf("\n");
}
}
else
{
printf("ORDER INCORRECT. \n");
}
}
```

```
void multiplication(int r1,int r2,int c1,int c2)
{
inti,j,k;
if(c1==r2)
{
printf("Multiplication of matrix :\n");
for(i=0;i<r1;i++)
{
for(j=0;j<c2;j++)
{
arr3[i][j]=0;
int k;
for(k=0;k<r1;k++)
{
arr3[i][j]+=arr1[i][k]*arr2[k][j];
}
printf("%d\t",arr3[i][j]);
} printf("\n");
}
}
else
{
printf("ORDER INCORRECT.\n");
}
```

```
}
void transpose1(int r1,int c1)
{
inti,j;
printf("Transpose matrix 1 \n");
for(i=0;i<r1;i++)
{
for(j=0;j<c1;j++)
{
arr3[j][i]=arr1[i][j];
}
}
for(i=0;i<c1;i++)
{
for(j=0;j<r1;j++)
{
printf("%d\t",arr3[i][j]);
}
printf("\n");
}
}
void transpose2(int r2,int c2)
{
inti,j;
```

```
printf("Transpose matrix 2 \n");
for(i=0;i<r2;i++)
{
for(j=0;j<c2;j++)
{
arr3[j][i]=arr1[i][j];
}
}
for(i=0;i<c2;i++)
{
for(j=0;j<r2;j++)
{
printf("%d\t",arr3[i][j]);
}
printf("\n");
}
}
```

OUTPUT :

```
Enter the matrix 1 size :
2
2
Enter the element in matrix 1 :
1
3
5
7
Matrix 1 :
1        3
5        7
Enter the matrix 2 size :
2
2
Enter the element in matrix 2 :
2
4
6
8
Matrix 2 :
2        4
6        8
```

```
******* Main Menu*******
1.Addition
2.Multiplication
3.transpose 1
4.transpose 2
Enter your chioce : 1
Addition of matrix :
3       7
11      15
******* Main Menu*******
1.Addition
2.Multiplication
3.transpose 1
4.transpose 2
Enter your chioce : 2
Multiplication of matrix :
20      28
52      76
******* Main Menu*******
1.Addition
2.Multiplication
3.transpose 1
4.transpose 2
Enter your chioce : 3
Transpose matrix 1
1       5
3       7
******* Main Menu*******
1.Addition
2.Multiplication
3.transpose 1
4.transpose 2
Enter your chioce : 4
Transpose matrix 2
1       5
3       7
```

PRACTICAL NO.:2(A)

AIM : Write a program to create a single linked list and display the node elements in reserve order.

Pogram code:

```
#include<stdio.h>
#include<conio.h>
#include<malloc.h>
#include<stdlib.h>
struct node
{
int info;
struct node *next;
};
struct node *start=NULL;
struct node *create(struct node *start);
struct node *dispaly(struct node *start);
void reverse(struct node *start);
int main()
{
clrscr();
start=create(start);
start=dispaly(start);
```

```
printf("\n");
printf("Reverse \t");
reverse(start);
getch ();
return 0;
}
struct node *create(struct node *start)
{
struct node *new_node=NULL,*temp=NULL;
int val;
printf("Enter -1 value to exit list.\n");
printf("Enter the value : \n");
scanf("%d",&val);
while(val!=-1)
{
new_node=(struct node*)malloc(sizeof(struct node));
new_node->info=val;
if(start==NULL)
{
start=new_node;
new_node->next=NULL;
}
else
{
```

```
temp=start;
while(temp->next!=NULL)
{
temp=temp->next;
}
temp->next=new_node;
new_node->next=NULL;
}
printf("Enter the value : \n");
scanf("%d",&val);
}
printf("List is successfully created.\n");
return start;
}
struct node *dispaly(struct node *start)
{
struct node *temp=NULL;
temp=start;
printf("List is :\n");
while(temp!=NULL)
{
printf("%d \t",temp->info);
temp=temp->next;
}
```

```
return start;
}
void reverse(struct node *start)
{
struct node *prev=NULL;
struct node *current=start;
struct node *next_node;
while(current!=NULL)
{
next_node=current->next;
current->next=prev;
prev=current;
current=next_node;
}
start=prev;
start=dispaly(start);
}
```

OUTPUT :

```
Enter -1 value to exit list.
Enter the value :
10
Enter the value :
20
Enter the value :
30
Enter the value :
40
Enter the value :
-1
List is successfully created.
List is :
10      20      30      40
Reverse         List is :
40      30      20      10
```

PRACTICAL NO.:2(B)

AIM : Write a program to search the elements in the linked list and display the same.

PROGRAM CODE:

```
#include<stdio.h>
#include<conio.h>
#include<malloc.h>
#include<stdlib.h>
struct node
{
int info;
struct node *next;
};
struct node *start=NULL;
struct node *create(struct node *start);
struct node *dispaly(struct node *start);
struct node *search(struct node *start);
int main()
{
start=create(start);
start=dispaly(start);
printf("\n");
start=search(start);
```

```
getch ();
return 0;
}
struct node *create(struct node *start)
{
struct node *new_node=NULL,*temp=NULL;
int val;
printf("Enter -1 value to exit list.\n");
printf("Enter the value : \n");
scanf("%d",&val);
while(val!=-1)
{
new_node=(struct node*)malloc(sizeof(struct node));
new_node->info=val;
if(start==NULL)
{
start=new_node;
new_node->next=NULL;
}
else
{
temp=start;
while(temp->next!=NULL)
{
```

```
temp=temp->next;
}
temp->next=new_node;
new_node->next=NULL;
}
printf("Enter the value : \n");
scanf("%d",&val);
}
printf("List is successfully created.\n");
return start;
}
struct node *dispaly(struct node *start)
{
struct node *temp=NULL;
temp=start;
printf("List is :\n");
while(temp!=NULL)
{
printf("%d \t",temp->info);
temp=temp->next;
}
return start;
}
struct node *search(struct node *start)
```

```
{
int val,count;
struct node *temp;
printf("\nwhich value are you looking for?\n");
scanf("%d",&val);
count=1;
temp=start;
while(temp->info!=val && temp->next!=NULL)
{
temp=temp->next;
count++;
}
//temp=temp->next;
if(temp->next==NULL && temp->info!=val)
{
printf("value not found");
}
else if(temp->next==NULL && temp->info==val)
{
printf("value found at %d node",count);
}
else
{
printf("value found at %d node",count);
```

```
}
return start;
}
```

OUTPUT :

```
Enter -1 value to exit list.
Enter the value :
10
Enter the value :
20
Enter the value :
30
Enter the value :
40
Enter the value :
50
Enter the value :
-1
List is successfully created.
List is :
10      20      30      40      50

which value are you looking for?
30
value found at 3 node_
```

PRACTICAL NO:-2(C)

AIM:Write a program to create double linked list and sort the elements in the linked list.

PROGRAM CODE:

```
#include<stdio.h>

#include<conio.h>

#include<malloc.h>

#include<stdlib.h>

struct node

{int data;

struct node *next;

struct node *prev;

};

struct node *start=NULL;

struct node *create(struct node *start);

struct node *display(struct node *start);

struct node *sort(struct node *start);

int main()

{

start=create(start);

start=display(start);

printf("\n");

printf("sort \t");

start=sort(start);
```

```
}
struct node *create(struct node *start)
{
struct node *new_node=NULL,*temp=NULL,prev;
int val;
printf("Enter the data or enter -1 to exit:");
scanf("%d",&val);
while(val!=-1)
{
new_node=(struct node*)malloc(sizeof(struct node));
new_node->data=val;
if(start==NULL)
{
start=new_node;
new_node->next=NULL;
new_node->prev=NULL;
}
else
{
temp=start;
while(temp->next!=NULL)
{
temp=temp->next;
}
```

```
temp->next=new_node;
new_node->prev=NULL;
new_node->next=NULL;
}
printf("enter the data or enter -1 to exit:");
scanf("%d",&val);
}
printf("Linked list successfully created.\n");
return start;
}
struct node *display(struct node *start)
{
struct node *temp=NULL;
temp=start;
printf("\nThe Linked list is:");
while(temp->next!=NULL)
{
printf("\t %d \t",temp->data);
temp=temp->next;
}
if(temp->next==NULL)
printf("%d \n",temp->data);
printf("\n");
return start;
```

```
}
struct node *sort(struct node*start)
{
struct node *temp1=start;
struct node *temp2,*temp;
int x;
while (temp1->next!=NULL)
{
temp2=start;
while(temp2->next!=NULL)
{
temp=temp2->next;
if(temp2->data>temp->data)
{
x=temp->data;
temp->data=temp2->data;
temp2->data=x;
}
temp2=temp2->next;
}
temp1=temp1->next;
}
temp=start;
printf("The Linked List is:");
```

```
while(temp->next!=NULL)
{
printf("%d \t",temp->data);
temp=temp->next;
}
if(temp->next==NULL)
printf("%d \n",temp->data);
printf("\n");
return start;
}
```

OUTPUT :

```
Enter the data or enter -1 to exit:10
enter the data or enter -1 to exit:40
enter the data or enter -1 to exit:60
enter the data or enter -1 to exit:20
enter the data or enter -1 to exit:30
enter the data or enter -1 to exit:-1
Linked list successfully created.

The Linked list is:      10              40              60              20
30


sort    The Linked List is:10   20      30      40      60
```

PRACTICAL NO:-3(A)

AIM : Write a program to implement the concept of stack with Push, Pop, Display and exit operation.

PROGRAM CODE:

```
#include<stdio.h>

#include<conio.h>

#define MAX 30

int stack[MAX];

int top =-1;   //Stack is empty.

void push();

int pop();

int peek();

void display();

int main()

{

int choice;

do

{

printf("\n **** Main Menu **** \n");

printf("1.Push\n");

printf("2.Pop \n");

printf("3.Peek \n");

printf("4.Display \n");
```

```
printf("Enter your choice :");
scanf("%d",&choice);
printf("\n");
switch(choice)
{
case 1: push();
break;
case 2 : pop();
break;
case 3 : peek();
break;
case 4 : display();
break;
case 5 : break;
}
}
while(choice!=5);
return 0;
}
void push()
{
int val;
if(top == MAX -1)
{
```

```
printf("Stack is full.");
}                    else
{
printf("Enter the value to be pushed : ");
scanf("%d",&val);
stack[++top]=val;
printf("Successfully pushed.\n");
}
}
int pop()
{
if(top == -1)
{
printf("Stack is already empty.");
}
else
{
int val = stack[top];
top--;
printf("The value is popped : %d",val);
}
}
int peek()
{
```

```
if(top == -1)
{
printf("Stack is empty.");
}
else
{
int topmost = stack[top];
printf("The topmost element of stack : %d ",topmost);
}
}
void display()
{
if(top == -1)
{
printf("Stack is empty.");
}
else
{
int i;
printf("Stack is : ");
for(i=top;i>=0;i--)
{
printf("\t%d",stack[i]);
}
```

}

}

OUTPUT :

```
 **** Main Menu ****
1.Push
2.Pop
3.Peek
4.Display
Enter your choice :1

Enter the value to be pushed : 10
Successfully pushed.

 **** Main Menu ****
1.Push
2.Pop
3.Peek
4.Display
Enter your choice :1

Enter the value to be pushed : 20
Successfully pushed.

 **** Main Menu ****
1.Push
2.Pop
3.Peek
4.Display
Enter your choice :1

Enter the value to be pushed : 30
Successfully pushed.

 **** Main Menu ****
1.Push
2.Pop
3.Peek
4.Display
Enter your choice :4

Stack is :      30      20      10
```

```
 **** Main Menu ****
1.Push
2.Pop
3.Peek
4.Display
Enter your choice :3

The topmost element of stack : 30
 **** Main Menu ****
1.Push
2.Pop
3.Peek
4.Display
Enter your choice :2

The value is popped : 30
 **** Main Menu ****
1.Push
2.Pop
3.Peek
4.Display
Enter your choice :4

Stack is :      20      10
 **** Main Menu ****
1.Push
2.Pop
3.Peek
4.Display
Enter your choice :3

The topmost element of stack : 20
```

PRACTICAL NO.:3(B)

AIM : Write a program to implement Tower of Hanio problem .

PROGRAM CODE:

```
#include<stdio.h>
#include<conio.h>
int move(int n,char source,char temp,char destination);
int main()
{
int n;
printf("enter number of Disk");
scanf("%d",&n);
move(n,'A','B','C');
getch();
return 0;
}
int move(int n,char source,char temp,char destination)
{
if(n == 1)
{
printf("\n Move from %c to %c",source,destination);
}
```

```
else
{
move(n-1,source,destination,temp);
move(1,source,temp,destination);
move(n-1,temp,source,destination);
}
}
```

OUTPUT :

```
enter number of Disk:5

 Move from A to C
 Move from A to B
 Move from C to B
 Move from A to C
 Move from B to A
 Move from B to C
 Move from A to C
 Move from A to B
 Move from C to B
 Move from C to A
 Move from B to A
 Move from C to B
 Move from A to C
 Move from A to B
 Move from C to B
 Move from A to C
 Move from B to A
 Move from B to C
 Move from A to C
 Move from B to A
 Move from C to B
 Move from C to A
 Move from B to A
 Move from B to C
 Move from A to C
 Move from A to B
 Move from C to B
 Move from A to C
 Move from B to A
 Move from B to C
 Move from A to C
```

PRACTICAL NO:-4(A)

AIM : Write a program to implement the concept of Queue with Insert, Delete, Display and exit operation.

PROGRAM CODE:

```
#include<stdio.h>
#include<conio.h>
#define max 30
int rear=-1;
int front=-1;
void insert();
int deleteq();
void display();
int q[max];
void insert()
{
int val;
printf("Enter value to be inserted :");
scanf("%d",&val);
if(rear==max-1)
{
printf("Queue is full.");
}
```

```
else if(front==-1)
{
front=rear=0;
q[rear]=val;
printf("Value inserted successfully.");
}
else
{
q[++rear]=val;
printf("Value inserted successfully.");
}
}
int deleteq()
{
if(front==-1)
{
printf("Queue is already empty.");
return -1;
}
else if(front==rear) //Only one item is present.
{        int val ;
val=q[front];
front=rear=-1;
printf("Value to be deletede : %d",val);
```

```
return val;
}
else
{
int val ;
val=q[front];
front++;
printf("Value to be deletede : %d",val);
return val;
}
}
void display()
{
if(front==-1)
{
printf("Queue is empty.");
}
else
{
int i;
printf("Queue is :");
for(i=front;i<=rear;i++)
{
printf("%d",q[i]);
```

```
}
}
}
int main()
{
int choice;
do
{
printf("\n **** Main Menu **** \n");
printf("1.Insert\n");
printf("2.Delete\n");
printf("3.Display \n");
printf("Enter your choice :");
scanf("%d",&choice);
printf("\n");
switch(choice)
{
case 1: insert();
break;
case 2 : deleteq();
break;
case 3 : display();
break;
case 4 : break;
```

```
}

}

while(choice!=4);

return 0;

}
```

OUTPUT :

```
 **** Main Menu ****
1.Insert
2.Delete
3.Display
Enter your choice :1

Enter value to be inserted :10
Value inserted successfully.
 **** Main Menu ****
1.Insert
2.Delete
3.Display
Enter your choice :1

Enter value to be inserted :20
Value inserted successfully.
 **** Main Menu ****
1.Insert
2.Delete
3.Display
Enter your choice :1

Enter value to be inserted :30
Value inserted successfully.
 **** Main Menu ****
1.Insert
2.Delete
3.Display
Enter your choice :1

Enter value to be inserted :40
Value inserted successfully.
 **** Main Menu ****
1.Insert
2.Delete
3.Display
Enter your choice :1

Enter value to be inserted :50
Value inserted successfully.
```

```
 **** Main Menu ****
1.Insert
2.Delete
3.Display
Enter your choice :3

Queue is :1020304050
 **** Main Menu ****
1.Insert
2.Delete
3.Display
Enter your choice :2

Value to be deletede : 10
 **** Main Menu ****
1.Insert
2.Delete
3.Display
Enter your choice :3

Queue is :20304050
```

PRACTICAL NO:-4(B)

AIM : Write a program to implement the concept of circular Queue.

PROGRAM CODE:

```
#include<stdio.h>
#include<conio.h>
#define max 5
int front = -1;
int rear = -1;
void insetr();
void display();
intdeleteq();
int q[max];
void insert()
{
intval;
printf("Enter value :");
scanf("%d",&val);
if((rear+1)%max==front)
{
printf("Queue is full.");
}
else if(rear==-1)
```

```
{
rear=front=0;
q[rear]=val;
printf("Inserted successfully.");
}
Else
{
rear=(rear + 1)%max;
q[rear]=val;
printf("Inserted successfully.");
}
}
intdeleteq()
{
intval;
if(front== -1)
{
printf("Queue is empty.");
return -1;
}
else if(front == rear)
{
intval=q[front];
front=rear= -1;
```

```
printf("Deleted value : %d",val);
return val;
}
else
{
val=q[front];
front=(front+1)%max;
printf("Deleted value : %d",val);
return val;
}
}
void display()
{
inti;
if(front ==-1)
{
printf("Queue is empty.");
}
else
{
printf("Queue is :");
for(i=front;i!=rear;i=(i+1)%max)
{
printf("%d",q[i]);
```

```
}
printf("%d",q[i]);
}
}
intmain()
{        int choice;
clrscr();
do
{
printf("\n **** Main Menu **** \n");
printf("1.Insert\n");
printf("2.Delete\n");
printf("3.Display \n");
printf("Enter your choice :");
scanf("%d",&choice);
printf("\n");
switch(choice)
{
case 1: insert();
break;
case 2 :deleteq();
break;
case 3 : display();
break;
```

```
case 4 : break;
}
}
while(choice!=4);
return 0;
}
```

OUTPUT :

```
 **** Main Menu ****
1.Insert
2.Delete
3.Display
Enter your choice :1

Enter value :10
Inserted successfully.
 **** Main Menu ****
1.Insert
2.Delete
3.Display
Enter your choice :1

Enter value :20
Inserted successfully.
 **** Main Menu ****
1.Insert
2.Delete
3.Display
Enter your choice :1

Enter value :30
Inserted successfully.
 **** Main Menu ****
1.Insert
2.Delete
3.Display
Enter your choice :1

Enter value :40
Inserted successfully.
```

```
 **** Main Menu ****
1.Insert
2.Delete
3.Display
Enter your choice :1

Enter value :50
Inserted successfully.
 **** Main Menu ****
1.Insert
2.Delete
3.Display
Enter your choice :1

Enter value :60
Queue is full.
 **** Main Menu ****
1.Insert
2.Delete
3.Display
Enter your choice :3

Queue is :1020304050
 **** Main Menu ****
1.Insert
2.Delete
3.Display
Enter your choice :2

Deleted value : 10
 **** Main Menu ****
1.Insert
2.Delete
3.Display
Enter your choice :3

Queue is :20304050
 **** Main Menu ****
1.Insert
```

PRACTICAL NO:-4(C)

AIM : Write a program to implement the concept of Deque.

PROGRAM CODE:

```
#include<stdio.h>
#include<conio.h>
#define max 5
int front = -1;
int rear = -1;
intinsert_rear();
intinsert_front();
void display();
intdeleteq_rear();
intdeleteq_front();
int q[max];
intmain()
{
int choice;
clrscr();
do
{
printf("\n **** Main Menu **** \n");
printf("1.Insert From Rear\n");
```

```
printf("2.Insert From Front\n");
printf("3.Delete From Front \n");
printf("4.Delete From Rear \n");
printf("5.Display\n");
printf("Enter your choice :");
scanf("%d",&choice);
printf("\n");
switch(choice)
{
case 1: insert_rear();
break;
case 2 :insert_front();
break;
case 3 :deleteq_front();
break;
case 4 :deleteq_rear();
break;
case 5 : display();
break;
case 6 : break;
}
}
while(choice!=6);
return 0;
```

```
}
intinsert_rear()
{        intval;
printf("Enter value :");
scanf("%d",&val);
if((rear+1)%max==front)
{
printf("Queue is full.");
return 0;
}
else if(rear==-1)
{
rear=front=0;
q[rear]=val;
printf("Inserted successfully.");
return val;
}
else
{
rear=(rear + 1)%max;
q[rear]=val;
printf("Inserted successfully.");
return val;
}
```

```
}
intinsert_front()
{        intval;
printf("Enter value :");
scanf("%d",&val);
if((rear+1)%max==front)
{
printf("Queue is full.");
return 0;
}
Else if(front==-1)
{
rear=front=0;
q[front]=val;
printf("Inserted successfully.");
return val;
}
else
{
front=(front-1+max)%max;
q[front]=val;
printf("Inserted successfully.");
return val;
}}
```

```
intdeleteq_front()
{        intval;
if(front== -1)
{
printf("Queue is empty.");
//return -1;
}
else if(front == rear)
{
intval=q[front];
front=rear= -1;
printf("Deleted value : %d",val);
return val;
}
else
{
val=q[front];
front=(front+1)%max;
printf("Deleted value : %d",val);
return val;
}}
intdeleteq_rear()
{        intval;
if(rear== -1)
```

```
{
printf("Queue is empty.");
return -1;
}
else if(front == rear)
{
intval=q[rear];
front=rear= -1;
printf("Deleted value : %d",val);
return val;
}
else
{
val=q[rear];
rear=(rear-1+max)%max;
printf("Deleted value : %d",val);
return val;
}}
void display()
{
inti;
if(front ==-1)
{
printf("Queue is empty.");
```

```
}
else
{
printf("Queue is :");
for(i=front;i!=rear;i=(i+1)%max)
{
printf(" %d ",q[i]);
}
printf(" %d ",q[i]);
}}
```

OUTPUT :

```
 **** Main Menu ****
1.Insert From Rear
2.Insert From Front
3.Delete From Front
4.Delete From Rear
5.Display
Enter your choice :1

Enter value :20
Inserted successfully.
 **** Main Menu ****
1.Insert From Rear
2.Insert From Front
3.Delete From Front
4.Delete From Rear
5.Display
Enter your choice :1

Enter value :30
Inserted successfully.
 **** Main Menu ****
1.Insert From Rear
2.Insert From Front
3.Delete From Front
4.Delete From Rear
5.Display
Enter your choice :1

Enter value :40
Inserted successfully.
```

```
 **** Main Menu ****
1.Insert From Rear
2.Insert From Front
3.Delete From Front
4.Delete From Rear
5.Display
Enter your choice :2

Enter value :10
Inserted successfully.
 **** Main Menu ****
1.Insert From Rear
2.Insert From Front
3.Delete From Front
4.Delete From Rear
5.Display
Enter your choice :1

Enter value :50
Inserted successfully.
 **** Main Menu ****
1.Insert From Rear
2.Insert From Front
3.Delete From Front
4.Delete From Rear
5.Display
Enter your choice :5

Queue is : 10  20  30  40  50
 **** Main Menu ****
1.Insert From Rear
2.Insert From Front
3.Delete From Front
4.Delete From Rear
5.Display
Enter your choice :3

Deleted value : 10
 **** Main Menu ****
```

```
 **** Main Menu ****
1.Insert From Rear
2.Insert From Front
3.Delete From Front
4.Delete From Rear
5.Display
Enter your choice :4

Deleted value : 50
 **** Main Menu ****
1.Insert From Rear
2.Insert From Front
3.Delete From Front
4.Delete From Rear
5.Display
Enter your choice :5

Queue is : 20  30  40
```

PRACTICAL NO:-5(A)

AIM : Write a program to implement bubble sort.

PROGRAM CODE:

```
#include<stdio.h>
#include<conio.h>
int size,val;
void disp(int size);
int sort(int size);
int arr[20];
int main()
{
int i,ch;
printf("Enter the size of array : ");
scanf("%d",&size);
for(i=0;i<size;i++)
{
scanf("%d",&arr[i]);
}
do
{
printf("\n****Main Menu****\n");
printf("1.Display\n");
printf("2.Sorting\n");
```

```
printf("Enter your Choice : ");
scanf("%d",&ch);
switch(ch)
{
case 1:disp(size);
break;
case 2:sort(size);
break;
}
}
while(ch!=2);
getch ();
return 0;
}
void disp(int size)
{
int i;
printf("Given Array :\n");
for(i=0;i<size;i++)
{
printf("%d\n",arr[i]);
}
}
int sort(size)
```

```
{
int i,j;
for(i=0;i<size;i++)
{
for(j=0;j<size-i-1;j++)
{
if(arr[j]>arr[j+1])
{
int temp;
temp=arr[j];
arr[j]=arr[j+1];
arr[j+1]=temp;
}
}
}
printf("Sorted Array : \n");
for(i=0;i<size;i++)
{
printf("%d \n",arr[i]);
}
}
```

OUTPUT :

```
Enter the size of array : 5
46
29
10
63
28

****Main Menu****
1.Display
2.Sorting
Enter your Choice : 1
Given Array :
46
29
10
63
28

****Main Menu****
1.Display
2.Sorting
Enter your Choice : 2
Sorted Array :
10
28
29
46
63
```

PRACTICAL NO:-5(B)

AIM : Write a program to implement selection sort.

PROGRAM CODE:

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

#include<malloc.h>
int selection_sort(int n);
int A[20];
int selection_sort(int n)
{
int imin,i,j,temp;
for(i=0;i<n;i++)
{
imin=i;
for(j=i+1;j<n;j++)
{
if(A[imin]>A[j])
{
imin=j;
}
}
temp = A[i];
A[i] = A[imin];
```

```
A[imin] = temp;
}
printf("Successfully sorted using Selection sort :");
}
int main()
{
int n,i;
printf("Enter the size :");
scanf("%d",&n);
printf("Enter the element :\n");
for(i=0;i<n;i++)
{
scanf("%d",&A[i]);
printf("\n");
}

selection_sort(n);
for(i=0;i<n;i++)
{
printf("\n %d\n",A[i]);
}
return 0;
}
```

OUTPUT :

```
Enter the size :5
Enter the element :
76

48

20

58

10

Successfully sorted using Selection sort :
 10

 20

 48

 58

 76
```

PRACTICAL NO:-5(C)

AIM : Write a program to implement insertion sort.

PROGRAM CODE:

```
#include<stdio.h>
#include<conio.h>
int A[10];
void insertion_sort(int n)
{



int val,vacant,i;
for(i=1;i<n;i++)
{
val=A[i];
vacant=i;
while(A[vacant-1]>val && vacant!=0)
{
A[vacant]=A[vacant-1];
vacant=vacant - 1;
}
A[vacant]=val;
}
printf("Successfully sorted using Insertion Sort Algorithm : \n");
}
```

```
void main()
{
int n,i;
printf("Enter the size of array : ");
scanf("%d",&n);
printf("Enter the elements :\n");
for(i=0;i<n;i++)
{
scanf("%d",&A[i]);
printf("\n");
}
insertion_sort(n);
for(i=0;i<n;i++)
{
printf("%d \n",A[i]);
}}
```

OUTPUT :

```
Enter the size of array : 5
Enter the elements :
23

67

10

48

37

Successfully sorted using Insertion Sort Algorithm :
10
23
37
48
67
```

PRACTICAL NO.:6(A)

AIM : Write a program to implement merge sort.

PROGRAM CODE:

```
#include<stdio.h>
#include<conio.h>
#define max 10
int a[11] = { 10, 14, 19, 26, 27, 31, 33, 35, 42, 44, 0 };
int b[10];

void merging(int low, int mid, int high) {
  int l1, l2, i;

  for(l1 = low, l2 = mid + 1, i = low; l1 <= mid && l2 <= high; i++) {
    if(a[l1] <= a[l2])
      b[i] = a[l1++];
    else
      b[i] = a[l2++];
  }

  while(l1 <= mid)
    b[i++] = a[l1++];
  while(l2 <= high)
    b[i++] = a[l2++];
  for(i = low; i <= high; i++)
```

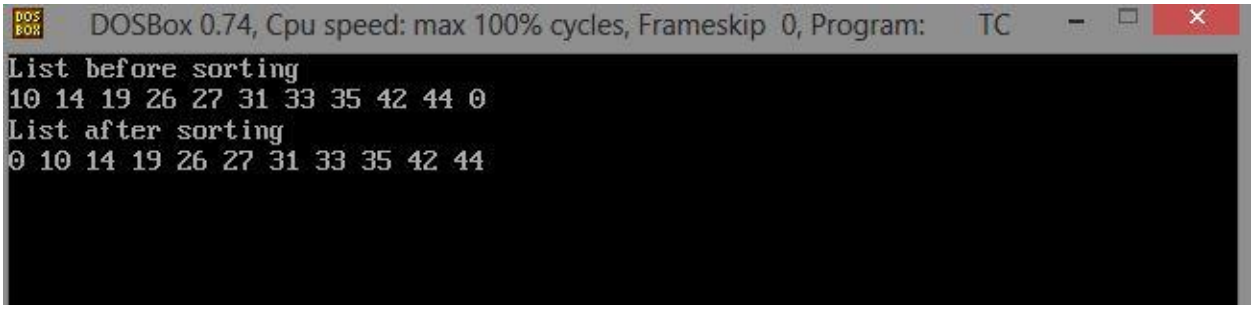
```
      a[i] = b[i];
}

void sort(int low, int high) {
  int mid;
  if(low < high) {
    mid = (low + high) / 2;
    sort(low, mid);
    sort(mid+1, high);
    merging(low, mid, high);
  } else {
    return;
  }
}
int main() {
  int i;
  clrscr();
  printf("List before sorting\n");

  for(i = 0; i <= max; i++)
    printf("%d ", a[i]);
  sort(0, max);
  printf("\nList after sorting\n");
  for(i = 0; i <= max; i++)
```

```
    printf("%d ", a[i]);
  getch();
}
```

OUTPUT :



PRACTICAL NO.:6(B)

AIM: Write a program to search the element using seqential search.

PROGRAM CODE:

```
#include<stdio.h>
#include<conio.h>
intsize,val;
void disp(int size);
void search(intval,int size);
intarr[20];
intmain()
{
inti,ch;
printf("Enter the size of array : ");
scanf("%d",&size);
for(i=0;i<size;i++)
{
scanf("%d",&arr[i]);
}
do
{
printf("\n****Main Menu****\n");
printf("1.Display\n");
printf("2.Search\n");
printf("Enter your Choice : ");
```

```
scanf("%d",&ch);
switch(ch)
{
case 1:disp(size);
break;
case 2:printf("Enter value to be search : ");
scanf("%d",&val);
search(val,size);
break;
}
}
while(ch!=2);
getch ();
return 0;
}
void search(intval,int size)
{
inti;
for(i=0;i<size;i++)
{
if(arr[i]==val)
{
printf("Value is found at %d position.",i);
break;
```

```
}
}
if(i==size)
{
printf("Value is not found.");
}
}
void disp(int size)
{
inti;
printf("Given Array :\n");
for(i=0;i<size;i++)
{
printf("%d\n",arr[i]);
}
}
```

OUTPUT :

```
Enter the size of array : 5
10
20
30
40
50

****Main Menu****
1.Display
2.Search
Enter your Choice : 1
Given Array :
10
20
30
40
50

****Main Menu****
1.Display
2.Search
Enter your Choice : 2
Enter value to be search : 30
Value is found at 2 position.
---------------------------------
```

PRACTICAL NO.:6(C)

AIM : Write a program to search the element using binary search.

PROGRAM CODE:

```
#include <stdio.h>
intmain()
{
int c, first, last, middle, n, search, array[100];
printf("Enter number of elements\n");
scanf("%d",&n);
printf("Enter %d integers\n", n);
for (c = 0; c < n; c++)
scanf("%d",&array[c]);
printf("Enter value to find\n");
scanf("%d", &search);
first = 0;
last = n - 1;
middle = (first+last)/2;
while (first <= last)
{
if (array[middle] < search)
first = middle + 1;
else if (array[middle] == search)
{
```

```
printf("%d found at location %d.\n", search, middle+1);
break;
}
else if(array[middle]>search)
last = middle - 1;
middle = (first + last)/2;
}
if (first > last)
printf("Not found! %d is not present in the list.\n", search);
return 0;
}
```

OUTPUT :

```
Enter number of elements
5
Enter 5 integers
10
20
30
40
50
Enter value to find
30
30 found at location 3.
```

PRACTICAL NO.:7

(Implement the following data structure techiniques)

Aim 7(A): Write a program to create the tree and display the element.

Aim 7(B): Write a program to construct the binary tree.

Aim 7(C): Write a program for inorder,postorder and preorder traversal of tree.

PROGRAM CODE:

```
#include<stdio.h>
#include<malloc.h>
struct node
{
int data;
struct node *left;
struct node *right;
};
struct node *root=NULL;
struct node *create(struct node*);
struct node *display(struct node*);
void preorder(struct node *temp);
void postorder(struct node *temp);
void inorder(struct node *temp);
intmain()
```

```
{
intchoice,val,count,min,max;
do
{
printf("**** Main Menu ***\n");
printf("1. create a binary search\n");
printf("2. Display the tree \n");
printf("3. EXIT \n");
printf("Enter your choice:");
scanf("%d",&choice);
printf("\n\n");
switch(choice)
{
case 1:root=create(root);
break;
case 2:root=display(root);
break;
case 3:break;
}
}while(choice!=3);
return 0;
}
struct node *create(struct node *root)
{
```

```
struct node *newnode=NULL,*temp=NULL,*parent=NULL;
intval;
printf("Enter the data or enter -1 to exit:");
scanf("%d",&val);
while(val!=-1)
{
newnode=(struct node*)malloc(sizeof(struct node));
newnode->data=val;
if(root==NULL)
{
root=newnode;
newnode->left=NULL;
newnode->right=NULL;
}
else
{
temp=root;
while(temp!=NULL)
{
parent=temp;
if(val<temp->data)
{
temp=temp->left;
}
```

```
else
{
temp=temp->right;
}
}
if(val<parent->data)
{
parent->left=newnode;
newnode->left=NULL;
newnode->right=NULL;
}
else
{
parent->right=newnode;
newnode->left=NULL;
newnode->right=NULL;
}
}
printf("Enter the data or enter -1 to exit:");
scanf("%d",&val);
}
printf("Succesfully created \n");
return root;
}
```

```
struct node *display(struct node *root)
{
int choice1;
printf("*** Display Menu***\n");
printf("1.pre-order\n");
printf("2.In-order\n");
printf("3.post-order\n");
printf("4. EXIT\n");
printf("Enter your choice :");
scanf("%d",&choice1);
switch(choice1)
{
case 1:printf("\tThe Pre-order Traveral is:");
preorder(root);
break;
case 2:printf("\tThe in order traversal is:");
inorder(root);
break;
case 3:printf("\tThe post-order traversal is:");
postorder(root);
break;
case 4:break;
}
printf("\n");
```

```
return root;
}
void preorder(struct node *temp)
{
if(temp!=NULL)
{
printf("%d",temp->data);
preorder(temp->left);
preorder(temp->right);
}
}
void postorder(struct node *temp)
{
if(temp!=NULL)
{
postorder(temp->left);
postorder(temp->right);
printf("%d",temp->data);

}
}
void inorder(struct node *temp)
{
if(temp!=NULL)
```

```
{
inorder(temp->left);
printf("%d",temp->data);
inorder(temp->right);
}
}
```

OUTPUT :

```
**** Main Menu ***
1. create a binary search
2. Display the tree
3. EXIT
Enter your choice:1


Enter the data or enter -1 to exit:1
Enter the data or enter -1 to exit:2
Enter the data or enter -1 to exit:3
Enter the data or enter -1 to exit:4
Enter the data or enter -1 to exit:5
Enter the data or enter -1 to exit:-1
Succesfully created
**** Main Menu ***
1. create a binary search
2. Display the tree
3. EXIT
Enter your choice:2


*** Display Menu***
1.pre-order
2.In-order
3.post-order
4. EXIT
Enter your choice :1
        The Pre-order Traveral is:12345
**** Main Menu ***
1. create a binary search
2. Display the tree
3. EXIT
Enter your choice:2
```

```
*** Display Menu***
1.pre-order
2.In-order
3.post-order
4. EXIT
Enter your choice :2
        The in order traversal is:12345
**** Main Menu ***
1. create a binary search
2. Display the tree
3. EXIT
Enter your choice:2


*** Display Menu***
1.pre-order
2.In-order
3.post-order
4. EXIT
Enter your choice :3
        The post-order traversal is:54321
**** Main Menu ***
1. create a binary search
2. Display the tree
3. EXIT
Enter your choice:3
```

PRACTICAL NO.:8(A)

AIM : Write a program to insert the element into maximum heap.

PROGRAM CODE:

```
#include<stdio.h>
#include<string.h>
#define SIZE 30
int a[SIZE],n;
void maxheapify(int a[],int i,int n1);
void buildheap(int a[],int n1);
void heap_sort(int a[]);
void swap(int i,int j);
int length(int a[]);
int main()
{
int i,j;
printf("Enter the number of element:");
scanf("%d",&n);
for(i=0;i<=n;i++)
{
printf("Enter a value:");
```

```
scanf("%d",&a[i]);
buildheap(a,i);
}
for(j=0;j<n;j++)
{
printf("%d",a[j]);

}
printf("\n");
}
void buildheap(int a[],int n1)
{
int i,j;
for(i=(n1/2)-1;i>=0;i--)
{
maxheapify(a,i,n1);
}
for(j=0;j<n1;j++)
{
printf("%d",a[j]);
}
printf("\n\n");
}
void maxheapify(int a[],int i,int n1)
```

```
{
int max,l,r;
max=i;
l=2*i+1;
r=2*i+2;
if(l<n1&&r<n1)
{
if(a[l]>a[max])
{
max=l;
}
if(a[r]>a[max])
{
max=r;
}
}
else if(l<n1&&r>=n1)
{
if(a[l]>a[max])
{
max=l;
}
}
else if(l>=n1&&r<n1)
```

```
{
if(a[r]>a[max])
{
max=r;
}
}
if(i!=max)
{
swap(i,max);
maxheapify(a,max,n1);
}
}
void swap(int i,int j)
{
int temp=a[i];
a[i]=a[j];
a[j]=temp;
}
int length(int a[])
{
int i=0;
while(a[i]!='\0')
{
i++;
```

```
}

return i;

}
```

OUTPUT :

```
Enter the number of element:5
Enter a value:1


Enter a value:2
1

Enter a value:3
21

Enter a value:4
312

Enter a value:5
4321

Enter a value:6
54213

54213
```

PRACTICAL NO.:8(B)

AIM : Write a program to insert the element into minimum heap.

PROGRAM CODE:

```
#include<stdio.h>
#include<string.h>
#define SIZE 30
int a[SIZE],n;
void maxheapify(int a[],inti,int n1);
void buildheap(int a[],int n1);
void heap_sort(int a[]);
void swap(inti,int j);
intlength(int a[]);
intmain()
{
inti,j;
printf("Enter the number of element:");
scanf("%d",&n);
for(i=0;i<=n;i++)
{
printf("Enter a value:");
scanf("%d",&a[i]);
buildheap(a,i);
}
```

```
for(j=0;j<n;j++)
{
printf("%d",a[j]);
}
printf("\n");
}
void buildheap(int a[],int n1)
{
inti,j;
for(i=(n1/2)-1;i>=0;i--)
{
maxheapify(a,i,n1);
}
for(j=0;j<n1;j++)
{
printf("%d",a[j]);
}
printf("\n");
}
void maxheapify(int a[],inti,int n1)
{
intmin,l,r;
min=i;
l=2*i+1;
```

```
r=2*i+2;
if(l<n1&&r<n1)
{
if(a[l]<a[min])
{
min=l;
}
if(a[r]<a[min])
{
min=r;
}
}
else if(l<n1&&r>=n1)
{
if(a[l]<a[min])
{
min=l;
}
}
else if(l>=n1&&r<n1)
{
if(a[r]<a[min])
{
min=r;
```

```
}
}
if(i!=min)
{
swap(i,min);
maxheapify(a,min,n1);
}
}
void swap(inti,int j)
{
int temp=a[i];
a[i]=a[j];
a[j]=temp;
}
intlength(int a[])
{
inti=0;
while(a[i]!='\0')
{
i++;
}
return i;
}
```

OUTPUT :

```
Enter the number of element:5
Enter a value:1

Enter a value:2
1
Enter a value:3
12
Enter a value:3
123
Enter a value:4
1233
Enter a value:5
12334
12334

--------------------------------
```