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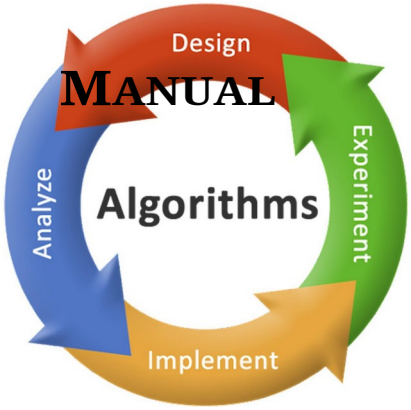
Tiruchirappalli Campus, Chennai- 600089.
FACULTY OF ENGINEERING AND TECHNOLOGY
Department of Computer Science & Engineering

DESIGN & ANALYSIS OF ALGORITHMS LAB MANUAL



CLASS	:	B.Tech. [U.G]
YEAR	:	II YEAR
SEM.	:	IV
SOFTWARE REQUIREMENT	:	Turbo C

Prepared By

Dr. V.Nivedita AP/CSE

Ex No	List of Experiment
1 A	Simple Algorithm
1 B	Insertion sort
2	Bubble Sort
3 A	Recurrence Type-Merge sort
3 B	Recurrence Type- Linear search
4 A	Quicksort
4 B	Binary search
5	Strassen Matrix multiplication

Ex No: 1 A	FACTORIAL OF N NUMBERS
Date:	

AIM

To Write a C Program for finding Factorial of N numbers

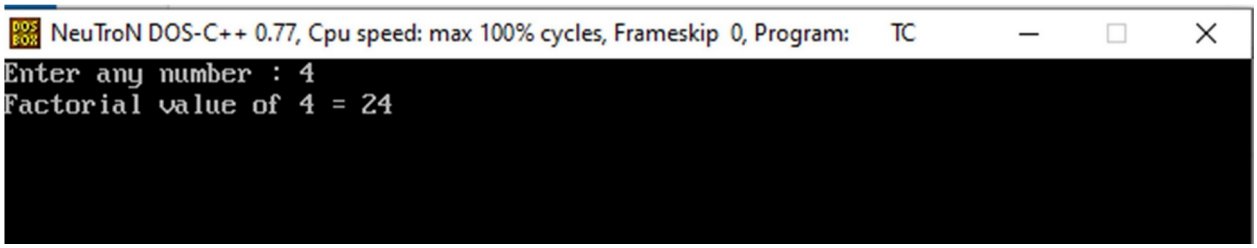
ALGORITHM

step 1. Start
step 2. Read the number
n step 3. [Initialize]
    i=1, fact=1
step 4. Repeat step 4 through 6 until i=n
step 5. fact=fact*i
step 6. i=i+1
step 7. Print fact
step 8. Stop

PROGRAM

```
#include<stdio.h>
#include<conio.h>
int main()
{
 int n,i,fact=1;
 clrscr();
 printf("Enter any number :
 "); scanf("%d", &n);
 for(i=1; i<=n; i++)
    fact = fact * i;
 printf("Factorial value of %d = %d",n,fact);
 getch();
}
```

INPUT & OUTPUT



RESULT

Thus the C Program for Finding factorial of N numbers has been executed and the output has been verified

Ex No: 1 B	INSERTION SORT
Date:	

AIM

To Write a C Program for Sorting of N numbers using Insertion Sort

ALGORITHM

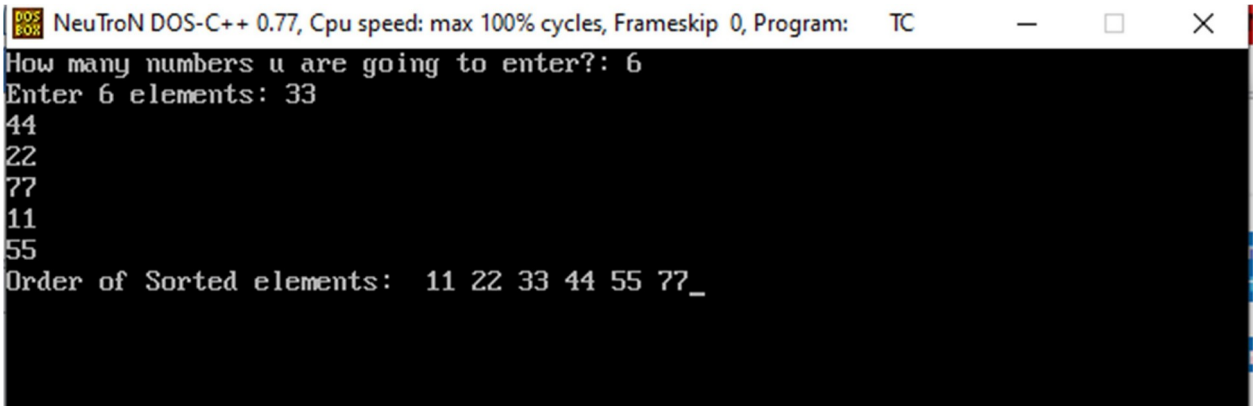
Step 1 − If the element is the first one, it is already
sorted. Step 2 – Move to next element
Step 3 − Compare the current element with all elements in the sorted array
Step 4 – If the element in the sorted array is smaller than the current element, iterate to the next element. Otherwise, shift the entire greater element in the array by one position towards the right
Step 5 − Insert the value at the correct position
Step 6 − Repeat until the complete list is sorted

PROGRAM

```
#include<stdio.h>
#include<conio.h>
int main(){
int i, j, count, temp,
number[25]; clrscr();
printf("How many numbers u are going to enter?: ");
scanf("%d",&count);
printf("Enter %d elements: ", count);
// This loop would store the input numbers in array
for(i=0;i<count;i++)
scanf("%d",&number[i]);
// Implementation of insertion sort
algorithm for(i=1;i<count;i++){
temp=number[i];
j=i-1;
while((temp<number[j])&&(j>=0)){
number[j+1]=number[j];
j=j-1;
}
number[j+1]=temp;
}
printf("Order of Sorted elements:
"); for(i=0;i<count;i++)
```

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

INPUT & OUTPUT



RESULT

Thus the C Program for Sorting of N numbers using Insertion Sort has been executed and the output has been verified

Ex No: 2	Bubble Sort
Date:	

AIM

To Write a C Program for Sorting of N numbers using Bubble Sort

ALGORITHM

Step 1: Repeat Steps 2 and 3 for i=1 to 10
Step 2: Set j=1
Step 3: Repeat while
j<=n if a[i] < a[j]
Then interchange a[i] and a[j]
[End of if]
Set j = j+1
[End of Inner Loop]
[End of Step 1 Outer
Loop]
Step 4: Exit

PROGRAM

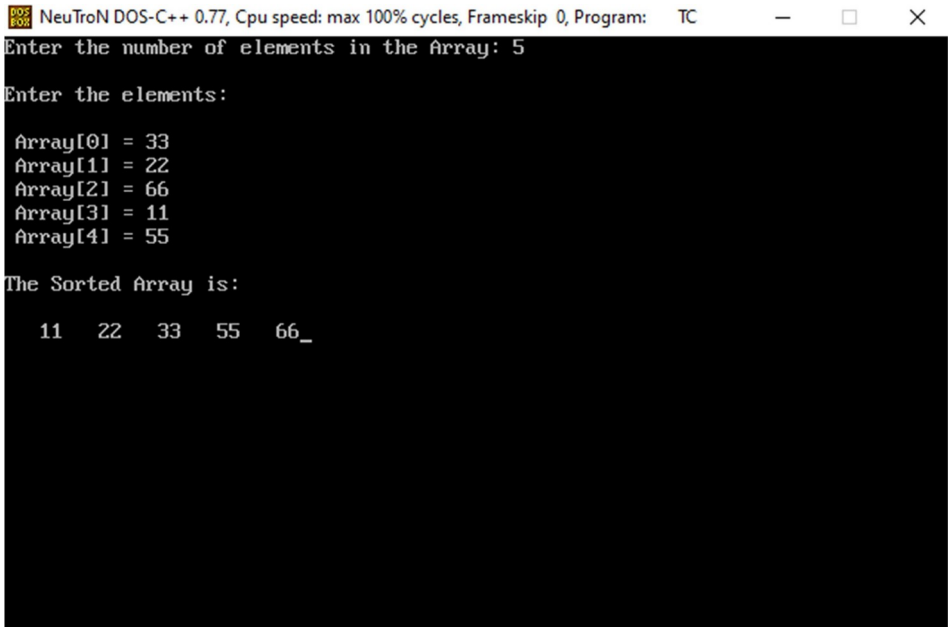
```
#include<stdio.h>
#include<conio.h>
void main()
{
 int i,n,temp,j,arr[25];
 clrscr();
 printf("Enter the number of elements in the Array: ");
 scanf("%d",&n);
 printf("\nEnter the elements:\n\n");

 for(i=0 ; i<n ; i++)
 {
  printf(" Array[%d] = ",i);
  scanf("%d",&arr[i]);
 }

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

```
   if(arr[j]>arr[j+1]) //Swapping Condition is Checked
   {
    temp=arr[j];
    arr[j]=arr[j+1];
    arr[j+1]=temp;
   }
  }
 }
  printf("\nThe Sorted Array is:\n\n");
 for(i=0 ; i<n ; i++)
 {
  printf(" %4d",arr[i]);
 }
 getch();
}
```

INPUT& OUTPUT



RESULT

Thus the C Program for Sorting of N numbers using Bubble Sort has been executed and the output has been verified

Ex No: 3 A	Recurrence Type-Merge sort
Date:	

AIM

To Write a C Program for Sorting of N numbers using merge sort

ALGORITHM

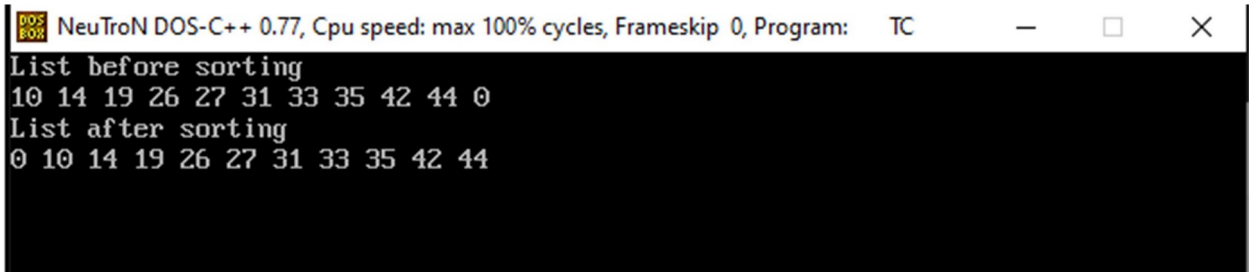
Step 1 : Declare left and right var which will mark the extreme indices of the array
Step 2: Left will be assigned to 0 and right will be assigned to n-1
Step 3: Find mid = (left+right)/2
Step 4: Call mergeSort on (left,mid) and
(mid+1,rear) MergeSort(arr, left, right):
if left > right
return
mid = (left+right)/2
mergeSort(arr, left, mid)
mergeSort(arr, mid+1,
right) merge(arr, left, mid,
right)
end
Step 5: continue till left<right
Step 6: merge on the 2 sub problems

PROGRAM

```
#include <stdio.h>
#define max 10
int a[11] = { 10, 14, 19, 26, 27, 31, 33, 35, 42, 44, 0 };
int b[10];
void merging(int low, int mid, int high) {
int l1, l2, i;
for(l1 = low, l2 = mid + 1, i = low; l1 <= mid && l2 <= high; i++) {
 if(a[l1] <= a[l2])
b[i] = a[l1++];
 else
 b[i] = a[l2++];
}
while(l1 <= mid)
b[i++] = a[l1++];
while(l2 <= high)
b[i++] = a[l2++];
```

```
for(i = low; i <= high; i++)
a[i] = b[i];
}
void sort(int low, int high)
{ int mid;
if(low < high) {
mid = (low + high) / 2;
sort(low, mid);
sort(mid+1, high);
merging(low, mid,
high);
} else
{
return;
}
}
int main()
{
int i;
clrscr();
printf("List before sorting\n");
for(i = 0; i <= max; i++)
printf("%d ", a[i]);
sort(0, max);
printf("\nList after sorting\n");
for(i = 0; i <= max; i++)
printf("%d ", a[i]);
getch();
}
```

INPUT& OUTPUT



RESULT

Thus the C Program for Sorting of N numbers using Merge Sort has been executed and the output has been verified

Ex No: 3 B	Recurrence Type-Linear Search
Date:	

AIM

To Write a C Program for searching an element using Linear Search

ALGORITHM

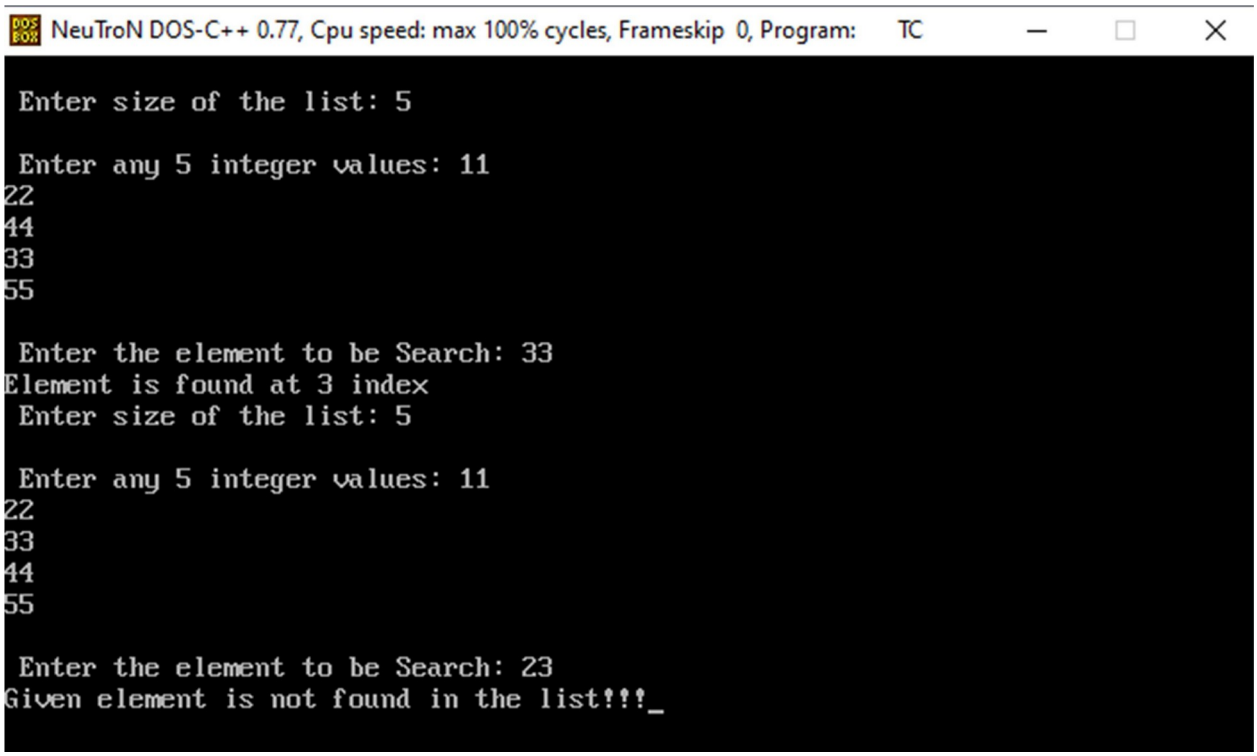
Step 1 - Read the search element from the user.
Step 2 - Compare the search element with the first element in the list.
Step 3 - If both are matched, then display "Given element is found!!!" and terminate the function
Step 4 - If both are not matched, then compare search element with the next element in the list.
Step 5 - Repeat steps 3 and 4 until search element is compared with last element in the list.
Step 6 - If last element in the list also doesn't match, then display "Element is not found!!!" and terminate the function.

PROGRAM

```
#include<stdio.h>
#include<conio.h>
void main(){
int list[20],size,i,sElement;
printf("Enter size of the list: ");
scanf("%d",&size);
printf("Enter any %d integer values:
",size); for(i = 0; i < size; i++)
scanf("%d",&list[i]);
printf("Enter the element to be Search:
"); scanf("%d",&sElement);
// Linear Search Logic
for(i = 0; i < size; i++)
{
if(sElement == list[i])
{
printf("Element is found at %d index",
i); break;
}
}
if(i == size)
printf("Given element is not found in the list!!!");
getch();
```

}

INPUT& OUTPUT



RESULT

Thus the C Program for searching an element by using linear Search has been executed and the output has been verified

Ex No: 4 A	Quick sort
Date:	

AIM

To Write a C Program for Sorting of N numbers using Quick Sort

ALGORITHM

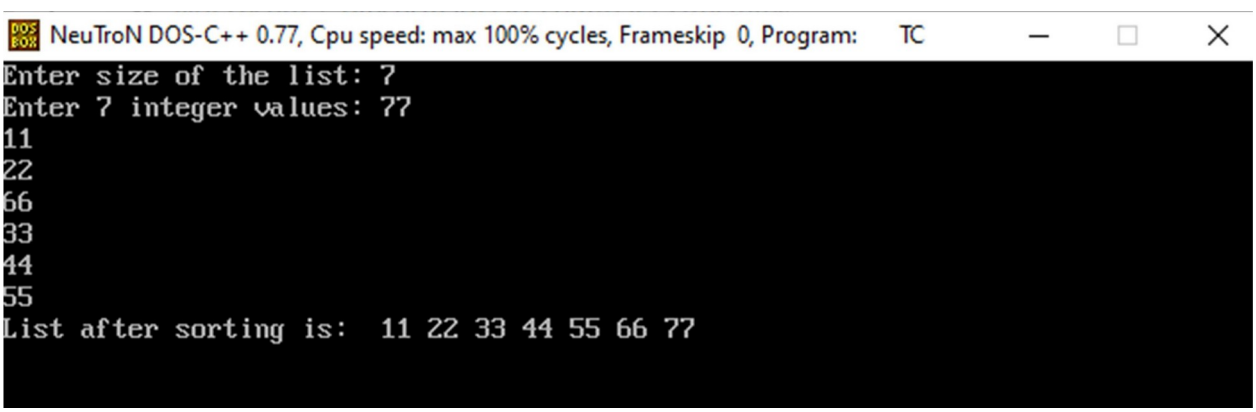
Step 1 - Consider the first element of the list as pivot (i.e., Element at first position in the list).
Step 2 - Define two variables i and j. Set i and j to first and last elements of the list respectively.
Step 3 - Increment i until list[i] > pivot then stop.
Step 4 - Decrement j until list[j] < pivot then stop.
Step 5 - If i < j then exchange list[i] and list[j].
Step 6 - Repeat steps 3,4 & 5 until i > j.
Step 7 - Exchange the pivot element with list[j] element.

PROGRAM

```
#include<stdio.h>
#include<conio.h>
void quickSort(int [10],int,int);
void main(){
int list[20],size,i;
printf("Enter size of the list: ");
scanf("%d",&size);
printf("Enter %d integer values:
",size); for(i = 0; i < size; i++)
scanf("%d",&list[i]);
quickSort(list,0,size-1);
printf("List after sorting is:
"); for(i = 0; i < size; i++)
printf(" %d",list[i]);
getch();
}
void quickSort(int list[10],int first,int last)
{ int pivot,i,j,temp;
if(first < last)
{
pivot = first;
i = first;
```

```
j = last;
while(i < j){
while(list[i] <= list[pivot] && i <
last) i++;
while(list[j] > list[pivot])
j--;
if(i <j)
{
temp = list[i];
list[i] = list[j];
list[j] = temp;
}
}
temp = list[pivot];
list[pivot] = list[j];
list[j] = temp;
quickSort(list,first,j-1);
quickSort(list,j+1,last);
}
}
```

INPUT & OUTPUT



RESULT

Thus the C Program for Sorting of N numbers using Quick Sort has been executed and the output has been verified

Ex No: 4 B	**Binary Search**
Date:	

AIM

To Write a C Program for searching an element using Binary Search

ALGORITHM

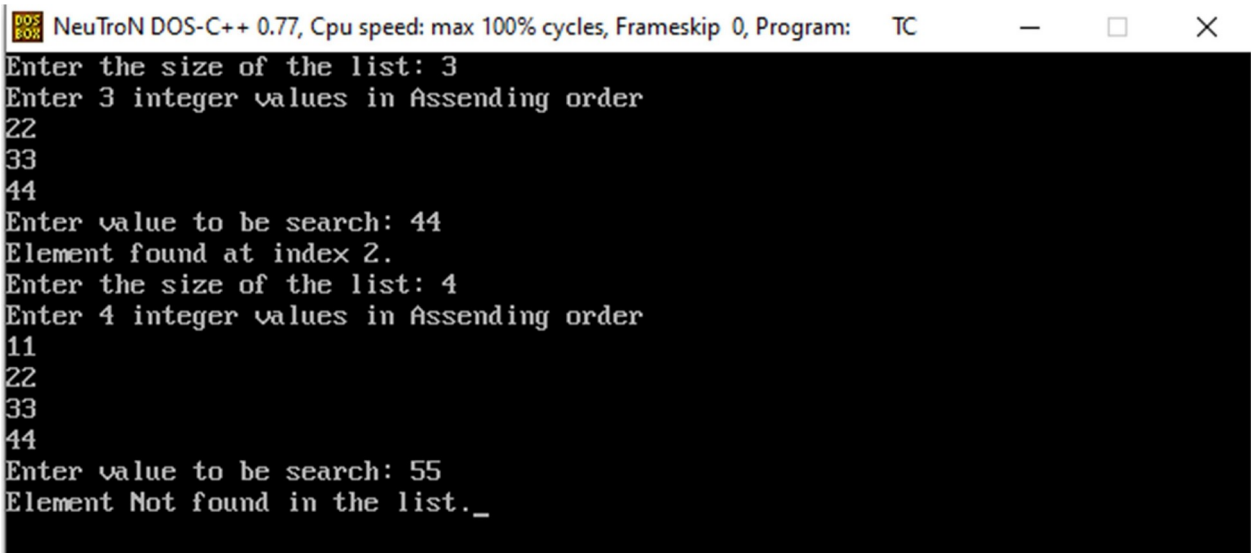
Step 1 - Read the search element from the user.
Step 2 - Find the middle element in the sorted list.
Step 3 - Compare the search element with the middle element in the sorted list.
Step 4 - If both are matched, then display "Given element is found!!!" and terminate the function. Step 5 - If both are not matched, then check whether the search element is smaller or larger than the middle element.
Step 6 - If the search element is smaller than middle element, repeat steps 2, 3, 4 and 5 for the left sublist of the middle element.
Step 7 - If the search element is larger than middle element, repeat steps 2, 3, 4 and 5 for the right sublist of the middle element.
Step 8 - Repeat the same process until we find the search element in the list or until sublist contains only one element.
Step 9 - If that element also doesn't match with the search element, then display "Element is not found in the list!!!" and terminate the function.

PROGRAM

```
#include<stdio.h>
#include<conio.h>
void main()
{
int first, last, middle, size, i, sElement, list[100];
clrscr();
printf("Enter the size of the list: ");
scanf("%d",&size);
printf("Enter %d integer values in Assending order\n", size);
for (i = 0; i < size; i++)
scanf("%d",&list[i]);
printf("Enter value to be search:
"); scanf("%d", &sElement);
first = 0;
last = size - 1;
```

```
middle = (first+last)/2;
while (first <= last) {
if (list[middle] < sElement)
first = middle + 1;
else if (list[middle] == sElement) {
printf("Element found at index %d.\
n",middle); break;
}
else
last = middle - 1;
middle = (first +
last)/2;
}
if (first > last)
printf("Element Not found in the
list."); getch();
}
```

INPUT & OUTPUT



RESULT

Thus the C Program for searching an element by using Binary Search has been executed and the output has been verified

Ex No: 5	**Strassen Matrix multiplication**
Date:	

AIM

To Write a C Program for performing matrix Multiplication using divide and Conquer

ALGORITHM

Step 1: Algorithm Strassen(n, a, b, d)
begin
Step 2: If n = threshold then compute
C = a * b is a conventional matrix.
Else
Step 3: Partition a into four sub matrices a11, a12, a21, a22.
Partition b into four sub matrices b11, b12, b21, b22. Strassen (n/2, a11 + a22, b11 + b22, d1)
Strassen (n/2, a21 + a22, b11, d2)
Strassen (n/2, a11, b12 – b22, d3)
Strassen (n/2, a22, b21 – b11, d4)
Strassen (n/2, a11 + a12, b22, d5)
Strassen (n/2, a21 – a11, b11 + b22, d6)
Strassen (n/2, a12 – a22, b21 + b22, d7)
Step 4: C = d1+d4-d5+d7 d3+d5
d2+d4 d1+d3-d2-d6

end if

return (C)
end.

PROGRAM

```
#include<stdio.h>
int main(){
int a[2][2],b[2][2],c[2][2],i,j;
int m1,m2,m3,m4,m5,m6,m7;
printf("Enter the 4 elements of first matrix: ");
for(i=0;i<2;i++)
for(j=0;j<2;j++)
```

```
scanf("%d",&a[i][j]);
printf("Enter the 4 elements of second matrix: ");
for(i=0;i<2;i++)
for(j=0;j<2;j++)
scanf("%d",&b[i][j]); printf("\
nThe first matrix is\n");
for(i=0;i<2;i++){
printf("\n");
for(j=0;j<2;j++)
printf("%d\t",a[i][j]);
}
printf("\nThe second matrix is\
n"); for(i=0;i<2;i++){
printf("\n");
for(j=0;j<2;j++)
printf("%d\t",b[i][j]);
}
m1= (a[0][0] + a[1][1])*(b[0][0]+b[1][1]);
m2= (a[1][0]+a[1][1])*b[0][0];
m3= a[0][0]*(b[0][1]-b[1][1]);
m4= a[1][1]*(b[1][0]-b[0][0]);
m5= (a[0][0]+a[0][1])*b[1][1];
m6= (a[1][0]-a[0][0])*(b[0][0]+b[0][1]);
m7= (a[0][1]-a[1][1])*(b[1][0]+b[1][1]);
c[0][0]=m1+m4-m5+m7; c[0]
[1]=m3+m5;
c[1][0]=m2+m4; c[1]
[1]=m1-m2+m3+m6;
printf("\nAfter multiplication using \
n"); for(i=0;i<2;i++){
printf("\n");
for(j=0;j<2;j++)
printf("%d\t",c[i][j]);
}
return 0;
}
```

INPUT & OUTPUT

```
NeuTroN DOS-C++ 0.77, Cpu speed: max 100% cycles, Frameskip 0, Program:    TC
Enter the 4 elements of first matrix: 1
2
3
4
Enter the 4 elements of second matrix: 5
6
7
8

The first matrix is

1       2
3       4
The second matrix is

5       6
7       8
After multiplication using

19      22
43      50      Enter the 4 elements of first matrix:
```

RESULT

Thus the C Program for multiplication of 2*2 elements Using Strassen Matrix multiplication has been executed and the output has been verified