Vidyalankar Polytechnic	DEPARTMENT OF COMPUTER ENGINEERING

Subject: - DSU	**Subject Code:** 313301
Semester: - III	**Course:** Computer Engineering
Laboratory No: L003	**Name of Subject Teacher:** Prof. Imran S.
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Experiment No:	4
Title of Experiment	Write a 'C' program to Search a particular data from the given Array of numbers using Binary Search Method.

Aim: Write a 'C' program to Search a particular data from the given Array of numbers using Binary Search Method.

Algorithm:

Step 1: Start
Step 2: Declare variables: a[100], i, j, key, n, low, high, mid
Step 3: Clear screen using clrscr()
Step 4: Print "Enter the size of the Array"
Step 5: Scan value of n from keyboard
Step 6: Print "Enter the Elements in the Array"
Step 7: Run a loop such that i = 0 to i < n
Scan each element and store it in a[i]
Step 8: Print "Enter the element to be searched"
Step 9: Scan the value of key from keyboard
Step 10: Initialize low = 0, high = n - 1
Step 11: Run a loop from i = 0 to i < n
Calculate mid = (low + high) / 2
If a[mid] == key, then
Print "key found at index mid"
Break the loop
Else if key > a[mid], then
Set low = mid + 1
Else
Set high = mid - 1
Step 12: After the loop, if a[mid] != key, then
Print "Element not found :("
Step 13: Stop

Code:

```
 ≡  File  Edit  Search  Run  Compile  Debug  Project  Options    Window  Help
[■]═══════════════ SAAD52.C ═══════════════1=[↕]
#include<stdio.h>
#include<conio.h>
void main()
{
int a[100],i,j,key,n,low,high,mid=0;
clrscr();
printf("Enter the size of the Array: ");
scanf("%i",&n);
printf("Enter the Elements in the Array: \n");
for(i=0;i<n;i++)
{
scanf("%i",&a[i]);
}
printf("\nEnter the element to be searched: ");
scanf("%i",&key);
low=0;
high=n-1;
for(i=0;i<n;i++){
mid=(low+high)/2;
if(a[mid]==key)
{
═══ 21:78 ═══
F1 Help  Alt-F8 Next Msg  Alt-F7 Prev Msg  Alt-F9 Compile  F9 Make  F10 Menu
 ≡  File  Edit  Search  Run  Compile  Debug  Project  Options    Window  Help
[■]═══════════════ SAAD52.C ═══════════════1=[↕]
printf("%i found at index %i",key,mid);
break;
}
else if(key>a[mid])
{
low=mid+1;
}
else
{
high=mid-1;
}
}
if(a[mid]!=key)
{
printf("Element not found :(");
}
getch();
}
═══ 39:78 ═══
F1 Help  Alt-F8 Next Msg  Alt-F7 Prev Msg  Alt-F9 Compile  F9 Make  F10 Menu
```

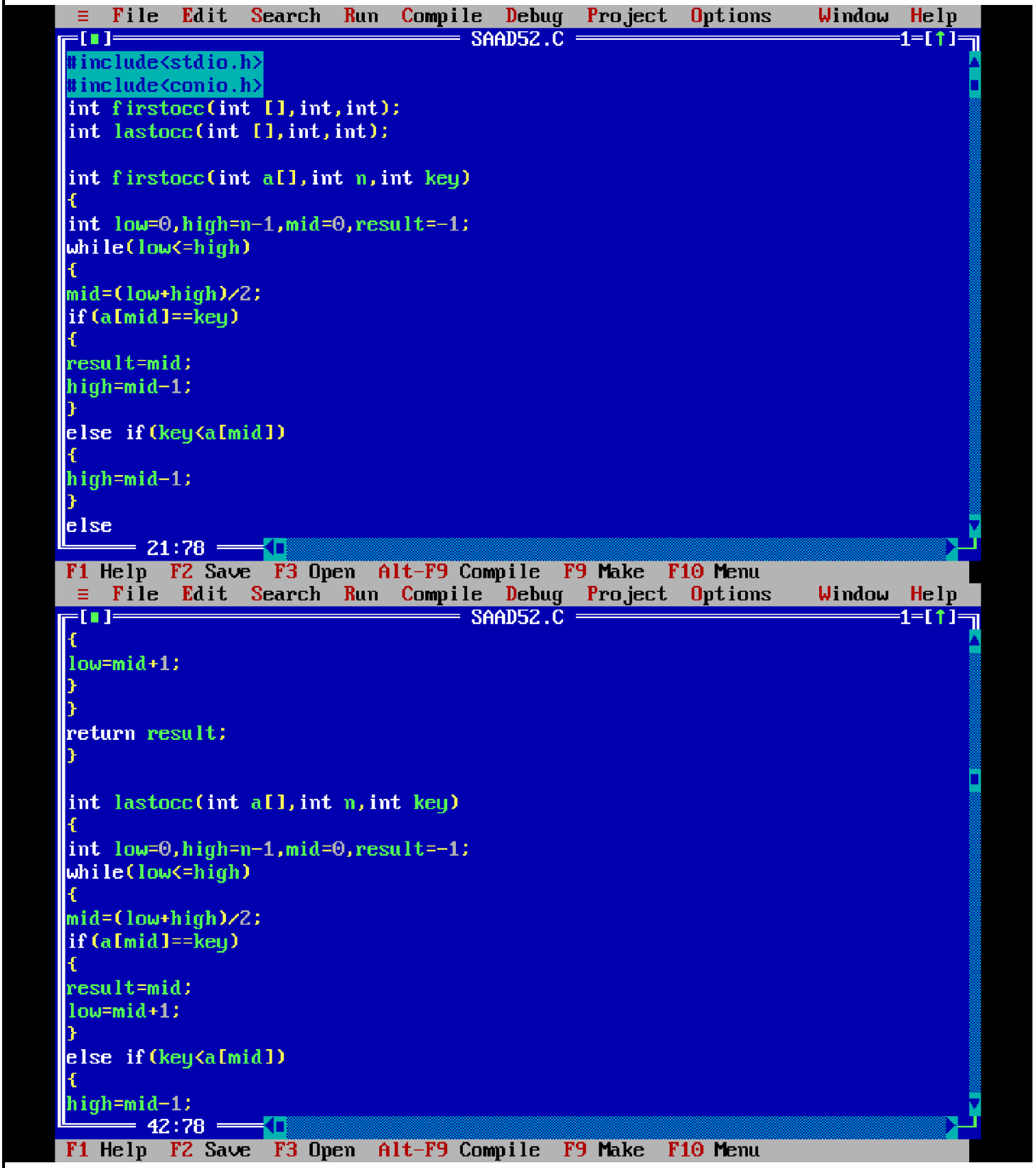
Output: -

```
Enter the size of the Array: 10
Enter the Elements in the Array:
1
2
3
4
5
6
7
8
9
10

Enter the element to be searched: 8
8 found at index 7_
```

Practical Related Questions:

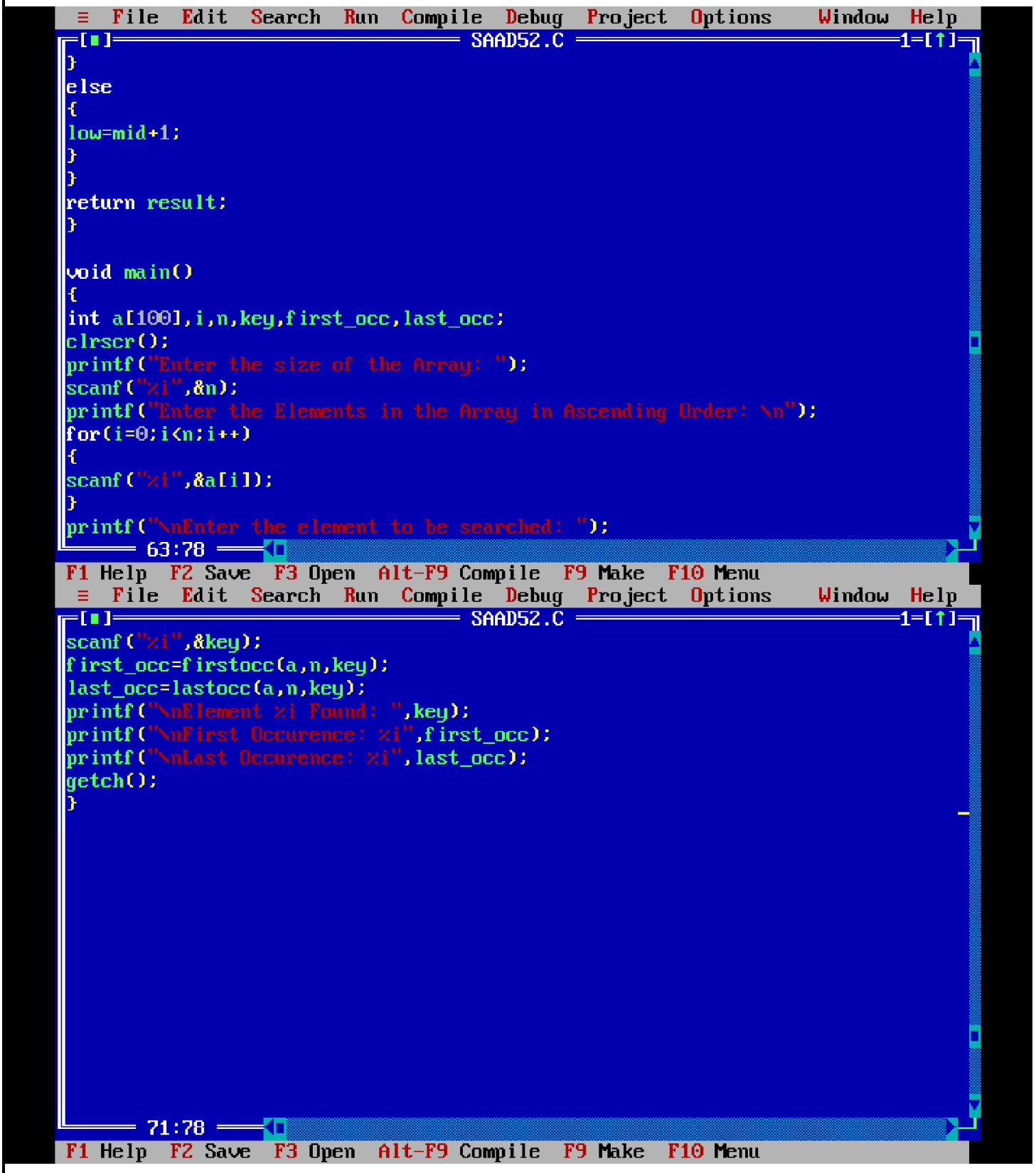
1. **Write a program to find the first and last occurrence of the element 3 in an array of 20 integers using binary search.**
   Ans:



```
 ≡  File  Edit  Search  Run  Compile  Debug  Project  Options    Window  Help
[■]═══════════ SAAD52.C ═══════════1=[↑]
#include<stdio.h>
#include<conio.h>
int firstocc(int [],int,int);
int lastocc(int [],int,int);

int firstocc(int a[],int n,int key)
{
int low=0,high=n-1,mid=0,result=-1;
while(low<=high)
{
mid=(low+high)/2;
if(a[mid]==key)
{
result=mid;
high=mid-1;
}
else if(key<a[mid])
{
high=mid-1;
}
else
═══ 21:78 ═══
F1 Help  F2 Save  F3 Open  Alt-F9 Compile  F9 Make  F10 Menu
 ≡  File  Edit  Search  Run  Compile  Debug  Project  Options    Window  Help
[■]═══════════ SAAD52.C ═══════════1=[↑]
{
low=mid+1;
}
}
return result;
}

int lastocc(int a[],int n,int key)
{
int low=0,high=n-1,mid=0,result=-1;
while(low<=high)
{
mid=(low+high)/2;
if(a[mid]==key)
{
result=mid;
low=mid+1;
}
else if(key<a[mid])
{
high=mid-1;
═══ 42:78 ═══
F1 Help  F2 Save  F3 Open  Alt-F9 Compile  F9 Make  F10 Menu
```


File Edit Search Run Compile Debug Project Options Window Help
SAAD52.C
}
else
{
low=mid+1;
}
}
return result;
}
void main()
{
int a[100],i,n,key,first_occ,last_occ;
clrscr();
printf("Enter the size of the Array: ");
scanf("%i",&n);
printf("Enter the Elements in the Array in Ascending Order: \n");
for(i=0;i<n;i++)
{
scanf("%i",&a[i]);
}
printf("\nEnter the element to be searched: ");
63:78
F1 Help F2 Save F3 Open Alt-F9 Compile F9 Make F10 Menu
File Edit Search Run Compile Debug Project Options Window Help
SAAD52.C
scanf("%i",&key);
first_occ=firstocc(a,n,key);
last_occ=lastocc(a,n,key);
printf("\nElement %i Found: ",key);
printf("\nFirst Occurence: %i",first_occ);
printf("\nLast Occurence: %i",last_occ);
getch();
}
71:78
F1 Help F2 Save F3 Open Alt-F9 Compile F9 Make F10 Menu

Output:

```
Enter the size of the Array: 20
Enter the Elements in the Array in Ascending Order:
1 2 3 4 5 6 7 8 9 10 11 12 13 13 13 13 14 18 19 20

Enter the element to be searched: 13

Element 13 Found:
First Occurence: 12
Last Occurence: 15
```

2. **Given an array of 15 integers, write a program to find the two middle elements using binary search.**

   Ans:

```
≡ File  Edit  Search  Run  Compile  Debug  Project  Options  Window  Help
[■]═══ SAAD56.C ═══1=[↕]
#include<stdio.h>
#include<conio.h>
void main()
{
int a[15],i,n=15,mid1,mid2;
clrscr();
printf("Enter the 15 elements in the array: \n");
for(i=0;i<n;i++)
{
scanf("%i",&a[i]);
}
mid1=a[n/2];
mid2=a[(n+1)/2];
printf("Mid 1: %i \n",mid1);
printf("Mid 2: %i",mid2);
getch();
}
═══ 7:45 ═══
F1 Help  Alt-F8 Next Msg  Alt-F7 Prev Msg  Alt-F9 Compile  F9 Make  F10 Menu
```

Outputs:

```
Enter the 15 elements in the array:
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Mid 1: 8
Mid 2: 9
```

Marks Obtained			**Dated signature of Teacher**
Process Related (35)	**Product Related (15)**	**Total (50)**	