S.No: 35	Exp. Name: ***Write a C program to Count number of Characters, Words and Lines of a given File***	Date:2023-04-28

ID: 224G1A0555

Aim:

Write a program to `count` number of **characters**, **words** and **lines** of given text file.

- open a new file "`DemoTextFile2.txt`" in write mode
- write the content onto the file
- close the file
- open the same file in read mode
- read the text from file and find the characters, words and lines count
- print the counts of characters, words and lines
- close the file

Source Code:

countCharWordLines.c

```
#include<stdio.h>
int main()
{
   FILE *fp;
   char ch;
   int i=0,j=1,k=1;
   fp=fopen("DemoTextFile2.txt","w");
   printf("Enter the text with @ at end : ");
   while((ch=getchar())!='@')
   {
      if(ch=='\n')
      {
         j++;
         k++;
      }
      else if(ch==' ')
      {
         j++;
      }
      else
      {
         i++;
      }
   }
   printf("Total characters : %d\n",i);
   printf("Total words : %d\n",j);
   printf("Total lines : %d\n",k);
   fclose(fp);
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
`Enter the text with @ at end :  Arise! Awake!`

and stop not until
the goal is reached@
Total characters : 43
Total words : 10
Total lines : 3

Test Case - 2
User Output
Enter the text with @ at end : All power is with in you
you can do anything
and everything@
Total characters : 48
Total words : 12
Total lines : 3

ID: 224G1A0555

S.No: 33	Exp. Name: ***Write a C program to Reverse first n characters in a File***	Date:2023-07-03

Aim:

Write a program to `reverse` the first `n` characters in a file.

- open a new file "`TestDataFile3.txt`" in read/write mode
- write the content onto the file
- read the number of characters to copy
- copy the specified number of characters into a string
- reverse the string
- overwrite the entire string into the file from the begining
- close the file
- open the copied file "`TestDataFile3.txt`" in read mode
- read the text from file and print on the screen
- close the file

Source Code:

Program1506.c

```
#include<stdio.h>
#include<string.h>
void stringReverse(char[]);
int main()
{
FILE *fp;
int num,i;
char ch,data[100];
fp=fopen("TestDataFile3.txt","w+");
printf("Enter the text with @ at end : ");
while((ch=getchar())!='@')
{
putc(ch,fp);
}
putc(ch,fp);
printf("Enter number of characters to copy : ");
scanf("%d",&num);
i=0;
rewind(fp);
while(i<num)
{
data[i]=getc(fp);
i++;
}
data[i]='\0';
rewind(fp);
stringReverse(data);
fputs(data,fp);
fclose(fp);
fp=fopen("TestDataFile3.txt","r");
printf("Result is : ");
while((ch=getc(fp))!='@')
{
putchar(ch);
}
printf("\n");
```

```
fclose(fp);
}
void stringReverse(char data[100])
{
char temp;
int i=0,n;
n=strlen(data)-1;
while(i<n)
{
temp=data[i];
data[i]=data[n];
data[n]=temp;
i++;
n--;
}
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter the text with @ at end : Teaching is a
very noble profession that shapes the
character, caliber and future of an individual@
Enter number of characters to copy : 18
Result is : yrev
a si gnihcaeT noble profession that shapes the
character, caliber and future of an individual

Test Case - 2
User Output
Enter the text with @ at end : Small aim
is a crime; have great aim@
Enter number of characters to copy : 11
Result is : i
mia llamSs a crime; have great aim

ID: 224G1A0555

S.No: 32	Exp. Name: ***Write a C program to Copy last n characters from one File to another File***	Date:2023-07-03

ID: 224G1A0555

Aim:

Write a program to `copy` last `n` characters from **file-1** to **file-2**.

- open a new file "`TestDataFile1.txt`" in write mode
- write the content onto the file
- close the file
- open an existing file "`TestDataFile1.txt`" in read mode
- open a new file "`TestDataFile2.txt`" in write mode
- read the number of characters to copy
- set the cursor position by using fseek()
- copy the content from existing file to new file
- close the files
- open the copied file "`TestDataFile2.txt`" in read mode
- read the text from file and print on the screen
- close the file

Source Code:

Copy.c

```
#include <stdio.h>
void main()
{
   FILE *fp, *fp1,*fp2;
int num, length;char ch;
fp = fopen("TestDataFile1.txt", "w");
printf("Enter the text with @ at end : ");
while ((ch = getchar()) != '@')
{
   putc(ch, fp);
}
putc(ch, fp);
fclose(fp);
fp1 = fopen("TestDataFile1.txt", "r");
fp2 = fopen("TestDataFile2.txt", "w");
printf("Enter number of characters to copy : ");
scanf("%d", &num);fseek(fp1, 0L, SEEK_END);
length = ftell(fp1);
fseek(fp1, (length - num - 1), SEEK_SET);
while ((ch = getc(fp1)) != '@')
{
   putc(ch, fp2);
}
putc(ch, fp2);
fclose(fp1);fclose(fp2);
fp2 = fopen("TestDataFile2.txt", "r");
printf("Copied text is : ");
while ((ch = getc(fp2)) != '@')
{
   putchar(ch);
}
printf("\n");
```

```
fclose(fp2);
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter the text with @ at end : We should not give up
and we should not allow the problem to defeat us@
Enter number of characters to copy : 15
Copied text is : em to defeat us

Test Case - 2
User Output
Enter the text with @ at end : You have to dream
before
Your dreams can come true@
Enter number of characters to copy : 20
Copied text is : dreams can come true

ID: 224G1A0555

S.No: 31	Exp. Name: ***Write a C program to Delete a File***	Date:2023-07-03

Aim:

Write a program to `delete` a **file**.

Note: Use the `remove(fileName)` function to delete an existing file.

Source Code:

Delete.c

```
#include <stdio.h>
void main()
{
FILE *fp;
int status;
char fileName[40], ch;
printf("Enter a new file name : ");
gets(fileName);
fp = fopen(fileName, "w");
printf("Enter the text with @ at end : ");
while ((ch = getchar()) != '@')
{
putc(ch, fp);
}
putc(ch, fp);
fclose(fp);
fp = fopen(fileName, "r");
printf("Given message is : ");
while ((ch = getc(fp)) != '@')
{
putchar(ch);
}
printf("\n");
fclose(fp);
status = remove(fileName);
if (status == 0)
printf("%s file is deleted successfully\n", fileName);
else
{
printf("unable to delete the file --");
perror("Error\n");
}
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
`Enter a new file name :  Text1.txt`
`Enter the text with @ at end :  This is CodeTantra@`
`Given message is : This is CodeTantra`
`Text1.txt file is deleted successfully`

ID: 224G1A0555
2022-2026-CSE-A
Srinivasa Ramanujan Institute of Technology

Test Case - 2
User Output
Enter a new file name : Text2.txt
Enter the text with @ at end : C developed by Dennis Ritchie@
Given message is : C developed by Dennis Ritchie
Text2.txt file is deleted successfully

S.No: 30	Exp. Name: ***Write a C program to Merge two Files and stores their contents in another File***	Date:2023-07-03

Aim:

Write a program to `merge` two files and stores their contents in another file.

- Open a new file "`SampleDataFile1.txt`" in write mode
- Write the content onto the file
- Close the file
- Open another new file "`SampleDataFile2.txt`" in write mode
- Write the content onto the file
- Close the file
- Open first existing file "`SampleDataFile1.txt`" in read mode
- Open a new file "`SampleDataFile3.txt`" in write mode
- Copy the content from first existing file to new file
- Close the first existing file
- Open another existing file "`SampleDataFile2.txt`" in read mode
- Copy its content from existing file to new file
- Close that existing file
- Close the merged file

Source Code:

Merge.c

```
#include<stdio.h>
int main()
{
   FILE *fp1;
   FILE *fp2;
   FILE *fp3;
   char ch,chh,c;
   fp1=fopen("SampleDataFile1.txt","w");
   printf("Enter the text with @ at end for file-1 :\n");
   while((ch=getchar())!='@')
   {
      putc(ch,fp1);
   }
   putc(ch,fp1);
   fclose(fp1);
   fp2=fopen("SampleDataFile2.txt","w");
   printf("Enter the text with @ at end for file-2 :\n");
   while((chh=getchar())!='@')
   {
      putc(chh,fp2);
   }
   putc(chh,fp2);
   fclose(fp2);
   fp1=fopen("SampleDataFile1.txt","r");
   fp3=fopen("SampleDataFile3.txt","w");
   while((c=fgetc(fp1))!='@')
   {
      fputc(c,fp3);
   }
   fclose(fp1);
   fp2=fopen("SampleDataFile2.txt","r");
```

```
    while((c=fgetc(fp2))!='@')
    {
    fputc(c,fp3);
    }
fclose(fp2);
fclose(fp3);
printf("Merged text is : ");
fp3=fopen("SampleDataFile3.txt","r");
while((c=getc(fp3))!=EOF)
{
putchar(c);
}
printf("\n");
fclose(fp3);
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter the text with @ at end for file-1 : CodeTantra developed an interactive tool
in the year 2014
CodeTantra got best Startup award in 2016@
Enter the text with @ at end for file-2 : Now lot of Companies and Colleges using CodeTantr
Merged text is : CodeTantra developed an interactive tool
in the year 2014
CodeTantra got best Startup award in 2016
Now lot of Companies and Colleges using CodeTantra Tool

S.No: 29	Exp. Name: ***Write a C program to Copy contents of one File into another File***	Date:2023-07-03

ID: 224G1A0555

Aim:

Write a program to `copy` contents of one file into another file. Follow the instructions given below to write a program to copy the contents of one file to another file:

- Open a new file "`SampleTextFile1.txt`" in write mode
- Write the content onto the file
- Close the file
- Open an existing file "`SampleTextFile1.txt`" in read mode
- Open a new file "`SampleTextFile2.txt`" in write mode
- Copy the content from existing file to new file
- Close the files
- Open the copied file in read mode
- Read the text from file and print on the screen
- Close the file

Source Code:

CopyFile.c

```
#include<stdio.h>
int main()
{
   FILE *fp1;
   FILE *fp2;
   char ch,c;
   fp1=fopen("SampleText1.txt","w");
   printf("Enter the text with @ at end : ");
   while((ch=getchar()) !='@')
   {
      putc(ch,fp1);
   }
   putc(ch,fp1);
   fclose(fp1);
   fp1=fopen("SampleText1.txt","r");
   fp2=fopen("SampleText2.txt","w");
   while((c=fgetc(fp1))!='@')
   {
      fputc(c,fp2);
   }
   fclose(fp1);
   fclose(fp2);
   fp2=fopen("SampleText2.txt","r");
   printf("Copied text is : ");
   while((c=getc(fp2))!=EOF)
   {
      putchar(c);
   }
   printf("\n");
   fclose(fp2);
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter the text with @ at end : CodeTantra started in the year 2014@
Copied text is : CodeTantra started in the year 2014

Test Case - 2
User Output
Enter the text with @ at end : CodeTantra received
best Startup award from Hysea in 2016@
Copied text is : CodeTantra received
best Startup award from Hysea in 2016

ID: 224G1A0555
2022-2026-CSE-A
Srinivasa Ramanujan Institute of Technology

S.No: 28	Exp. Name: ***Write a C program to Open a File and to Print its contents on the screen***	Date:2023-04-28

ID: 224G1A0555

Aim:

Follow the instructions given below to write a program to `open` a file and to `print` its **contents** on the screen.

- Open a new file "`SampleText1.txt`" in write mode
- Write the content in the file
- Close the file
- Open the same file in read mode
- Read the content from file and print them on the screen
- Close the file

Source Code:

file1.c

```
#include<stdio.h>
int main()
{
   FILE *fp;
   char ch;
   fp=fopen("SampleText1.txt","w");
   printf("Enter the text with @ at end : ");
   while((ch=getchar())!='@')
   {
      putc(ch,fp);
   }
   putc(ch,fp);
   fclose(fp);
   fp=fopen("SampleText1.txt","r");
   printf("Given message is : ");
   while((ch=getc(fp))!='@')
   {
      putchar(ch);
   }
   printf("\n");
   fclose(fp);
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
`Enter the text with @ at end :  CodeTantra is a`
Startup Company recognized by Government of India@
`Given message is : CodeTantra is a`
`Startup Company recognized by Government of India`

Test Case - 2
User Output

```
Enter the text with @ at end :  CodeTantra is
increasing development of Languages Year
by Year@
Given message is : CodeTantra is
increasing development of Languages Year
by Year
```

S.No: 27	Exp. Name: ***Travelling Sales Person problem using Dynamic programming***	Date:2023-07-03

ID: 224G1A0555

Aim:

Write a C program to implement **Travelling Sales Person** problem using **Dynamic programming**.

Source Code:

TSP.c

```
#include<stdio.h>
int ary[10][10],
completed[10], n, cost = 0;
void takeInput()
{
   int i, j;
   printf("Number of villages: ");
   scanf("%d", & n);
   for (i = 0; i < n; i++)
   {
      for (j = 0; j < n; j++)
      scanf("%d", & ary[i][j]);
      completed[i] = 0;

   }
   printf("The cost list is:");
   for (i = 0; i < n; i++)
   {
      printf("\n");
      for (j = 0; j < n; j++)
      printf("\t%d", ary[i][j]);

   }
}
void mincost(int city)
{
   int i, ncity;completed[city] = 1;
   printf("%d-->", city + 1);
   ncity = least(city);
   if (ncity == 999)
   {
      ncity = 0;printf("%d", ncity + 1);
      cost += ary[city][ncity];
      return;

   }
   mincost(ncity);
}
int least(int c)
{
   int i, nc = 999;int min = 999, kmin;
   for (i = 0; i < n; i++)
   {
      if ((ary[c][i] != 0) && (completed[i] == 0))
      if (ary[c][i] + ary[i][c] < min)
      {
```

```
            min = ary[i][0] + ary[c][i];
            kmin = ary[c][i];nc = i;
         }
      }
      if (min != 999)cost += kmin;
      return nc;
}
int main()
{
      takeInput();
      printf("\nThe Path is:\n");
      mincost(0);
      printf("\nMinimum cost is %d", cost);
      return 0;
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Number of villages: 3
0 10 15
10 0 35
15 35 0
The cost list is:
0 10 15
10 0 35
15 35 0
The Path is:
1-->2-->3-->1
Minimum cost is 60

S.No: 26	Exp. Name: ***Graph traversals implementation - Depth First Search***	Date:2023-06-25

Aim:

Write a program to implement Depth First Search for a graph.

Source Code:

GraphsDFS.c

```
#include<stdio.h>
#include<stdlib.h>
struct node
{
      struct node *next;
         int vertex;
};
typedef struct node * GNODE;
GNODE graph[20];
int visited[20];
int n;
void DFS(int i)
{
GNODE p;
printf("\n%d",i);
p=graph[i];
visited[i]=1;
while(p!=NULL)
{
i=p->vertex;
if(!visited[i])
DFS(i);
p=p->next;
}
}
void main()
{
   int N,E,i,s,d,v;
   GNODE q,p;
   printf("Enter the number of vertices : ");
   scanf("%d",&N);
   printf("Enter the number of edges : ");
   scanf("%d",&E);
   for(i=1;i<=E;i++)
   {
      printf("Enter source : ");
      scanf("%d",&s);
        printf("Enter destination : ");
        scanf("%d",&d);
        q=(GNODE)malloc(sizeof(struct node));
        q->vertex=d;
        q->next=NULL;
        if(graph[s]==NULL)
        graph[s]=q;
        else
        {
```


ID: 224G1A0555

```
            p=graph[s];
            while(p->next!=NULL)
            p=p->next;
            p->next=q;
          }
      }
for(i=0;i<n;i++)
visited[i]=0;
printf("Enter Start Vertex for DFS : ");
scanf("%d", &v);
printf("DFS of graph : ");
DFS(v);
printf("\n");
}
```


Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter the number of vertices : 6
Enter the number of edges : 7
Enter source : 1
Enter destination : 2
Enter source : 1
Enter destination : 4
Enter source : 4
Enter destination : 2
Enter source : 2
Enter destination : 3
Enter source : 4
Enter destination : 5
Enter source : 1
Enter destination : 3
Enter source : 3
Enter destination : 6
Enter Start Vertex for DFS : 1
DFS of graph :
1
2
3
6
4
5

Test Case - 2
User Output
Enter the number of vertices : 5
Enter the number of edges : 5
Enter source : 1
Enter destination : 2

```
Enter source : 1
Enter destination : 4
Enter source : 4
Enter destination : 2
Enter source : 2
Enter destination : 3
Enter source : 4
Enter destination : 5
Enter Start Vertex for DFS : 1
DFS of graph :
1
2
3
4
5
```

S.No: 25	Exp. Name: ***Graph traversals implementation - Breadth First Search***	Date:2023-06-25

Aim:

Write a program to implement Breadth First Search of a graph.

Source Code:

GraphsBFS.c

```
#include <stdio.h>
#include <stdlib.h>
#define MAX 99
struct node
{
   struct node *next;
   int vertex;
};
typedef struct node* GNODE;
GNODE graph[20];
int visited[20];
int queue[MAX], front= -1,rear = -1;
int n;
void insertQueue(int vertex)
{
   if(rear == MAX-1)
   printf("Queue Overflow.\n");
   else
   {
      if(front == -1)
      front= 0;
      rear= rear+1;
      queue[rear] = vertex;
   }
}
int isEmptyQueue()
{
   if(front == -1 || front> rear)
   return 1;
   else
   return 0;
}
int deleteQueue()
{
    int deleteItem;
   if(front == -1 || front> rear)
   {
      printf("Queue Underflow\n");
      exit(1);
   }
   deleteItem = queue[front];
   front= front+1;
   return deleteItem;
}
void BFS(int v)
{
```


ID: 224G1A0555

Srinivasa Ramanujan Institute of Technology

```
   int w;
    insertQueue(v);
   while(!isEmptyQueue())
   {
      v = deleteQueue( );
      printf("\n%d",v);
      visited[v]=1;
      GNODE g = graph[v];
      for(;g!=NULL;g=g->next)
       {
         w=g->vertex;
         if(visited[w]==0)
         {
            insertQueue(w);
            visited[w]=1;
            }
      }
    }
}
void main()
{
   int N, E, s, d, i, j, v;
   GNODE p, q;
   printf("Enter the number of vertices : ");
   scanf("%d",&N);
   printf("Enter the number of edges : ");
   scanf("%d",&E);
   for(i=1;i<=E;i++)
   {
       printf("Enter source : ");
      scanf("%d",&s);
      printf("Enter destination : ");
      scanf("%d",&d);
      q=(GNODE)malloc(sizeof(struct node));
      q->vertex=d;
      q->next=NULL;
      if(graph[s]==NULL)
      {
         graph[s]=q;
      }
      else
      {
         p=graph[s];
         while(p->next!=NULL)
         p=p->next;
         p->next=q;
      }
   }
   for(i=1;i<=n;i++)
   visited[i]=0;
   printf("Enter Start Vertex for BFS : ");
   scanf("%d", &v);
   printf("BFS of graph : ");
   BFS(v);
   printf("\n");
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter the number of vertices : 5
Enter the number of edges : 5
Enter source : 1
Enter destination : 2
Enter source : 1
Enter destination : 4
Enter source : 4
Enter destination : 2
Enter source : 2
Enter destination : 3
Enter source : 4
Enter destination : 5
Enter Start Vertex for BFS : 1
BFS of graph :
1
2
4
3
5

Test Case - 2
User Output
Enter the number of vertices : 4
Enter the number of edges : 3
Enter source : 1
Enter destination : 2
Enter source : 2
Enter destination : 3
Enter source : 3
Enter destination : 4
Enter Start Vertex for BFS : 2
BFS of graph :
2
3
4

S.No: 24	Exp. Name: ***Write a Program to Search an element using Binary Search and Recursion***	Date:2023-06-25

Aim:

Write a program to `search` the given element from a list of elements with `binary search` technique using **recursion**.

At the time of execution, the program should print the message on the console as:

```
Enter value of n :
```

For example, if the user gives the **input** as:

```
Enter value of n : 5
```

Next, the program should print the following messages one by one on the console as:

```
Enter 5 elements :
```

if the user gives the **input** as:

```
Enter 5 elements : 33 55 22 44 11
```

then the program should **print** the result as:

```
After sorting the elements are : 11 22 33 44 55
```

Next, the program should print the message on the console as:

```
Enter key element :
```

if the user gives the **input** as:

```
Enter key element : 11
```

then the program should **print** the result as:

```
The given key element 11 is found at position : 0
```

Similarly, if the key element is given as `18` for the above example then the program should print the output as:

```
The given key element 18 is not found
```

Note: Write the functions **read()**, **bubbleSort()**, **display()** and **binarySearch()** in `BinarySearch.c`

Source Code:

BinarySearch.c

```
#include <stdio.h>
void main()
{
   int a[20], n, key, flag;
   printf("Enter value of n : ");
   scanf("%d", &n);
   read(a, n);
   bubbleSort(a, n);
```

```
    printf("After sorting the elements are : ");
    display(a, n);
    printf("Enter key element : ");
    scanf("%d", &key);
    flag = binarySearch(a, 0, n - 1, key);
    if (flag == -1)
    {
        printf("The given key element %d is not found\n", key);
    }
    else
    {
        printf("The given key element %d is found at position : %d\n", key, flag);
    }
}
void read(int a[], int n)
{
    int i;
    printf("Enter %d elements : ",n);
    for(i=0;i<n;i++)
    {
        scanf("%d",&a[i]);
    }
}
void display(int a[], int n)
{
    int i;
    for(i=0;i<n;i++)
    {
        printf("%d ",a[i]);
    }
    printf("\n");
}
void bubbleSort(int a[], int n)
{
    int i,j,temp;
    for(i=0;i<n;i++)
    {
        for(j=0;j<n-1;j++)
        {
            if(a[j+1]<a[j])
            {
                temp = a[j+1];
                a[j+1] = a[j];
                a[j] = temp;
            }
        }
    }
}
int binarySearch(int a[], int x, int n,int key)
{
    int low = 0,high = n-1, mid;
    while(low<=high)
    {
        mid = (low+high)/2;
        if(a[mid]==key)
        {
```

```
            x = mid;
            return x;
            break;
        }
        else if(a[mid]<key)
        {
            low = mid+1;
        }
        else
        {
            high = mid-1;
        }
    }
    return -1;
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter value of n : 5
Enter 5 elements : 33 55 22 44 11
After sorting the elements are : 11 22 33 44 55 11
Enter key element : 11
The given key element 11 is found at position : 0

Test Case - 2
User Output
Enter value of n : 4
Enter 4 elements : 23 9 45 18
After sorting the elements are : 9 18 23 45 24
Enter key element : 24
The given key element 24 is not found

ID: 224G1A0555

S.No: 23	Exp. Name: ***Program to insert into BST and traversal using In-order, Pre-order and Post-order***	Date:2023-06-25

Aim:

Write a program to create a binary search tree of integers and perform the following operations using linked list.

1. Insert a node
2. In-order traversal
3. Pre-order traversal
4. Post-order traversal

Source Code:

BinarySearchTree.c

```
#include<stdio.h>
#include<stdlib.h>
struct node
{
   int data;
   struct node *left, *right;
};
typedef struct node *BSTNODE;
BSTNODE newNodeInBST(int item)
{
   BSTNODE temp = (BSTNODE)malloc(sizeof(struct node));
   temp->data = item;
   temp->left = temp->right = NULL;
   return temp;
}
void inorderInBST(BSTNODE root)
{
    if(root != NULL)
   {
      inorderInBST(root->left);
        printf("%d ",root->data);
      inorderInBST(root->right);
   }
}
void preorderInBST(BSTNODE root)
{
   if(root != NULL)
    {
      printf("%d ",root->data);
        preorderInBST(root->left);
        preorderInBST(root->right);
    }
}
void postorderInBST(BSTNODE root)
{
   if(root != NULL)
   {
      postorderInBST(root->left);
      postorderInBST(root->right);
        printf("%d ",root->data);
```

```
   }
}
BSTNODE insertNodeInBST(BSTNODE node, int ele)
{
    if(node == NULL)
   {
        printf("Successfully inserted.\n");
        return newNodeInBST(ele);
    }
   if(ele<node->data)
   {
       node->left = insertNodeInBST(node->left, ele);
    }
    else if(ele>node->data)
    {
       node->right = insertNodeInBST(node->right, ele);
    }
    else
        printf("Element already exist in BST.\n");
        return node;

}
void main()
{
    int x,op;
    BSTNODE root = NULL;
    while(1)
    {
        printf("1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Travers
al 5.Exit\n");
        printf("Enter your option : ");
        scanf("%d",&op);
        switch(op)
        {
        case 1:
        printf("Enter an element to be inserted : ");
        scanf("%d",&x);
        root = insertNodeInBST(root,x);
        break;
        case 2:
        if(root == NULL)
        {
            printf("Binary search tree is empty.\n");
        }
        else
        {
            printf("Elements of the BST (in-order traversal): ");
            inorderInBST(root);
            printf("\n");
        }
        break;
        case 3:
        if(root == NULL)
        {
         printf("Binary search Tree is empty.\n");
        }
```

```
        else
        {
            printf("Elements of the BST (pre-order traversal): ");
            preorderInBST(root);
            printf("\n");
        }
        break;
        case 4:
        if(root == NULL)
        {
            printf("Binary Search Tree is empty.\n");
        }
        else
        {
           printf("Elements of the BST (post-order traversal): ");
            postorderInBST(root);
            printf("\n");
        }
        break;
        case 5:
        exit(0);
        }
    }

}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 1
Enter your option : 1
Enter an element to be inserted : 100
Successfully inserted. 1
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 1
Enter your option : 1
Enter an element to be inserted : 20
Successfully inserted. 1
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 1
Enter your option : 1
Enter an element to be inserted : 200
Successfully inserted. 1
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 1
Enter your option : 1
Enter an element to be inserted : 10
Successfully inserted. 1
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 1
Enter your option : 1
Enter an element to be inserted : 30
Successfully inserted. 1
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 1
Enter your option : 1

Enter an element to be inserted : 150
Successfully inserted. 1
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 1
Enter your option : 1
Enter an element to be inserted : 300
Successfully inserted. 2
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 2
Enter your option : 2
Elements of the BST (in-order traversal): 10 20 30 100 150 200 300 3
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 3
Enter your option : 3
Elements of the BST (pre-order traversal): 100 20 10 30 200 150 300 4
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 4
Enter your option : 4
Elements of the BST (post-order traversal): 10 30 20 150 300 200 100 5
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 5
Enter your option : 5

Test Case - 2
User Output
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 1
Enter your option : 1
Enter an element to be inserted : 25
Successfully inserted. 1
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 1
Enter your option : 1
Enter an element to be inserted : 63
Successfully inserted. 1
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 1
Enter your option : 1
Enter an element to be inserted : 89
Successfully inserted. 1
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 1
Enter your option : 1
Enter an element to be inserted : 45
Successfully inserted. 1
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 1
Enter your option : 1
Enter an element to be inserted : 65
Successfully inserted. 1
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 1
Enter your option : 1
Enter an element to be inserted : 28
Successfully inserted. 4
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 4
Enter your option : 4
Elements of the BST (post-order traversal): 28 45 65 89 63 25 3
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 3
Enter your option : 3
Elements of the BST (pre-order traversal): 25 63 45 28 89 65 2
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 2

```
Enter your option :  2
Elements of the BST (in-order traversal): 25 28 45 63 65 89  5
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 5
Enter your option :  5
```

S.No: 22	Exp. Name: ***Reversing the links of a linked list***	Date:2023-07-22

Aim:

Write a C program to reverse the links (not just displaying) of a linked list.
Note: Add node at the beginning.

Source Code:

reverseLinkedList.c

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

    struct Node {
        int data;
          struct Node* next;
    };

static void reverse(struct Node** head_ref) {
struct Node* prev = NULL;
struct Node* current = *head_ref;
struct Node* next = NULL;
while (current != NULL)    {
   next=current->next;
   current->next=prev;
   prev=current;
   current=next;
}
*head_ref = prev;
}
/* Function to push a node */
void push(struct Node** head_ref, int new_data)
{
struct Node* new_node = (struct Node*) malloc(sizeof(struct Node)) ;
new_node->data=new_data;
new_node->next = (*head_ref) ;
(*head_ref) =new_node  ;
}
void printList(struct Node* head)
{
struct Node* temp=head;
while (temp != NULL)
{
printf("%d", temp->data) ;
if ( temp -> next != NULL) {
   printf("->") ;
}
temp=temp->next;
}
}
   int main()
   {
   struct Node* head = NULL;
   int i,count=0,num=0;
   printf("How many  numbers you want to enter:") ;
```


ID: 224G1A0555
2022-2026-CSE-A
Srinivasa Ramanujan Institute of Technology

```
    scanf(" %d", &count);
    for (i = 0; i < count; i++) {
    printf("Enter number %d:", i+1) ;
    scanf(" %d", &num) ;
    push(&head, num)     ;
    }
    printf("Given linked list:") ;
    printList(head)       ;
    reverse(&head);
    printf("\nReversed linked list:")    ;
    printList(head) ;
    }
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
How many numbers you want to enter: 4
Enter number 1: 6
Enter number 2: 1
Enter number 3: 8
Enter number 4: 5
Given linked list:5->8->1->6
Reversed linked list:6->1->8->5

Test Case - 2
User Output
How many numbers you want to enter: 2
Enter number 1: 5
Enter number 2: 9
Given linked list:9->5
Reversed linked list:5->9

ID: 224G1A0555

S.No: 21	Exp. Name: ***Write a C program to implement different Operations on Queue using Linked Lists***	Date:2023-06-25

ID: 224G1A0555

2022-2026-CSE-A

Srinivasa Ramanujan Institute of Technology

Aim:

Write a program to implement queue using **linked lists**.

```
Sample Input and Output:
        1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
        Enter your option : 1
        Enter element : 57
        Successfully inserted.
        1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
        Enter your option : 1
        Enter element : 87
        Successfully inserted.
        1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
        Enter your option : 5
        Queue size : 2
        1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
        Enter your option : 3
        Elements in the queue : 57 87
        1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
        Enter your option : 2
        Deleted value = 57
        1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
        Enter your option : 2
        Deleted value = 87
        1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
        Enter your option : 3
        Queue is empty.
        1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
        Enter your option : 5
        Queue size : 0
        1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
        Enter your option : 6
```

Source Code:

QUsingLL.c

```
#include <conio.h>
#include <stdio.h>
int main()
{
   int op, x;
   while(1)
   {
      printf("1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit\n");
      printf("Enter your option : ");
      scanf("%d",&op);
      switch(op) {
         case 1:
         printf("Enter element : ");
         scanf("%d",&x);
```

```
            enqueue(x);
            break;

            case 2:
            dequeue();
            break;
            case 3:
            display();
            break;
            case 4:
            isEmpty();
            break;
            case 5:
            size();
            break;
            case 6: exit(0);
         }
      }
}
struct queue
{
   int data;
   struct queue *next;
};
typedef struct queue *Q;
Q front = NULL, rear = NULL;
void enqueue(int ele)
{
   Q temp = NULL;
   temp = (Q)malloc(sizeof(struct queue));
   if(temp == NULL)
   {
      printf("Queue is overflow.\n");
   }
   else
   {
      temp->data = ele;
      temp->next = NULL;
      if(front == NULL)
      {
         front = temp;
      }
      else
      {
         rear->next = temp;
      }
      rear = temp;
      printf("Successfully inserted.\n");
   }
}
void dequeue()
{
   if(front == NULL)
   printf("Queue is underflow.\n");
   else {
      Q temp = front;
```

```
        front = front->next;
        printf("Deleted value = %d\n",temp->data);
        free(temp);
    }
}
void display()
{
    if(front == NULL)
    printf("Queue is empty.\n");
    else
    {
        Q temp = front;
        printf("Elements in the queue : ");
        while(temp!=NULL)
        {
            printf("%d ",temp->data);
            temp = temp->next;
        }
        printf("\n");
    }
}
void size()
{
    int count = 0;
    printf("Queue size : ");
    if(front == NULL)
    printf("0\n");
    else
    {
        Q temp = front;
        while(temp!=NULL)
        {
            count++;
            temp = temp->next;
        }
        printf("%d\n" ,count);
    }
}
void isEmpty()
{
    if(front == NULL)
    printf("Queue is empty.\n");
    else
    printf("Queue is not empty.\n");
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 2
Enter your option : 2
Queue is underflow. 3
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 3

ID: 224G1A0555

```
Enter your option : 3
Queue is empty. 4
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 4
Enter your option : 4
Queue is empty. 5
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 5
Enter your option : 5
Queue size : 0 1
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 1
Enter your option : 1
Enter element : 44
Successfully inserted. 1
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 1
Enter your option : 1
Enter element : 55
Successfully inserted. 1
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 1
Enter your option : 1
Enter element : 66
Successfully inserted. 1
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 1
Enter your option : 1
Enter element : 67
Successfully inserted. 3
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 3
Enter your option : 3
Elements in the queue : 44 55 66 67  2
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 2
Enter your option : 2
Deleted value = 44 2
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 2
Enter your option : 2
Deleted value = 55 5
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 5
Enter your option : 5
Queue size : 2 4
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 4
Enter your option : 4
Queue is not empty. 6
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 6
Enter your option : 6
```

Test Case - 2

User Output

```
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 1
Enter your option : 1
Enter element : 23
Successfully inserted. 1
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 1
Enter your option : 1
Enter element : 234
```

```
Successfully inserted. 1
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 1
Enter your option :  1
Enter element :  45
Successfully inserted. 1
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 1
Enter your option :  1
Enter element :  456
Successfully inserted. 2
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 2
Enter your option :  2
Deleted value = 23 3
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 3
Enter your option :  3
Elements in the queue : 234 45 456  2
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 2
Enter your option :  2
Deleted value = 234 3
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 3
Enter your option :  3
Elements in the queue : 45 456  4
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 4
Enter your option :  4
Queue is not empty. 5
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 5
Enter your option :  5
Queue size : 2 3
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 3
Enter your option :  3
Elements in the queue : 45 456  6
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 6
Enter your option :  6
```

S.No: 20	Exp. Name: ***Write a C program to implement different Operations on Queue using Dynamic Array***	Date:2023-06-18

Aim:

Write a program to implement queue using **dynamic array**.

In this queue implementation has

1. a pointer 'queue' to a dynamically allocated array (used to hold the contents of the queue)
2. an integer 'maxSize' that holds the size of this array (i.e the maximum number of data that can be held in this array)
3. an integer 'front' which stores the array index of the first element in the queue
4. an integer 'rear' which stores the array index of the last element in the queue.

ID: 224G1A0555

```
Sample Input and Output:
        Enter the maximum size of the queue : 3
        1.Enqueue 2.Dequeue 3.Display 4.Exit
        Enter your option : 2
        Queue is underflow.
        1.Enqueue 2.Dequeue 3.Display 4.Exit
        Enter your option : 3
        Queue is empty.
        1.Enqueue 2.Dequeue 3.Display 4.Exit
        Enter your option : 1
        Enter element : 15
        Successfully inserted.
        1.Enqueue 2.Dequeue 3.Display 4.Exit
        Enter your option : 1
        Enter element : 16
        Successfully inserted.
        1.Enqueue 2.Dequeue 3.Display 4.Exit
        Enter your option : 1
        Enter element : 17
        Successfully inserted.
        1.Enqueue 2.Dequeue 3.Display 4.Exit
        Enter your option : 1
        Enter element : 18
        Queue is overflow.
        1.Enqueue 2.Dequeue 3.Display 4.Exit
        Enter your option : 3
        Elements in the queue : 15 16 17
        1.Enqueue 2.Dequeue 3.Display 4.Exit
        Enter your option : 2
        Deleted element = 15
        1.Enqueue 2.Dequeue 3.Display 4.Exit
        Enter your option : 2
        Deleted element = 16
        1.Enqueue 2.Dequeue 3.Display 4.Exit
        Enter your option : 3
        Elements in the queue : 17
        1.Enqueue 2.Dequeue 3.Display 4.Exit
        Enter your option : 2
        Deleted element = 17
        1.Enqueue 2.Dequeue 3.Display 4.Exit
        Enter your option : 3
        Queue is empty.
        1.Enqueue 2.Dequeue 3.Display 4.Exit
        Enter your option : 2
        Queue is underflow.
        1.Enqueue 2.Dequeue 3.Display 4.Exit
        Enter your option : 4
```

Source Code:

QUsingDynamicArray.c

```
#include <conio.h>
#include <stdio.h>
int *queue;
```

```
int front, rear;
int maxSize;
void initQueue() {
   queue = (int *)malloc(maxSize*sizeof(int));
   front = -1;
   rear = -1;
}
void enqueue(int x) {
   if (rear == maxSize - 1) {
      printf("Queue is overflow.\n");
   }
   else {
      rear++;
      queue[rear] = x;
      printf("Successfully inserted.\n");
   }
   if (front == -1) {
      front++;
   }
}
void dequeue() {
   if (front == -1) {
      printf("Queue is underflow.\n");
   }
   else {
      printf("Deleted element = %d\n", *(queue+front));
      if (rear == front) {
         rear = front = -1;
      }
      else {
         front++;
      }
   }
}
void display() {
   if (front == -1 && rear == -1) {
      printf("Queue is empty.\n");
   }
   else {
      printf("Elements in the queue : ");
      for(int i = front;i <= rear; i++)
      {
         printf("%d ",*(queue+i));
      }
      printf("\n");
   }
}
int main() {
   int op, x;
   printf("Enter the maximum size of the queue : ");
   scanf("%d", &maxSize);
   initQueue();
   while(1) {
      printf("1.Enqueue 2.Dequeue 3.Display 4.Exit\n");
      printf("Enter your option : ");
      scanf("%d",&op);
```

```
      switch(op) {
         case 1:
         printf("Enter element : ");
         scanf("%d",&x);
         enqueue(x);
         break;
         case 2:
         dequeue();
         break;
         case 3:
         display();
         break;
         case 4:
         exit(0);
      }
   }
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter the maximum size of the queue : 3
1.Enqueue 2.Dequeue 3.Display 4.Exit 2
Enter your option : 2
Queue is underflow. 3
1.Enqueue 2.Dequeue 3.Display 4.Exit 3
Enter your option : 3
Queue is empty. 1
1.Enqueue 2.Dequeue 3.Display 4.Exit 1
Enter your option : 1
Enter element : 15
Successfully inserted. 1
1.Enqueue 2.Dequeue 3.Display 4.Exit 1
Enter your option : 1
Enter element : 16
Successfully inserted. 1
1.Enqueue 2.Dequeue 3.Display 4.Exit 1
Enter your option : 1
Enter element : 17
Successfully inserted. 1
1.Enqueue 2.Dequeue 3.Display 4.Exit 1
Enter your option : 1
Enter element : 18
Queue is overflow. 3
1.Enqueue 2.Dequeue 3.Display 4.Exit 3
Enter your option : 3
Elements in the queue : 15 16 17 2
1.Enqueue 2.Dequeue 3.Display 4.Exit 2
Enter your option : 2
Deleted element = 15 2
1.Enqueue 2.Dequeue 3.Display 4.Exit 2

Enter your option : 2
Deleted element = 16 3
1.Enqueue 2.Dequeue 3.Display 4.Exit 3
Enter your option : 3
Elements in the queue : 17 2
1.Enqueue 2.Dequeue 3.Display 4.Exit 2
Enter your option : 2
Deleted element = 17 3
1.Enqueue 2.Dequeue 3.Display 4.Exit 3
Enter your option : 3
Queue is empty. 2
1.Enqueue 2.Dequeue 3.Display 4.Exit 2
Enter your option : 2
Queue is underflow. 4
1.Enqueue 2.Dequeue 3.Display 4.Exit 4
Enter your option : 4

Test Case - 2
User Output
Enter the maximum size of the queue : 2
1.Enqueue 2.Dequeue 3.Display 4.Exit 1
Enter your option : 1
Enter element : 34
Successfully inserted. 1
1.Enqueue 2.Dequeue 3.Display 4.Exit 1
Enter your option : 1
Enter element : 56
Successfully inserted. 1
1.Enqueue 2.Dequeue 3.Display 4.Exit 1
Enter your option : 1
Enter element : 45
Queue is overflow. 3
1.Enqueue 2.Dequeue 3.Display 4.Exit 3
Enter your option : 3
Elements in the queue : 34 56 2
1.Enqueue 2.Dequeue 3.Display 4.Exit 2
Enter your option : 2
Deleted element = 34 2
1.Enqueue 2.Dequeue 3.Display 4.Exit 2
Enter your option : 2
Deleted element = 56 2
1.Enqueue 2.Dequeue 3.Display 4.Exit 2
Enter your option : 2
Queue is underflow. 2
1.Enqueue 2.Dequeue 3.Display 4.Exit 2
Enter your option : 2
Queue is underflow. 3
1.Enqueue 2.Dequeue 3.Display 4.Exit 3
Enter your option : 3
Queue is empty. 1
1.Enqueue 2.Dequeue 3.Display 4.Exit 1

```
Enter your option :  1
Enter element :  56
Successfully inserted. 3
1.Enqueue 2.Dequeue 3.Display 4.Exit 3
Enter your option :  3
Elements in the queue : 56  4
1.Enqueue 2.Dequeue 3.Display 4.Exit 4
Enter your option :  4
```

S.No: 19	Exp. Name: ***Write a C program to implement different Operations on Queue using Array representation***	Date:2023-06-18

ID: 224G1A0555

2022-2026-CSE-A

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Aim:

Write a program to implement queue using **arrays**.

```
Sample Input and Output:
        1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
        Enter your option : 1
        Enter element : 23
        Successfully inserted.
        1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
        Enter your option : 1
        Enter element : 56
        Successfully inserted.
        1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
        Enter your option : 3
        Elements in the queue : 23 56
        1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
        Enter your option : 4
        Queue is not empty.
        1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
        Enter your option : 5
        Queue size : 2
        1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
        Enter your option : 2
        Deleted element = 23
        1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
        Enter your option : 2
        Deleted element = 56
        1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
        Enter your option : 4
        Queue is empty.
        1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
        Enter your option : 6
```

Source Code:

QUsingArray.c

```
#include<stdio.h>
#include<conio.h>
#define MAX 10
int queue[MAX];
int front=-1,rear=-1;
void enqueue(int x) {
   if(rear==MAX-1) {
      printf("Queue is overflow.\n");
   }
   else {
      rear++;
      queue[rear]=x;
      printf("Successfully inserted.\n");
   }
```

```
    if(front==-1) {
        front++;
    }
}
void dequeue() {
    if(front==-1) {
        printf("Queue is underflow.\n");
    }
    else {
        printf("Deleted element = %d\n",queue[front]);
        if(rear==front) {
            rear=front=-1;
        }
        else {
            front++;
        }
    }
}
void display() {
    if(front==-1&&rear==-1) {
        printf("Queue is empty.\n");
    }
    else {
        printf("Elements in the queue : ");
        for(int i=front;i<=rear;i++)
        printf("%d ",queue[i]);
        printf("\n");
    }
}
void size()
{
    if(front==-1&&rear==-1)
    {
        printf("Queue size : 0\n");
    }
    else
    {
        printf("Queue size : %d\n",rear-front+1);
    }
}
void isEmpty()
{
    if(front==-1&&rear==-1)
    {
        printf("Queue is empty.\n");
    }
    else
    {
        printf("Queue is not empty.\n");
    }
}
int main()
{
    int op,x;
    while(1)
    {
```


ID: 224G1A0555

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```
        printf("1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit\n");
        printf("Enter your option : ");
        scanf("%d",&op);
        switch(op)
        {
           case 1:
           printf("Enter element : ");
           scanf("%d",&x);
           enqueue(x);
           break;
           case 2:
           dequeue();
           break;
           case 3:
           display();
           break;
           case 4:
           isEmpty();
           break;
           case 5:
           size();
           break;
           case 6:
           exit(0);
        }
    }
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 2
Enter your option : 2
Queue is underflow. 3
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 3
Enter your option : 3
Queue is empty. 4
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 4
Enter your option : 4
Queue is empty. 5
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 5
Enter your option : 5
Queue size : 0 1
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 1
Enter your option : 1
Enter element : 14
Successfully inserted. 1
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 1
Enter your option : 1
Enter element : 78
Successfully inserted. 1
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 1

```
Enter your option : 1
Enter element : 53
Successfully inserted. 3
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 3
Enter your option : 3
Elements in the queue : 14 78 53 5
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 5
Enter your option : 5
Queue size : 3 6
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 6
Enter your option : 6
```

Test Case - 2

User Output

```
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 1
Enter your option : 1
Enter element : 25
Successfully inserted. 2
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 2
Enter your option : 2
Deleted element = 25 2
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 2
Enter your option : 2
Queue is underflow. 3
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 3
Enter your option : 3
Queue is empty. 1
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 1
Enter your option : 1
Enter element : 65
Successfully inserted. 3
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 3
Enter your option : 3
Elements in the queue : 65 4
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 4
Enter your option : 4
Queue is not empty. 2
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 2
Enter your option : 2
Deleted element = 65 4
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 4
Enter your option : 4
Queue is empty. 5
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 5
Enter your option : 5
Queue size : 0 1
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 1
Enter your option : 1
Enter element : 63
Successfully inserted. 5
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 5
```

```
Enter your option :  5
Queue size : 1 6
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit 6
Enter your option :  6
```

S.No: 18	Exp. Name: ***Write a C program to implement different Operations on Stack using Linked Lists***	Date:2023-06-18

ID: 224G1A0555

2022-2026-CSE-A

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Aim:

Write a program to implement stack using **linked lists**.

```
Sample Input and Output:
        1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
        Enter your option : 1
        Enter element : 33
        Successfully pushed.
        1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
        Enter your option : 1
        Enter element : 22
        Successfully pushed.
        1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
        Enter your option : 1
        Enter element : 55
        Successfully pushed.
        1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
        Enter your option : 1
        Enter element : 66
        Successfully pushed.
        1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
        Enter your option : 3
        Elements of the stack are : 66 55 22 33
        1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
        Enter your option : 2
        Popped value = 66
        1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
        Enter your option : 2
        Popped value = 55
        1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
        Enter your option : 3
        Elements of the stack are : 22 33
        1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
        Enter your option : 5
        Peek value = 22
        1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
        Enter your option : 4
        Stack is not empty.
        1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
        Enter your option : 6
```

Source Code:

StackUsingLList.c

```
#include<stdio.h>
#include<stdlib.h>
struct stack {
   int data;
   struct stack*next;
};
```

```
typedef struct stack*stk;
stk top=NULL;
stk push(int x) {
   stk temp;
   temp=(stk)malloc(sizeof(struct stack));
   if(temp==NULL) {
      printf("Stack is overflow.\n");
   }
   else {
      temp->data=x;
      temp->next=top;
      top=temp;
      printf("Successfully pushed.\n");
   }
}
void display() {
   stk temp=top;
   if(temp==NULL) {
      printf("Stack is empty.\n");
   }
   else {
      printf("Elements of the stack are : ");
      while(temp!=NULL) {
         printf("%d ",temp->data);
         temp=temp->next;
      }
      printf("\n");
   }
}
stk pop() {
   stk temp;
   if(top==NULL) {
      printf("Stack is underflow.\n");
   }
   else {
      temp=top;
      top=top->next;
      printf("Popped value = %d\n",temp->data);
      free(temp);
   }
}
void peek() {
   stk temp;
   if(top==NULL) {
      printf("Stack is underflow.\n");
   }
   else {
      temp=top;
      printf("Peek value = %d\n",temp->data);
   }
}
void isEmpty() {
   if(top==NULL) {
      printf("Stack is empty.\n");
   }
   else {
```

```
      printf("Stack is not empty.\n");
   }
}
int main() {
   int op,x;
   while(1) {
      printf("1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit\n");
      printf("Enter your option : ");
      scanf("%d",&op);
      switch(op) {
         case 1:
         printf("Enter element : ");
         scanf("%d",&x);
         push(x);
         break;
         case 2:
         pop();
         break;
         case 3:
         display();
         break;
         case 4:
         isEmpty();
         break;
         case 5:
         peek();
         break;
         case 6:
         exit(0);
      }
   }
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 1
Enter your option : 1
Enter element : 33
Successfully pushed. 1
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 1
Enter your option : 1
Enter element : 22
Successfully pushed. 1
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 1
Enter your option : 1
Enter element : 55
Successfully pushed. 1
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 1
Enter your option : 1
Enter element : 66
Successfully pushed. 3

1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 3
Enter your option : 3
Elements of the stack are : 66 55 22 33 2
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 2
Enter your option : 2
Popped value = 66 2
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 2
Enter your option : 2
Popped value = 55 3
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 3
Enter your option : 3
Elements of the stack are : 22 33 5
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 5
Enter your option : 5
Peek value = 22 4
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 4
Enter your option : 4
Stack is not empty. 6
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 6
Enter your option : 6

Test Case - 2
User Output
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 2
Enter your option : 2
Stack is underflow. 3
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 3
Enter your option : 3
Stack is empty. 5
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 5
Enter your option : 5
Stack is underflow. 4
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 4
Enter your option : 4
Stack is empty. 1
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 1
Enter your option : 1
Enter element : 23
Successfully pushed. 1
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 1
Enter your option : 1
Enter element : 24
Successfully pushed. 3
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 3
Enter your option : 3
Elements of the stack are : 24 23 5
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 5
Enter your option : 5
Peek value = 24 2
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 2
Enter your option : 2

Popped value = 24 2
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 2
Enter your option : 2
Popped value = 23 2
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 2
Enter your option : 2
Stack is underflow. 4
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 4
Enter your option : 4
Stack is empty. 6
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 6
Enter your option : 6

S.No: 17	Exp. Name: ***Write a C program to implement different Operations on Stack using Array representation***	Date:2023-06-18

ID: 224G1A0555

Aim:

Write a program to implement `stack` using **arrays**.

```
Sample Input and Output:
    1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
    Enter your option : 4
    Stack is empty.
    1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
    Enter your option : 2
    Stack is underflow.
    1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
    Enter your option : 3
    Stack is empty.
    1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
    Enter your option : 5
    Stack is underflow.
    1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
    Enter your option : 1
    Enter element : 25
    Successfully pushed.
    1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
    Enter your option : 1
    Enter element : 26
    Successfully pushed.
    1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
    Enter your option : 3
    Elements of the stack are : 26 25
    1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
    Enter your option : 2
    Popped value = 26
    1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
    Enter your option : 4
    Stack is not empty.
    1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
    Enter your option : 5
    Peek value = 25
    1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
    Enter your option : 6
```

Source Code:

StackUsingArray.c

```
#include<stdio.h>
#include<stdlib.h>
#define STACK_MAX_SIZE 10
int arr[STACK_MAX_SIZE];
int top=-1;
void push(int element) {
```

```
    }
    else {
        top=top+1;
        arr[top]=element;
        printf("Successfully pushed.\n");
    }
}
void display() {
    if(top<0) {
        printf("Stack is empty.\n");
    }
    else {
        printf("Elements of the stack are : ");
        for(int i=top;i>=0;i--)
        printf("%d ",arr[i]);
        printf("\n");
    }
}
void pop() {
    int x;
    if(top<0) {
        printf("Stack is underflow.\n");
    }
    else {
        x=arr[top];
        top=top-1;
        printf("Popped value = %d\n",x);
    }
}
void peek() {
    int x;
    if(top<0) {
        printf("Stack is underflow.\n");
    }
    else {
        x=arr[top];
        printf("Peek value = %d\n",x);
    }
}
void isEmpty() {
    if(top<0) {
        printf("Stack is empty.\n");
    }
    else {
        printf("Stack is not empty.\n");
    }
}
int main() {
    int op,x;
    while(1) {
        printf("1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit\n");
        printf("Enter your option : ");
        scanf("%d",&op);
        switch(op) {
            case 1:
            printf("Enter element : ");
```

```
            scanf("%d",&x);
            push(x);
            break;
            case 2:
            pop();
            break;
            case 3:
            display();
            break;
            case 4:
            isEmpty();
            break;
            case 5:
            peek();
            break;
            case 6:
            exit(0);
        }
    }
}
```


Execution Results - All test cases have succeeded!

Test Case - 1
User Output
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 1
Enter your option : 1
Enter element : 10
Successfully pushed. 1
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 1
Enter your option : 1
Enter element : 20
Successfully pushed. 1
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 1
Enter your option : 1
Enter element : 30
Successfully pushed. 3
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 3
Enter your option : 3
Elements of the stack are : 30 20 10 5
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 5
Enter your option : 5
Peek value = 30 2
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 2
Enter your option : 2
Popped value = 30 2
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 2
Enter your option : 2
Popped value = 20 3
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 3
Enter your option : 3

Elements of the stack are : 10 5
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 5
Enter your option : 5
Peek value = 10 4
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 4
Enter your option : 4
Stack is not empty. 2
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 2
Enter your option : 2
Popped value = 10 3
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 3
Enter your option : 3
Stack is empty. 4
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 4
Enter your option : 4
Stack is empty. 6
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit 6
Enter your option : 6

S.No: 16	Exp. Name: ***Implementation of Circular Queue using Dynamic Array***	Date:2023-06-18

Aim:

Write a program to implement `circular queue` using **dynamic array**.

ID: 224G1A0555

2022-2026-CSE-A

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```
Sample Input and Output:
    Enter the maximum size of the circular queue : 3
    1.Enqueue 2.Dequeue 3.Display 4.Exit
    Enter your option : 2
    Circular queue is underflow.
    1.Enqueue 2.Dequeue 3.Display 4.Exit
    Enter your option : 3
    Circular queue is empty.
    1.Enqueue 2.Dequeue 3.Display 4.Exit
    Enter your option : 1
    Enter element : 111
    Successfully inserted.
    1.Enqueue 2.Dequeue 3.Display 4.Exit
    Enter your option : 1
    Enter element : 222
    Successfully inserted.
    1.Enqueue 2.Dequeue 3.Display 4.Exit
    Enter your option : 1
    Enter element : 333
    Successfully inserted.
    1.Enqueue 2.Dequeue 3.Display 4.Exit
    Enter your option : 1
    Enter element : 444
    Circular queue is overflow.
    1.Enqueue 2.Dequeue 3.Display 4.Exit
    Enter your option : 3
    Elements in the circular queue : 111 222 333
    1.Enqueue 2.Dequeue 3.Display 4.Exit
    Enter your option : 2
    Deleted element = 111
    1.Enqueue 2.Dequeue 3.Display 4.Exit
    Enter your option : 1
    Enter element : 444
    Successfully inserted.
    1.Enqueue 2.Dequeue 3.Display 4.Exit
    Enter your option : 3
    Elements in the circular queue : 222 333 444
    1.Enqueue 2.Dequeue 3.Display 4.Exit
    Enter your option : 2
    Deleted element = 222
    1.Enqueue 2.Dequeue 3.Display 4.Exit
    Enter your option : 2
    Deleted element = 333
    1.Enqueue 2.Dequeue 3.Display 4.Exit
    Enter your option : 2
    Deleted element = 444
    1.Enqueue 2.Dequeue 3.Display 4.Exit
    Enter your option : 3
    Circular queue is empty.
    1.Enqueue 2.Dequeue 3.Display 4.Exit
    Enter your option : 4
```

Source Code:

CQueueUsingDynamicArray.c

```
#include <stdio.h>
#include <stdlib.h>
int *cqueue;
int front, rear;
int maxSize;
void initCircularQueue() {
   cqueue=(int *)malloc(maxSize * sizeof(int));
   front=-1;
   rear=-1;
}
void dequeue() {
   if (front==-1) {
      printf("Circular queue is underflow.\n");
   }
   else {
      printf("Deleted element = %d\n", *(cqueue + front));
      if (rear==front) {
         rear=front=-1;
      }
      else if (front==maxSize-1) {
         front=0;
      }
      else {
         front++;
      }
   }
}
void enqueue(int x) {
   if (((rear==maxSize-1)&&(front==0))||(rear+1==front)) {
      printf("Circular queue is overflow.\n");
   }
   else {
      if (rear==maxSize-1) {
         rear=-1;
      }
      else if (front==-1) {
         front=0;
      }
      rear++;
      cqueue[rear] = x;
      printf("Successfully inserted.\n");
   }
}
void display()
{
   int i;
   if (front==-1&&rear==-1) {
      printf("Circular queue is empty.\n");
   }
   else {
      printf("Elements in the circular queue : ");
      if (front<=rear) {
         for (i=front;i<=rear;i++) {
            printf("%d ",*(cqueue + i));
```

```
         }
      }
      else {
         for (i=front;i<=maxSize-1;i++) {
            printf("%d ",*(cqueue + i));
         }
         for (i=0;i<=rear;i++) {
            printf("%d ",*(cqueue + i));
         }
      }
      printf("\n");
   }
}
int main() {
   int op, x;
   printf("Enter the maximum size of the circular queue : ");
   scanf("%d",&maxSize);
   initCircularQueue();
   while(1) {
      printf("1.Enqueue 2.Dequeue 3.Display 4.Exit\n");
      printf("Enter your option : ");
      scanf("%d",&op);
      switch(op) {
         case 1:
         printf("Enter element : ");
         scanf("%d",&x);
         enqueue(x);
         break;
         case 2:
         dequeue();
         break;
         case 3:
         display();
         break;
         case 4:
         exit(0);
      }
   }
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter the maximum size of the circular queue : 3
1.Enqueue 2.Dequeue 3.Display 4.Exit 2
Enter your option : 2
Circular queue is underflow. 3
1.Enqueue 2.Dequeue 3.Display 4.Exit 3
Enter your option : 3
Circular queue is empty. 1
1.Enqueue 2.Dequeue 3.Display 4.Exit 1
Enter your option : 1
Enter element : 111

```
Successfully inserted. 1
1.Enqueue 2.Dequeue 3.Display 4.Exit 1
Enter your option :  1
Enter element :  222
Successfully inserted. 1
1.Enqueue 2.Dequeue 3.Display 4.Exit 1
Enter your option :  1
Enter element :  333
Successfully inserted. 1
1.Enqueue 2.Dequeue 3.Display 4.Exit 1
Enter your option :  1
Enter element :  444
Circular queue is overflow. 3
1.Enqueue 2.Dequeue 3.Display 4.Exit 3
Enter your option :  3
Elements in the circular queue : 111 222 333  2
1.Enqueue 2.Dequeue 3.Display 4.Exit 2
Enter your option :  2
Deleted element = 111 1
1.Enqueue 2.Dequeue 3.Display 4.Exit 1
Enter your option :  1
Enter element :  444
Successfully inserted. 3
1.Enqueue 2.Dequeue 3.Display 4.Exit 3
Enter your option :  3
Elements in the circular queue : 222 333 444  2
1.Enqueue 2.Dequeue 3.Display 4.Exit 2
Enter your option :  2
Deleted element = 222 2
1.Enqueue 2.Dequeue 3.Display 4.Exit 2
Enter your option :  2
Deleted element = 333 2
1.Enqueue 2.Dequeue 3.Display 4.Exit 2
Enter your option :  2
Deleted element = 444 3
1.Enqueue 2.Dequeue 3.Display 4.Exit 3
Enter your option :  3
Circular queue is empty. 4
1.Enqueue 2.Dequeue 3.Display 4.Exit 4
Enter your option :  4
```

S.No: 15	Exp. Name: ***C program to which performs all operations on Circular linked list.***	Date:2023-06-18

Aim:

Write a program that uses functions to perform the following **operations on Circular linked list**
i)Creation ii)insertion iii)deletion iv) Traversal

Source Code:

AlloperationsinCLL.c

```
#include<stdio.h>
#include<stdlib.h>
struct node
{
   int data;
   struct node *next;
};
void insert();
void deletion();
void find();
void print();
struct node *head = NULL;
int main()
{
   int choice;
   printf("CIRCULAR LINKED LIST IMPLEMENTATION OF LIST ADT\n");
   while(1)
   {
      printf("1.INSERT ");
      printf("2.DELETE ");
      printf("3.FIND ");
      printf("4.PRINT ");
      printf("5.QUIT\n");
      printf("Enter the choice: ");
      scanf("%d", &choice);
      switch(choice)
      {
         case 1:insert();break;
         case 2:deletion();break;
         case 3:find();break;
         case 4:print();break;
         case 5:exit(0);
      }
   }
}
void insert()
{
   int x,n;
   struct node *newnode,*temp = head, *prev;
   newnode = (struct node*)malloc(sizeof(struct node));
   printf("Enter the element to be inserted: ");
   scanf("%d", &x);
   printf("Enter the position of the element: ");
   scanf("%d", &n);
   newnode->data = x;
```

```
    newnode->next = NULL;
    if(head == NULL)
    {
        head = newnode;
        newnode->next = newnode;
    }
    else if(n == 1)
    {
        temp = head;
        newnode->next = temp;
        temp->next = newnode;
        head = newnode;
    }
    else
    {
        for(int i = 1; i < n-1; i++)
        {
            temp = temp->next;
        }
        newnode->next = temp->next;
        temp->next = newnode;
    }
}
void deletion()
{
    struct node *temp = head, *prev, *temp1 = head;
    int key, count = 0;
    printf("Enter the element to be deleted: ");
    scanf("%d", &key);
    if(temp->data == key)
    {
        prev = temp -> next;
        while(temp->next != head)
        {
            temp = temp->next;
        }
        temp->next = prev;
        free(head);
        head = prev;
        printf("Element deleted\n");
    }
    else
    {
        while(temp->next != head)
        {
            if(temp->data == key)
            {
                count += 1;
                break;
            }
            prev = temp;
            temp = temp->next;
        }
        if(temp->data == key)
        {
            prev->next = temp->next;
```

```
         free(temp);
         printf("Element deleted\n");
      }
      else
      {
         printf("Element does not exist...!\n");
      }
   }
}
void find()
{
struct node *temp = head;
int key, count = 0;
printf("Enter the element to be searched: ");
scanf("%d", &key);
while(temp->next != head)
{
   if(temp->data == key)
   {
      count = 1;
      break;
   }
   temp = temp->next;
}
if (count == 1)
printf("Element exist...!\n");
else
 {
   if(temp->data == key)
   printf("Element exist...!\n");
   else
   printf("Element does not exist...!\n");
   }
}
void print()
{
   struct node *temp = head;
   printf("The list element are: ");
   while(temp->next != head)
   {
      printf("%d -> ",temp->data);
      temp = temp->next;
   }
   printf("%d -> ", temp->data) ;
   printf("\n");
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
CIRCULAR LINKED LIST IMPLEMENTATION OF LIST ADT 1
1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT 1
Enter the choice: 1

ID: 224G1A0555
2022-2026-CSE-A
Srinivasa Ramanujan Institute of Technology

Enter the element to be inserted: 12
Enter the position of the element: 1
1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT 1
Enter the choice: 1
Enter the element to be inserted: 14
Enter the position of the element: 2
1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT 1
Enter the choice: 1
Enter the element to be inserted: 15
Enter the position of the element: 3
1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT 4
Enter the choice: 4
The list element are: 12 -> 14 -> 15 -> 2
1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT 2
Enter the choice: 2
Enter the element to be deleted: 14
Element deleted 4
1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT 4
Enter the choice: 4
The list element are: 12 -> 15 -> 3
1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT 3
Enter the choice: 3
Enter the element to be searched: 12
Element exist...! 5
1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT 5
Enter the choice: 5

Test Case - 2
User Output
CIRCULAR LINKED LIST IMPLEMENTATION OF LIST ADT 1
1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT 1
Enter the choice: 1
Enter the element to be inserted: 54
Enter the position of the element: 1
1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT 2
Enter the choice: 2
Enter the element to be deleted: 1
Element does not exist...! 4
1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT 4
Enter the choice: 4
The list element are: 54 -> 1
1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT 1
Enter the choice: 1
Enter the element to be inserted: 65
Enter the position of the element: 2
1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT 4
Enter the choice: 4
The list element are: 54 -> 65 -> 5
1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT 5
Enter the choice: 5

S.No: 14	Exp. Name: *C program which performs all operations on double linked list.*	Date:2023-07-22

Aim:

Write a C program that uses functions to perform the following **operations on double linked list**
i) Creation ii) Insertion iii) Deletion iv) Traversal

Source Code:

AllOperationsDLL.c

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

struct dnode
{
   struct dnode *prev;
   int data;
   struct dnode *next;
};

struct dnode *start = NULL;

void insert(int);
void remov(int);
void display();

int main()
{
   int n, ch;
   do
   {
      printf("Operations on doubly linked list");
      printf("\n1. Insert \n2.Remove\n3. Display\n0. Exit");
      printf("\nEnter Choice 0-4? : ");
      scanf("%d", &ch);
      switch (ch)
      {
         case 1:
         printf("Enter number: ");
         scanf("%d", &n);
         insert(n);
         break;
         case 2:
         printf("Enter number to delete: ");
         scanf("%d", &n);
         remov(n);
         break;
         case 3:
         display();
         break;
      }
   }while (ch != 0);
}
```


ID: 224G1A0555

Srinivasa Ramanujan Institute of Technology

```
void insert(int num)
{
   struct dnode *nptr,  *temp = start;


   nptr = malloc(sizeof(struct dnode));
   nptr->data = num;
   nptr->next = NULL;
   nptr->prev = NULL;


   if (start == NULL)
   {
      start = nptr;
   }
   else
   {

            while (temp->next != NULL)
               temp = temp->next;

                     nptr->prev = temp;
                        temp->next = nptr;
   }
}


void remov(int num)
{
   struct dnode *temp = start;

   while (temp != NULL)
   {
      if (temp->data == num)
      {

         if (temp == start)
         {
            start = start->next;
            start->prev = NULL;
         }
         else
         {

            if (temp->next == NULL)
            temp->prev->next = NULL;
            else
            {
               temp->prev->next = temp->next;
               temp->next->prev = temp->prev;
            }
            free(temp);
         }
         return ;
      }
      temp = temp->next;
```

```
    }
    printf("%d not found.\n", num);
}


void display()
{
    struct dnode *temp = start;
    while (temp != NULL)
    {
        printf("%d\t", temp->data);
        temp = temp->next;
    }
    printf("\n");
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Operations on doubly linked list 1
1.Insert 1
2.Remove 1
3.Display 1
0.Exit 1
Enter Choice 0-4?: 1
Enter number: 15
Operations on doubly linked list 1
1.Insert 1
2.Remove 1
3.Display 1
0.Exit 1
Enter Choice 0-4?: 1
Enter number: 16
Operations on doubly linked list 1
1.Insert 1
2.Remove 1
3.Display 1
0.Exit 1
Enter Choice 0-4?: 1
Enter number: 17
Operations on doubly linked list 1
1.Insert 1
2.Remove 1
3.Display 1
0.Exit 1
Enter Choice 0-4?: 1
Enter number: 18
Operations on doubly linked list 3
1.Insert 3
2.Remove 3
3.Display 3

```
0.Exit 3
Enter Choice 0-4?: 3
15      16      17      18      2
Operations on doubly linked list 2
1.Insert 2
2.Remove 2
3.Display 2
0.Exit 2
Enter Choice 0-4?: 2
Enter number to delete: 19
19 not found 3
Operations on doubly linked list 3
1.Insert 3
2.Remove 3
3.Display 3
0.Exit 3
Enter Choice 0-4?: 3
15      16      17      18      2
Operations on doubly linked list 2
1.Insert 2
2.Remove 2
3.Display 2
0.Exit 2
Enter Choice 0-4?: 2
Enter number to delete: 16
Operations on doubly linked list 0
1.Insert 0
2.Remove 0
3.Display 0
0.Exit 0
Enter Choice 0-4?: 0
```

S.No: 13	Exp. Name: ***C program to performs all operations on singly linked list***	Date:2023-07-22

Aim:

Write a program that uses functions to perform the following **operations on singly linked list**

i) Creation

ii) Insertion

iii) Deletion

iv) Traversal

Source Code:

singlelinkedlistalloperations.c

```
#include<stdio.h>
#include<stdlib.h>
void menu()
{
   printf("Options\n");
   printf("1 : Insert elements into the linked list\n");
   printf("2 : Delete elements from the linked list\n");
   printf("3 : Display the elements in the linked list\n");
   printf("4 : Count the elements in the linked list\n");
   printf("5 : Exit()\n");
}
struct node
{
   int data;
   struct node *next;
};
typedef struct node node;
struct node *head=NULL;
node* createnode(int data)
{
   node* temp=(node*)malloc(sizeof(node));
   temp->data=data;
   temp->next=NULL;
   return temp;
}
void insert(int data)
{
   node* newnode=createnode(data);
   node* temp;
   if(head==NULL)
   {
      head=createnode(data);
   }
   else
   {
      temp=head;
      while(temp->next!=NULL)
      {
         temp=temp->next;
      }
      temp->next=newnode;
   }
```

```
}
void delete(int position)
{
   int i;
   node* temp;
   if(head==NULL)
   {
      printf("List is empty");
   }
   else
   {
      temp=head;
      for(i=1;i<position-1;i++)
      {
         temp=temp->next;
      }
      temp->next=temp->next->next;
      printf("Deleted successfully\n");
   }
}
void display()
{
   node* temp;
   temp=head;
   if(head==NULL)
   {
      printf("List is empty\n");
   }
   while(temp!=NULL)
   {
      printf("%d ",temp->data);
      temp=temp->next;
   }
   printf("\n");
}
void count()
{
   int c=0;
   node * temp;
   if(head==NULL)
   {
      printf("List is Empty\n");
   }
   else
   {
      temp=head;
      while(temp!=NULL)
      {
         c++;
         temp=temp->next;
      }
   }
   printf("No of elements in the linked list are : %d\n",c);;
}
void main()
{
```

```
    int choice,data,position,c;
    printf("Singly Linked List Example - All Operations\n");
    menu();
    printf("Enter your option : ");
    scanf("%d",&choice);
    while(choice!=5)
    {
       switch(choice)
       {
          case 1:
          {
             printf("Enter elements for inserting into linked list : ");
             scanf("%d",&data);
             insert(data);
             break;
          }
          case 2:
          {
             printf("Enter position of the element for deleteing the element : ");
             scanf("%d",&position);
             delete(position);
             break;
          }
          case 3:
          {
             printf("The elements in the linked list are : ");
             display();
             break;
          }
          case 4:
          {
             count();
             break;
          }
          case 5:
          {
             exit(0);
          }
          default:
          {
             printf("Enter options from 1 to 5\n");
             exit(0);
          }
       }
       menu();
       printf("Enter your option : ");
       scanf("%d",&choice);
    }
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output

ID: 224G1A0555

Srinivasa Ramanujan Institute of Technology

```
Singly Linked List Example - All Operations 1
Options 1
1 : Insert elements into the linked list 1
2 : Delete elements from the linked list 1
3 : Display the elements in the linked list 1
4 : Count the elements in the linked list 1
5 : Exit() 1
Enter your option :  1
Enter elements for inserting into linked list :  111
Options 1
1 : Insert elements into the linked list 1
2 : Delete elements from the linked list 1
3 : Display the elements in the linked list 1
4 : Count the elements in the linked list 1
5 : Exit() 1
Enter your option :  1
Enter elements for inserting into linked list :  222
Options 1
1 : Insert elements into the linked list 1
2 : Delete elements from the linked list 1
3 : Display the elements in the linked list 1
4 : Count the elements in the linked list 1
5 : Exit() 1
Enter your option :  1
Enter elements for inserting into linked list :  333
Options 1
1 : Insert elements into the linked list 1
2 : Delete elements from the linked list 1
3 : Display the elements in the linked list 1
4 : Count the elements in the linked list 1
5 : Exit() 1
Enter your option :  1
Enter elements for inserting into linked list :  444
Options 3
1 : Insert elements into the linked list 3
2 : Delete elements from the linked list 3
3 : Display the elements in the linked list 3
4 : Count the elements in the linked list 3
5 : Exit() 3
Enter your option :  3
The elements in the linked list are : 111 222 333 444  2
Options 2
1 : Insert elements into the linked list 2
2 : Delete elements from the linked list 2
3 : Display the elements in the linked list 2
4 : Count the elements in the linked list 2
5 : Exit() 2
Enter your option :  2
Enter position of the element for deleteing the element :  2
Deleted successfully 3
Options 3
1 : Insert elements into the linked list 3
```

2 : Delete elements from the linked list 3
3 : Display the elements in the linked list 3
4 : Count the elements in the linked list 3
5 : Exit() 3
Enter your option : 3
The elements in the linked list are : 111 333 444 4
Options 4
1 : Insert elements into the linked list 4
2 : Delete elements from the linked list 4
3 : Display the elements in the linked list 4
4 : Count the elements in the linked list 4
5 : Exit() 4
Enter your option : 4
No of elements in the linked list are : 3 5
Options 5
1 : Insert elements into the linked list 5
2 : Delete elements from the linked list 5
3 : Display the elements in the linked list 5
4 : Count the elements in the linked list 5
5 : Exit() 5
Enter your option : 5

Test Case - 2
User Output
Singly Linked List Example - All Operations 1
Options 1
1 : Insert elements into the linked list 1
2 : Delete elements from the linked list 1
3 : Display the elements in the linked list 1
4 : Count the elements in the linked list 1
5 : Exit() 1
Enter your option : 1
Enter elements for inserting into linked list : 001
Options 1
1 : Insert elements into the linked list 1
2 : Delete elements from the linked list 1
3 : Display the elements in the linked list 1
4 : Count the elements in the linked list 1
5 : Exit() 1
Enter your option : 1
Enter elements for inserting into linked list : 010
Options 1
1 : Insert elements into the linked list 1
2 : Delete elements from the linked list 1
3 : Display the elements in the linked list 1
4 : Count the elements in the linked list 1
5 : Exit() 1
Enter your option : 1
Enter elements for inserting into linked list : 100
Options 1
1 : Insert elements into the linked list 1

```
2 : Delete elements from the linked list 1
3 : Display the elements in the linked list 1
4 : Count the elements in the linked list 1
5 : Exit() 1
Enter your option :  1
Enter elements for inserting into linked list :  101
Options 3
1 : Insert elements into the linked list 3
2 : Delete elements from the linked list 3
3 : Display the elements in the linked list 3
4 : Count the elements in the linked list 3
5 : Exit() 3
Enter your option :  3
The elements in the linked list are : 1 10 100 101  2
Options 2
1 : Insert elements into the linked list 2
2 : Delete elements from the linked list 2
3 : Display the elements in the linked list 2
4 : Count the elements in the linked list 2
5 : Exit() 2
Enter your option :  2
Enter position of the element for deleteing the element :  3
Deleted successfully 3
Options 3
1 : Insert elements into the linked list 3
2 : Delete elements from the linked list 3
3 : Display the elements in the linked list 3
4 : Count the elements in the linked list 3
5 : Exit() 3
Enter your option :  3
The elements in the linked list are : 1 10 101  4
Options 4
1 : Insert elements into the linked list 4
2 : Delete elements from the linked list 4
3 : Display the elements in the linked list 4
4 : Count the elements in the linked list 4
5 : Exit() 4
Enter your option :  4
No of elements in the linked list are : 3 5
Options 5
1 : Insert elements into the linked list 5
2 : Delete elements from the linked list 5
3 : Display the elements in the linked list 5
4 : Count the elements in the linked list 5
5 : Exit() 5
Enter your option :  5
```

S.No: 12	Exp. Name: ***Write a C program to sort given elements using Radix sort***	Date:2023-06-18

Aim:

Write a program to `sort` (`ascending order`) the given elements using `radix sort` technique.

At the time of execution, the program should print the message on the console as:

```
Enter array size :
```

For example, if the user gives the **input** as:

```
Enter array size : 5
```

Next, the program should print the following message on the console as:

```
Enter 5 elements :
```

if the user gives the **input** as:

```
Enter 5 elements : 34 67 12 45 22
```

then the program should **print** the result as:

```
Before sorting the elements are : 34 67 12 45 22
After sorting the elements are : 12 22 34 45 67
```

Note: Do use the **printf()** function with a **newline** character (`\n`).

Source Code:

RadixSortMain2.c

```
#include<stdio.h>
void main() {
   int a[10],i,n;
   printf("Enter array size : ");
   scanf("%d",&n);
   printf("Enter %d elements : ",n);
   for(i=0;i<n;i++) {
      scanf("%d",&a[i]);
   }
   printf("Before sorting the elements are : ");
   for(i=0;i<n;i++) {
      printf("%d ",a[i]);
   }
   Radixsort(a,n);
   printf("\nAfter sorting the elements are : ");
   for(i=0;i<n;i++) {
      printf("%d ",a[i]);
   }
   printf("\n");
}
int largest(int a[],int n) {
   int i,k=a[0];
   for(i=1;i<n;i++) {
      if(a[i]>k) {
         k=a[i];
```

```
      }
   }
   return k;
}
void Radixsort(int a[],int n) {
   int buc[10][10],buc_count[10],i,j,k,rem,NOP=0,divi=1,large,pass;
   large=largest(a,n);
   while(large>0) {
      NOP++;
      large/=10;
   }
   for(pass=0;pass<NOP;pass++) {
      for(i=0;i<=10;i++) {
         buc_count[i]=0;
      }
      for(i=0;i<n;i++) {
         rem=(a[i]/divi)%10;
         buc[rem][buc_count[rem]]=a[i];
         buc_count[rem]++;
      }
      i=0;
      for(k=0;k<10;k++) {
         for(j=0;j<buc_count[k];j++) {
            a[i]=buc[k][j];
            i++;
         }
      }
      divi*=10;
   }
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter array size : 5
Enter 5 elements : 23
43
54
12
65
Before sorting the elements are : 23 43 54 12 65
After sorting the elements are : 12 23 43 54 65

Test Case - 2
User Output
Enter array size : 7
Enter 7 elements : 23
54
136
85

ID: 224G1A0555
2022-2026-CSE-A
Srinivasa Ramanujan Institute of Technology

24
65
76
Before sorting the elements are : 23 54 136 85 24 65 76
After sorting the elements are : 23 24 54 65 76 85 136

S.No: 11	Exp. Name: ***Write a C program to Sort given elements using Merge sort***	Date:2023-06-18

Aim:

Write a program to `sort` (`Ascending order`) the given elements using `merge sort` technique.

At the time of execution, the program should print the message on the console as:

```
Enter array size :
```

For example, if the user gives the **input** as:

```
Enter array size : 5
```

Next, the program should print the following message on the console as:

```
Enter 5 elements :
```

if the user gives the **input** as:

```
Enter 5 elements : 34 67 12 45 22
```

then the program should **print** the result as:

```
Before sorting the elements are : 34 67 12 45 22
After sorting the elements are : 12 22 34 45 67
```

Note: Do use the **printf()** function with a **newline** character (`\n`).

Source Code:

MergeSortMain.c

```
#include <stdio.h>
void merge(int [],int ,int ,int );
void splitAndMerge(int [],int ,int );
void main() {
   int arr[15],i,n;
   printf("Enter array size : ");
   scanf("%d", &n);
   printf("Enter %d elements : ",n);
   for(i=0;i<n;i++) {
      scanf("%d",&arr[i]);
   }
   printf("Before sorting the elements are : ");
   for(i=0;i<n;i++)
   printf("%d ",arr[i]);
   splitAndMerge(arr, 0, n - 1);
   printf("\nAfter sorting the elements are : ");
   for(i=0;i<n;i++)
   printf("%d ",arr[i]);
   printf("\n");
}
void merge(int arr[15], int low, int mid, int high) {
   int i=low,h=low,j=mid+1,k,temp[15];
   while(h<=mid&&j<=high) {
      if (arr[h]<=arr[j]) {
         temp[i]=arr[h];
```

```
            h++;
        }
        else {
            temp[i]=arr[j];
            j++;
        }
        i++;
    }
    if (h>mid) {
        for (k=j;k<=high;k++) {
            temp[i]=arr[k];
            i++;
        }
    }
    else {
        for(k=h;k<=mid;k++) {
            temp[i]=arr[k];
            i++;
        }
    }
    for(k=low;k<=high;k++)
    {
        arr[k]=temp[k];
    }
}
void splitAndMerge(int arr[15], int low, int high) {
    if (low<high) {
        int mid=(low+high)/2;
        splitAndMerge(arr,low,mid);
        splitAndMerge(arr,mid+1,high);
        merge(arr,low,mid,high);
    }
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter array size : 5
Enter 5 elements : 34 67 12 45 22
Before sorting the elements are : 34 67 12 45 22
After sorting the elements are : 12 22 34 45 67

Test Case - 2
User Output
Enter array size : 8
Enter 8 elements : 77 55 22 44 99 33 11 66
Before sorting the elements are : 77 55 22 44 99 33 11 66
After sorting the elements are : 11 22 33 44 55 66 77 99

Test Case - 3

User Output
Enter array size : 5
Enter 5 elements : -32 -45 -67 -46 -14
Before sorting the elements are : -32 -45 -67 -46 -14
After sorting the elements are : -67 -46 -45 -32 -14

S.No: 10	Exp. Name: ***Write a C program to sort the given elements using Heap sort***	Date:2023-05-16

Aim:

Write a program to sort (ascending order) the given elements using heap sort technique.

Note: Do use the printf() function with a newline character (\n).

Source Code:

HeapSortMain.c

```
#include<stdio.h>
int main()
{
   int arr[15],i,n;
   printf("Enter array size : ");
   scanf("%d",&n);
   printf("Enter %d elements : ",n);
   for(i=0;i<n;i++)
   {
      scanf("%d",&arr[i]);
   }
   printf("Before sorting the elements are : ");
   display(arr, n);
   heapsort(arr, n);
   printf("After sorting the elements are : ");
   display(arr, n);
}
void display(int arr[15],int n)
{
   int i;
   for(i=0;i<n;i++)
   printf("%d ",arr[i]);
   printf("\n");
}
void heapify(int arr[],int n, int i)
{
   int largest=i;
   int l=2*i+1;
   int r=2*i+2;
   int temp;
   if(l<n&&arr[l]>arr[largest])
   largest=l;
   if(r<n&&arr[r]>arr[largest])
   largest=r;
   if(largest!=i)
   {
      temp=arr[i];
      arr[i]=arr[largest];
      arr[largest]=temp;
      heapify(arr,n,largest);
   }
}
void heapsort(int arr[],int n)
{
```


ID: 224G1A0555

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```
    int i,temp;
    for(i=n/2-1;i>=0;i--)
    {
       heapify(arr,n,i);
    }
    for(i=n-1;i>=0;i--)
    {
       temp=arr[0];
       arr[0]=arr[i];
       arr[i]=temp;
       heapify(arr,i,0);
    }
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter array size : 5
Enter 5 elements : 23 54 22 44 12
Before sorting the elements are : 23 54 22 44 12
After sorting the elements are : 12 22 23 44 54

Test Case - 2
User Output
Enter array size : 6
Enter 6 elements : 12 65 23 98 35 98
Before sorting the elements are : 12 65 23 98 35 98
After sorting the elements are : 12 23 35 65 98 98

Test Case - 3
User Output
Enter array size : 4
Enter 4 elements : -23 -45 -12 -36
Before sorting the elements are : -23 -45 -12 -36
After sorting the elements are : -45 -36 -23 -12

Test Case - 4
User Output
Enter array size : 6
Enter 6 elements : 1 -3 8 -4 -2 5
Before sorting the elements are : 1 -3 8 -4 -2 5
After sorting the elements are : -4 -3 -2 1 5 8

ID: 224G1A0555

S.No: 9	Exp. Name: ***Write a program to sort Ascending order the given elements using quick sort technique.***	Date:2023-04-28

ID: 224G1A0555

Aim:

Write a program to `sort` (`Ascending order`) the given elements using `quick sort` technique.

Note: Pick the first element as pivot. You will not be awarded marks if you do not follow this instruction.

At the time of execution, the program should print the message on the console as:

```
Enter array size :
```

For example, if the user gives the **input** as:

```
Enter array size : 5
```

Next, the program should print the following message on the console as:

```
Enter 5 elements :
```

if the user gives the **input** as:

```
Enter 5 elements : 34 67 12 45 22
```

then the program should **print** the result as:

```
Before sorting the elements are : 34 67 12 45 22
After sorting the elements are : 12 22 34 45 67
```

Note: Do use the **printf()** function with a **newline** character (`\n`).

Source Code:

QuickSortMain.c

```
#include<stdio.h>
void sort(int [],int ,int );
int main()
{
   int arr[20],i,n;
   printf("Enter array size : ");
   scanf("%d",&n);
   printf("Enter %d elements : ",n);
   for(i=0;i<n;i++)
   {
      scanf("%d",&arr[i]);
   }
   printf("Before sorting the elements are : ");
   for(i=0;i<n;i++)
   {
      printf("%d ",arr[i]);
   }
   sort(arr,0,n-1);
   printf("\nAfter sorting the elements are : ");
   for(i=0;i<n;i++)
   {
```

```
        printf("%d ",arr[i]);
    }
    printf("\n");
}
void sort(int a[20],int low,int high)
{
    int left,right,pivolt,temp;
    left=low;
    right=high;
    pivolt=a[(low+high)/2];
    do
    {
        while(a[left]<pivolt)
        left++;
        while(a[right]>pivolt)
        right--;
        if(left<=right)
        {
            temp=a[left];
            a[left]=a[right];
            a[right]=temp;
            right--;
            left++;
        }
    }
    while(left<=right);
    if(low<right)
    sort(a,low,right);
    if(left<high)
    sort(a,left,high);
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter array size : 5
Enter 5 elements : 34 67 12 45 22
Before sorting the elements are : 34 67 12 45 22
After sorting the elements are : 12 22 34 45 67

Test Case - 2
User Output
Enter array size : 8
Enter 8 elements : 77 55 22 44 99 33 11 66
Before sorting the elements are : 77 55 22 44 99 33 11 66
After sorting the elements are : 11 22 33 44 55 66 77 99

Test Case - 3
User Output
Enter array size : 5
Enter 5 elements : -32 -45 -67 -46 -14

```
Before sorting the elements are : -32 -45 -67 -46 -14
After sorting the elements are : -67 -46 -45 -32 -14
```

S.No: 8	Exp. Name: ***Write a C program to Sort the elements using Bubble Sort Technique***	Date:2023-04-28

ID: 224G1A0555

Aim:

Write a program to **sort** the given elements using `bubble sort technique`.

At the time of execution, the program should print the message on the console as:

```
Enter value of n :
```

For example, if the user gives the **input** as:

```
Enter value of n : 3
```

Next, the program should print the messages one by one on the console as:

```
Enter element for a[0] :
Enter element for a[1] :
Enter element for a[2] :
```

if the user gives the **input** as:

```
Enter element for a[0] : 22
Enter element for a[1] : 33
Enter element for a[2] : 12
```

then the program should **print** the result as:

```
Before sorting the elements in the array are
Value of a[0] = 22
Value of a[1] = 33
Value of a[2] = 12
After sorting the elements in the array are
Value of a[0] = 12
Value of a[1] = 22
Value of a[2] = 33
```

Fill in the missing code so that it produces the desired result.

Source Code:

BubbleSortDemo3.c

```
#include<stdio.h>
int main()
{
   int a[10],i,j,n,temp;
   printf("Enter value of n : ");
   scanf("%d",&n);
   for(i=0;i<n;i++)
   {
      printf("Enter element for a[%d] : ",i);
      scanf("%d",&a[i]);
   }
   printf("Before sorting the elements in the array are\n");
   for(i=0;i<n;i++)
   {
      printf("Value of a[%d] = %d\n",i,a[i]);
```

```
    }
    for(i=0;i<n;i++)
    {
       for(j=i+1;j<n;j++)
       {
          if(a[i]>a[j])
          {
             temp=a[i];
             a[i]=a[j];
             a[j]=temp;
          }
       }
    }
    printf("After sorting the elements in the array are\n");
    for(i=0;i<n;i++)
    {
       printf("Value of a[%d] = %d\n",i,a[i]);
    }
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter value of n : 3
Enter element for a[0] : 34
Enter element for a[1] : 25
Enter element for a[2] : 28
Before sorting the elements in the array are
Value of a[0] = 34
Value of a[1] = 25
Value of a[2] = 28
After sorting the elements in the array are
Value of a[0] = 25
Value of a[1] = 28
Value of a[2] = 34

Test Case - 2
User Output
Enter value of n : 5
Enter element for a[0] : 1
Enter element for a[1] : 6
Enter element for a[2] : 3
Enter element for a[3] : 8
Enter element for a[4] : 4
Before sorting the elements in the array are
Value of a[0] = 1
Value of a[1] = 6
Value of a[2] = 3
Value of a[3] = 8
Value of a[4] = 4

After sorting the elements in the array are
Value of a[0] = 1
Value of a[1] = 3
Value of a[2] = 4
Value of a[3] = 6
Value of a[4] = 8

S.No: 7	Exp. Name: ***Write a C program to sort given elements using shell sort technique.***	Date:2023-04-28

Aim:

Write a program to `sort` (`ascending order`) the given elements using `shell sort` technique.

At the time of execution, the program should print the message on the console as:

```
Enter array size :
```

For example, if the user gives the **input** as:

```
Enter array size : 5
```

Next, the program should print the following message on the console as:

```
Enter 5 elements :
```

if the user gives the **input** as:

```
Enter 5 elements : 34 67 12 45 22
```

then the program should **print** the result as:

```
Before sorting the elements are : 34 67 12 45 22
After sorting the elements are : 12 22 34 45 67
```

Note: Do use the **printf()** function with a **newline** character (`\n`).

Source Code:

ShellSort2.c

```
#include<stdio.h>
#include<conio.h>
int main()
{
   int size, *arr,i;
   printf("Enter array size : ");
   scanf("%d",&size);
   arr = (int*)malloc(size * sizeof(int));
   printf("Enter %d elements : ",size);
   for(i=0;i<size;i++)
   {
      scanf("%d",&arr[i]);
   }
   printf("Before sorting the elements are : ");
   printArray(arr,size);
   ShellSort(arr,size);
   printf("After sorting the elements are : ");
   printArray(arr,size);
   return 0;
}
int ShellSort(int arr[],int n)
{
   int gap,i,j,temp;
   for(gap=n/2;gap>0;gap/=2)
   {
```

```
        for(i=gap;i<n;i++)
        {
            temp=arr[i];
            for(j=i;j>=gap&&arr[j-gap]>temp;j-=gap)
            {
                arr[j]=arr[j-gap];
            }
            arr[j]=temp;
        }
    }
}
void printArray(int arr[],int n)
{
    for(int i=0;i<n;i++)
    {
        printf("%d ",arr[i]);
    }
    printf("\n");
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter array size : 5
Enter 5 elements : 12 32 43 56 78
Before sorting the elements are : 12 32 43 56 78
After sorting the elements are : 12 32 43 56 78

S.No: 6	Exp. Name: ***Write a C program to Sort the elements using Selection Sort - Smallest element method Technique***	Date:2023-04-27

Aim:

Write a program to **sort** the given array elements using **selection sort smallest element** method.

At the time of execution, the program should print the message on the console as:

```
Enter value of n :
```

For example, if the user gives the **input** as:

```
Enter value of n : 3
```

Next, the program should print the messages one by one on the console as:

```
Enter element for a[0] :
Enter element for a[1] :
Enter element for a[2] :
```

if the user gives the **input** as:

```
Enter element for a[0] : 22
Enter element for a[1] : 33
Enter element for a[2] : 12
```

then the program should **print** the result as:

```
Before sorting the elements in the array are
Value of a[0] = 22
Value of a[1] = 33
Value of a[2] = 12
After sorting the elements in the array are
Value of a[0] = 12
Value of a[1] = 22
Value of a[2] = 33
```

Fill in the missing code so that it produces the desired result.

Source Code:

SelectionSortDemo6.c

```
#include<stdio.h>
int main()
{
   int a[20],i,j,n,max,temp=0;
   printf("Enter value of n : ");
   scanf("%d",&n);
   for(i=0;i<n;i++)
   {
      printf("Enter element for a[%d] : ",i);
      scanf("%d",&a[i]);
   }
   printf("Before sorting the elements in the array are\n");
   for(i=0;i<n;i++)
   {
```

```
        printf("Value of a[%d] = %d\n",i,a[i]);
    }
    for(i=n-1;i>0;i--)
    {
        max=1;
        for(j=i;j>=0;j--)
        {
            if(a[j]>=a[max])
            {
                max=j;
            }
        }
        temp=a[i];
        a[i]=a[max];
        a[max]=temp;
    }
    printf("After sorting the elements in the array are\n");
    for(i=0;i<n;i++)
    {
        printf("Value of a[%d] = %d\n",i,a[i]);
    }
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter value of n : 4
Enter element for a[0] : 78
Enter element for a[1] : 43
Enter element for a[2] : 99
Enter element for a[3] : 27
Before sorting the elements in the array are
Value of a[0] = 78
Value of a[1] = 43
Value of a[2] = 99
Value of a[3] = 27
After sorting the elements in the array are
Value of a[0] = 27
Value of a[1] = 43
Value of a[2] = 78
Value of a[3] = 99

S.No: 5	Exp. Name: ***Write a C program to Sort the elements using Insertion Sort Technique***	Date:2023-04-27

ID: 224G1A0555

Aim:

Write a program to **sort** the given elements using `insertion sort technique`.

At the time of execution, the program should print the message on the console as:

```
Enter value of n :
```

For example, if the user gives the **input** as:

```
Enter value of n : 3
```

Next, the program should print the messages one by one on the console as:

```
Enter element for a[0] :
Enter element for a[1] :
Enter element for a[2] :
```

if the user gives the **input** as:

```
Enter element for a[0] : 22
Enter element for a[1] : 33
Enter element for a[2] : 12
```

then the program should **print** the result as:

```
Before sorting the elements in the array are
Value of a[0] = 22
Value of a[1] = 33
Value of a[2] = 12
After sorting the elements in the array are
Value of a[0] = 12
Value of a[1] = 22
Value of a[2] = 33
```

Fill in the missing code so that it produces the desired result.

Source Code:

InsertionSortDemo3.c

```
#include<stdio.h>
void sort(int[],int);
int main()
{
   int a[20],n,i;
   printf("Enter value of n : ");
   scanf("%d",&n);
   for(i=0;i<n;i++)
   {
      printf("Enter element for a[%d] : ",i);
      scanf("%d",&a[i]);
   }
   printf("Before sorting the elements in the array are\n");
   for(i=0;i<n;i++)
```

2022-2026-CSE-A

Srinivasa Ramanujan Institute of Technology

```
    {
       printf("Value of a[%d] = %d\n",i,a[i]);
    }
    sort(a,n);
    printf("After sorting the elements in the array are\n");
    for(i=0;i<n;i++)
    {
       printf("Value of a[%d] = %d\n",i,a[i]);
    }
}
void sort(int a[],int n)
{
    int i,j,k;
    for(i=1;i<n;i++)
    {
       k=a[i];
       j=i-1;
       while(j>=0&&a[j]>k)
       {
          a[j+1]=a[j];
          j=j-1;
       }
       a[j+1]=k;
    }
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter value of n : 6
Enter element for a[0] : 5
Enter element for a[1] : 9
Enter element for a[2] : 2
Enter element for a[3] : 5
Enter element for a[4] : 1
Enter element for a[5] : 3
Before sorting the elements in the array are
Value of a[0] = 5
Value of a[1] = 9
Value of a[2] = 2
Value of a[3] = 5
Value of a[4] = 1
Value of a[5] = 3
After sorting the elements in the array are
Value of a[0] = 1
Value of a[1] = 2
Value of a[2] = 3
Value of a[3] = 5
Value of a[4] = 5
Value of a[5] = 9

Test Case - 2
User Output
Enter value of n : 3
Enter element for a[0] : 5
Enter element for a[1] : 9
Enter element for a[2] : 4
Before sorting the elements in the array are
Value of a[0] = 5
Value of a[1] = 9
Value of a[2] = 4
After sorting the elements in the array are
Value of a[0] = 4
Value of a[1] = 5
Value of a[2] = 9

S.No: 4	Exp. Name: ***Write a C program to implement Fibonacci Search technique***	Date:2023-04-27

ID: 224G1A0555

Aim:

Write a C program to implement **Fibonacci search** technique

Source Code:

FibonacciSearch.c

```
#include<stdio.h>
int main()
{
   int a[20],i,j,n,flag=0;
   printf("Enter the size of an array: ");
   scanf("%d",&n);
   printf("Enter the %d array elements\n",n);
   for(i=0;i<n;i++)
   {
      scanf("%d",&a[i]);
   }
   printf("Enter the element to be searched: ");
   scanf("%d",&j);
   for(i=0;i<n;i++)
   {
      if(j==a[i])
      {
         flag++;
         break;
      }
   }
   if(flag==1)
   printf("Element found at index: %d.\n",i);
   else
   printf("Element not found.\n");
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter the size of an array: 5
Enter the 5 array elements 3 4 5 6 7
Enter the element to be searched: 3
Element found at index: 0.

Test Case - 2
User Output
Enter the size of an array: 5
Enter the 5 array elements 3 4 5 6 7
Enter the element to be searched: 4
Element found at index: 1.

S.No: 3	Exp. Name: ***Write a C program to Search a Key element using Binary search Technique***	Date:2023-04-27

ID: 224G1A0555

Aim:

Write a program to **search** a key element in the given array of elements using `binary search`.

At the time of execution, the program should print the message on the console as:

```
Enter value of n :
```

For example, if the user gives the **input** as:

```
Enter value of n : 3
```

Next, the program should print the messages one by one on the console as:

```
Enter element for a[0] :
Enter element for a[1] :
Enter element for a[2] :
```

if the user gives the **input** as:

```
Enter element for a[0] : 89
Enter element for a[1] : 33
Enter element for a[2] : 56
```

Next, the program should print the message on the console as:

```
Enter key element :
```

if the user gives the **input** as:

```
Enter key element : 56
```

then the program should **print** the result as:

```
After sorting the elements in the array are
Value of a[0] = 33
Value of a[1] = 56
Value of a[2] = 89
The key element 56 is found at the position 1
```

Similarly if the key element is given as **25** for the above one dimensional array elements then the program should print the output as "**The Key element 25 is not found in the array**".

Source Code:

BinarySearch.c

```
#include<stdio.h>
int main()
{
   int a[5],i,j,n,temp,k,flag=0;
   printf("Enter value of n : ");
   scanf("%d",&n);
   for(i=0;i<n;i++)
```

```
    {
       printf("Enter element for a[%d] : ",i);
       scanf("%d",&a[i]);
    }
    for(i=0;i<n;i++)
    {
       for(j=i+1;j<n;j++)
       {
          if(a[j]<a[i])
          {
             temp=a[i];
             a[i]=a[j];
             a[j]=temp;
          }
       }
    }
    printf("Enter key element : ");
    scanf("%d",&k);
    printf("After sorting the elements in the array are\n");
    for(i=0;i<n;i++)
    {
       printf("Value of a[%d] = %d\n",i,a[i]);
    }
    for(i=0;i<n;i++)
    {
       if(k==a[i])
       {
          flag++;
          break;
       }
    }
    if(flag==1)
    printf("The key element %d is found at the position %d\n",k,i);
    else
    printf("The Key element %d is not found in the array\n",k);
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter value of n : 3
Enter element for a[0] : 25
Enter element for a[1] : 15
Enter element for a[2] : 23
Enter key element : 45
After sorting the elements in the array are
Value of a[0] = 15
Value of a[1] = 23
Value of a[2] = 25
The Key element 45 is not found in the array

Test Case - 2

User Output
Enter value of n : 2
Enter element for a[0] : 80
Enter element for a[1] : 39
Enter key element : 50
After sorting the elements in the array are
Value of a[0] = 39
Value of a[1] = 80
The Key element 50 is not found in the array

S.No: 2	Exp. Name: ***Write a C program to Search a Key element using Linear search Technique***	Date:2023-04-27

Aim:

Write a program to search a **key element** with in the given array of elements using `linear search` process.

At the time of execution, the program should print the message on the console as:

```
Enter value of n :
```

For example, if the user gives the **input** as:

```
Enter value of n : 3
```

Next, the program should print the messages one by one on the console as:

```
Enter element for a[0] :
Enter element for a[1] :
Enter element for a[2] :
```

if the user gives the **input** as:

```
Enter element for a[0] : 89
Enter element for a[1] : 33
Enter element for a[2] : 56
```

Next, the program should print the message on the console as:

```
Enter key element :
```

if the user gives the **input** as:

```
Enter key element : 56
```

then the program should **print** the result as:

```
The key element 56 is found at the position 2
```

Similarly if the key element is given as **25** for the above one dimensional array elements then the program should print the output as "**The key element 25 is not found in the array**".

Source Code:

LinearSearch.c

```
#include<stdio.h>
int main()
{
int a[20],i,j,n,flag=0;
printf("Enter value of n : ");
scanf("%d",&n);
for(i=0;i<n;i++)
{
   printf("Enter element for a[%d] : ",i);
   scanf("%d",&a[i]);
```

```
}
printf("Enter key element : ");
scanf("%d",&j);
for(i=0;i<n;i++)
{
   if(j==a[i])
   {
      flag++;
      break;
   }
}
if(flag==1)
{
   printf("The key element %d is found at the position %d",j,i);
}
else
{
   printf("The key element %d is not found in the array",j);
}
printf("\n");
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter value of n : 4
Enter element for a[0] : 1
Enter element for a[1] : 22
Enter element for a[2] : 33
Enter element for a[3] : 44
Enter key element : 22
The key element 22 is found at the position 1

Test Case - 2
User Output
Enter value of n : 7
Enter element for a[0] : 101
Enter element for a[1] : 102
Enter element for a[2] : 103
Enter element for a[3] : 104
Enter element for a[4] : 105
Enter element for a[5] : 106
Enter element for a[6] : 107
Enter key element : 110
The key element 110 is not found in the array

S.No: 1	Exp. Name: ***Design a C program which sorts the strings using array of pointers***	Date:2023-04-27

Aim:

Design a C program that sorts the strings using array of pointers.

Sample input output

```
Sample input-output -1:
Enter the number of strings: 2
Enter string 1: Tantra
Enter string 2: Code
Before Sorting
Tantra
Code
After Sorting
Code
Tantra
Sample input-output -2:
Enter the number of strings: 3
Enter string 1: India
Enter string 2: USA
Enter string 3: Japan
Before Sorting
India
USA
Japan
After Sorting
India
Japan
USA
```

Source Code:

stringssort.c

```
#include<stdio.h>
#include<stdlib.h>
#include<string.h>
void main()
{
   char * temp;
   int i,j,diff,n;
   char * strarray[10];
   printf("Enter the number of strings: ");
   scanf("%d",&n);
   for(i=0;i<n;i++)
   {
      printf("Enter string %d: ",i+1);
      strarray[i]=(char *)malloc(sizeof(char)*20);
      scanf("%s",strarray[i]);
   }
   printf("Before Sorting\n");
   for(i=0;i<n;i++)
   {
      printf("%s\n",strarray[i]);
```

```
    }
    for(i=0;i<n-1;i++)
    {
        for(j=0;j<n-1-i;j++)
       {
                diff=strcmp(strarray[j],strarray[j+1]);
                 if(diff>0)
                 {
                      temp=strarray[j];
                         strarray[j]=strarray[j+1];
                         strarray[j+1]=temp;
                 }
       }
}
printf("After Sorting\n");
for(i=0;i<n;i++)
{
   printf("%s\n",strarray[i]);
}
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter the number of strings: 2
Enter string 1: Tantra
Enter string 2: Code
Before Sorting
Tantra
Code
After Sorting
Code
Tantra

Test Case - 2
User Output
Enter the number of strings: 3
Enter string 1: Dhoni
Enter string 2: Kohli
Enter string 3: Rohit
Before Sorting
Dhoni
Kohli
Rohit
After Sorting
Dhoni
Kohli
Rohit

ID: 224G1A0555