

**Department of Electrical Engineering**  
**Assignment**

**Date: 21/08/2020**

**Course Details**

**Course Title:** Data Structure and Algorithm      **Module:** 6  
**Instructor:** Dr Naeem Ahmad Jan      **Total Marks:** 30

**Student Details**

**Name:** Muhammad Waqar Hameed      **Student ID:** 6939

Note: Plagiarism of more than 20% will result in negative marking.  
Similar answers of students will result in cancellation of the answer for all parties.

Q1.	<p>The following is your sorted array and let assume that you need to search the location of value 31 using binary search.</p> <div style="text-align: center;"><table border="1"><tr><td>10</td><td>14</td><td>19</td><td>26</td><td>27</td><td>31</td><td>33</td><td>35</td><td>42</td><td>44</td></tr><tr><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr></table></div>	10	14	19	26	27	31	33	35	42	44	0	1	2	3	4	5	6	7	8	9	CLO 1  Marks 10
10	14	19	26	27	31	33	35	42	44													
0	1	2	3	4	5	6	7	8	9													
Q2.	<p>Let LA be a Linear Array (Unordered) with N elements and K is a positive integer such that <math>K \leq N</math>. Following is the algorithm where ITEM is inserted into the <math>K^{\text{th}}</math> position of LA-</p> <ol style="list-style-type: none"><li>1. Start</li><li>2. Set <math>J=N</math></li><li>3. Set <math>N= N+1</math></li><li>4. Repeat steps 5 and 6 while <math>J \geq K</math></li><li>5. Set <math>LA [J+1]= LA[J]</math></li><li>6. Set <math>J=J-1</math></li><li>7. Set <math>LA[K]=ITEM</math></li><li>8. Stop</li></ol> <p>Write the implementation of the above algorithm</p>	CLO 2  Marks 10																				
Q3.	<p>Find a given target number (<math>x=61</math>) using linear Search from a list of number using C++.</p> <p>[ 18, 36,56,61,73,87,93]</p>	CLO 1  Marks 10																				

①

Q#1:

The following is your sorted array and let us assume that you need to search the location of value 31 using binary search.

10	14	19	26	27	31	33	35	42	44
0	1	2	3	4	5	6	7	8	9

Ans:-

We find out the location of value 31 by using the binary search

10	14	19	26	27	31	33	35	42	44
0	1	2	3	4	5	6	7	8	9

Firstly determine half of the array by using formula

$$\text{mid} = \text{low} + (\text{high} - \text{low}) / 2$$

Here it is  $0 + (9 - 0) / 2 =$

$$9/2 = 4.5$$

The integer value is 4.5, so 4 is the mid of array

10	14	19	26	27	31	33	35	42	44
0	1	2	3	4	5	6	7	8	9

②

Comparison of sorted value at location 4 with the value searched 31.

The value that find out at position 4 is 27 which is not match. The value 31 is greater than 27 and we have a sorted array.

We change our low to mid + 1 and find the new mid value again.

$$\text{low} = \text{mid} + 1$$

$$\text{mid} = \text{low} + (\text{high} - \text{low}) / 2$$

↓

20	14	19	26	27	31	33	35	42	44
0	1	2	3	4	5	6	7	8	9

The value sorted at location 7 is not a match. It is more than what we are want. So the value must be in the lower part from this location

20	14	19	26	27	31	33	35	42	44
0	1	2	3	4	5	6	7	8	9

Hence calculate the mid again This is time it is 5

3



10	14	19	26	27	31	33	35	42	44
0	1	2	3	4	5	6	7	8	9

Compared the value sorted at position 5 with target value. It is a match.

Binary search halves the searchable items and thus reduce the count of comparisons to be made to very less numbers.

(4)

Q# 21:

Let LA be a linear Array (Uncolored) with  $N$  elements and  $K$  is a positive integer such that  $K \leq N$ . Following is the algorithm where ITEM is inserted into the  $K^{\text{th}}$  position of LA.

1  $\rightarrow$  Start

2  $\rightarrow$  Set  $J = N$

3  $\rightarrow$  Set  $N = N + 1$

4  $\rightarrow$  Repeat step 5 and 6 while  $J > K$

5  $\rightarrow$  Set  $LA[J+1] = LA[J]$

6  $\rightarrow$  Set  $J = J - 1$

7  $\rightarrow$  Set  $LA[K] = \text{Item}$

8  $\rightarrow$  Stop

Write the implementation of above algorithm

Answer:-

```
void main() {  
    int array[] = {1, 3, 5, 7, 8};  
    int item = 10;  
    int K = 3
```

(5)

```
int n = 5
```

```
int i = 0
```

```
int j = n;
```

```
printf ("The original array elements are
```

```
:/n") for (i = 0; i < n; i++) {
```

```
printf ("array [%d] = %d/n", i, array[i]); }
```

```
n = n + 1
```

```
while (j >= k) { array [j+1] = array [j];
```

```
j = j - 1
```

```
array [k] = item;
```

```
printf ("The array elements after insertion
```

```
:/n");
```

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

```
printf ("array [%d] = %d/n", i, array[i])
```

```
}
```

(6)

Q#3:

Find a given target ( $x=61$ ) using linear search from a list of number using C++.

[18, 36, 56, 61, 73, 87, 93]

Answer:-

```
#include <iostream>
using namespace std;
int search(int arr[], int n, int x)
{
    int i;
    for (i=0; i < n; i++)
        if (arr[i] == x)
            return i;
    return -1;
}
int main (void)
{
    int arr[] = {18, 36, 56, 61, 73, 87, 93};
    int x = 61;
    int n = sizeof(arr) / sizeof(arr[0]);
    int result = search(arr, n, x);
```

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```
(result == -1) ? count << "Element is  
not present in array"  
count << "Element is present at  
index " << result;  
return 0;]
```