	Date
Expt.	No Page No
a.	Aim Write a program to implement Linear Search and analyze its time complicity Write a program to implement Binary Search and analyze its time complicity.
A)	Linear Search # include Liostruam? using namespace std;
	void Linear Search (cirl * arr, int n, int num) { for (int i = 0; i < n; i++) { y (arr [i] = = num) { cout < endl < num < (" found at index: ' < < i; return; }
	cout << endl << num << "not found n"; return; 3
	Teacher's Signature

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	Date
cpt. No	Page No
int mai	· () {
UU W/00	
	cout << " t te te t Linear Search " "
	int ant []= { 10,34,12,67,23,1,5,99,55,25
	int n = size of (our) / size of (ut);
	contas" Array in "
	for (in i=0; ikn; i++) {
	contex anci] (1)
	2
	cout << endl;
	cout << "Enter element to search: ";
	int num;
	and mum;
	Linea Search (ary n, nun);
	return O;
	ζ
Time (e	implicity.
	,
T(n) =	$T(n-1) \succ O(1)$
	-T(n-2) +1
1	=> Tn=1++1 +1
. '.	
7(2)	= t(1) +1
	Time Complicaty = O(n)
	Time Complexity = O(n) Space Complexity = O(1)
	Teacher's Signature

	Date
Exp	t. No Page No
ba	Binary Search
	# include <iostream></iostream>
	using namespau stal;
	void Binary Search (int & arm, int n, int num) {
	int s=0;
	int 1= n-1;
	while (st=l) {
	int mid = s + (l-s)/2;
	if (arr[mid] == num) {
	cout KL endl KK mum KL'' found at index!"
	<pre> <pre> <pre> <pre> <pre> </pre> </pre> <pre> <pre> <pre> <pre> </pre> <pre> </pre> <pre> </pre> <pre> </pre> <pre> </pre> <pre> <pre> <pre> <pre> </pre> <pre> </pre> <pre> </pre> <pre> <pre> <pre> </pre> <pre> </pre> <pre> <pre> <pre> </pre> <pre> <pre> </pre> <pre> <pre> <pre> <pre> </pre> <pre> </pre> <pre> <pre> <pre> </pre> <pre> <pre> </pre> <pre> </pre> <pre> <pre> <pre> <pre> <pre> </pre> <pre> <pre> <pre> <pre> <pre> </pre> <pre> <pr< th=""></pr<></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre>
	rutur ;
	ely of (arr[mid] > num) {
	1 = mid -1;
	<u> </u>
	else {
	s-mid +1;
	7
	contact Endl LL num << "not found";
	Coura enou 22 num (Frond)
	Jump',
	L
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Expt.	No Page No
	int main () }
	cout LL"LE LE Binary Search Inn";
	int ann [] = { 10,20, 30, 40,50, 60,70, 80,90,100};
	int n = size of (arr) / size of (int);
	contac " Array is:"
	for (int i=0; i kn; i H) }
	cout
	cout << end);
	cont « "énter number of search";
	int num;
	and num;
	Binary Search (avr, n, num);
	rutur 0;
	J
	/ 1 · 1
	Compliant
	T(n) + (n) \ \ \ (
	T(n) = T(n/2) + C $= T(n/2) + C$
	= +(1/8) +36
	Trn=t(n) +kc
	21-
	$N = 1$ $k = log_n$
	$\frac{N}{2} = \frac{1}{k} \cdot \frac{1}{\log_2 n}$
	T(n) = +(1) + log, n ~(
	Tai: O (login)
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	Date
Exp	Page No
	Experiment-5
*	Aim: Write a program to implement matrix Chain Multiplication
	#include <ios bream=""></ios>
	using namuspace ald;
- 44	int m [10][10] = {0}, s[10][10] = {0}, l,k,ijj,q,p[8], n, min, d; void mat ch (int); void optimal (int, int);
	void mot-ch (int n) {
	for (i=1; i(=n-d; i++) { j= i+d;
	min = INT_MAX; fo(k=1; k<=.j-1; k+L) {
	q=m[i][h] + m[k+i][j] + p[i-1]*qh]*ρ[j] y (q < min) {
	min = 9; S[i][j] = k;
	m [i] [j] = min)
	Teacher's Signature

xpt. No	Page No.
void optimal (inti, inty)	(
VOID OPHINAL COUL, (NI)	y (i==j) {
	J (''A S'A'' :).
	print ("A rid", i);
	elve {
	print ("(");
	1 0 1 / 1 / 1 / 1 / 1 / 1 / 1
	optimax ((still) + 1);
	optimal ((, still)); optimal ((still)); print (")");
	2 poroq c
}	
int main () {	
") thura	enter the matrix size:");
scant ("7.0	l", In).
print ("e	enter the matrix clements:);
•	
for (i=0;	ikn; i++)
scant (('/d", lp[i]); (Ln; i++)
for li=1;	(Ln; 1++)
print	("Axd xd * xd \n", i, p[i-1], p[i]);
mar-ch (. (())
anint ("	the M Matrix vn").
for ligo; i	Ln; i+t) {
forlj	=0; j(=n; j++){
·	print((1-1+");
	print ("- LE")
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	Date
Expt. No.	Page No
printy (" the S front i=0; it= front j=	else printf ("'\d\t", m[i][j]); matrix "); n; i+1) { O; j<=r; j+t) {
ophimal (printy ("	Min product = /d", marini);
return O;	
3	Teacher's Signature

	Date
Expt. N	NoPage No
	Experiment-6
A A	im: Write a program to implement Longest Common Subsequence
	Finclude Kiostrom>
w	sing namespace del;
voi	id les Mgo (chan *SI, chan *SZ, int m, int m) {
	int LCS=bable [mH][nH];
	far (int i=0; i <= m; i+1) { for (int j=0; j <= n; j+1) {
	4 (i== 0 i== 0)
	y (i == 0 j == 0) L(S_bblic[i][j] = 0; else y (SI[i-1] == SZ[j-1])
	else f (SI[i-1] == SZ[j-1])
	else
	LCS-block[i][j] = max CLCs-balk [i-1][j], Les Etable
	(1) (1) (1)
	3
	3
	Teacher's Signature

	Date
·	xpt. No Page No
,	
	int index = LCS-table[m][n];
٢	char les Ago Lindu HT:
	les Mgo [index] = 10;
*	int i=m, j=n;
*	while (iro & ljro) {
e.	ý (SI[i-1] == S2[j-1]) {
*	les Algo [index -1] = SI[i-1];
	(· ,
	1 ;
	undux;
^\	else'd (LCS-table [i-1][j] > LCS-table [i][j-i])
	else
	1;
	?
	coutex"SI: "Les Kel" Lnsz: "<< szee "Inzes:"
	<< los/lgo <<"\n";
2	3
	int main() {
	chan SIE] = ACADBDA",
	chan SZC] = "CBDA";
	int m = strlen(SI);
	int n = strlan(SL);
	listlgo (si, sz, m, n); }
E.	Teacher's Signature

Bubble Sort

```
#include <stdio.h>
#include<iostream>
using namespace std;
int main()
{ int n=5;
  int arr[5];
  cout<<endl<<endl;
  cout<<"Bubble Sort\nMade By: Ramit Batra\nCSE-A\nRoll
no:23\nenter array:\n";
  for(int i=0;i< n;i++)
  cin>>arr[i];
for(int j=n-1; j>=0; j--)
   for(int k=0; k< j; k++)
  if(arr[k]>arr[k+1]){
  int temp=arr[k];
  arr[k]=arr[k+1];
  arr[k+1]=temp;}}
for(int i=0;i< n;i++)
  cout<<arr[i]<<"
cout<<endl<<endl;
  return 0;
}
```

```
Bubble_Sort
Made By: Ramit Batra
CSF-A
Roll no:23
enter array:
-9
2
0
1
6
-9 0 1 2 6
ramits-NacBook-Air:ADA ramitbatra$■
```

Selection Sort

```
#include <stdio.h>
#include<iostream>
using namespace std;
int main()
  int n=5,arr[5],min=0;
  cout<<endl<<endl;
cout<<"Selection_Sort\nMade By: Ramit Batra\nCSE-A\nRoll
no:23\nenter array:\n";
  for(int i=0;i< n;i++)
  cin>>arr[i];
  for(int i=0;i< n;i++){
min=i;
for(int j=i;j<n;j++){
if(arr[j]<arr[min])</pre>
min=i;
  int temp=arr[min];
  arr[min]=arr[i];
  arr[i]=temp;
  for(int i=0;i<n;i++)
  cout<<arr[i]<<"
cout<<endl<<endl;
  return 0;
}
```

```
Selection_Sort
Made By: Ramit Batra
CSE-A
Roll no:23
enter array:
-9
0
2
1
8
-9
0
1
2
ramits-MacBook-Air:ADA ramitbatra$
■
```

Insertion Sort

```
#include <stdio.h>
#include<iostream>
using namespace std;
void insertionSort(int arr∏, int n)
{
  int i, key, j;
  for (i = 1; i < n; i++)
     key = arr[i];
     i = i - 1;
     /* Move elements of arr[0..i-1], that are
     greater than key, to one position ahead
     of their current position */
     while (i \ge 0 \&\& arr[i] > key)
        arr[j + 1] = arr[j];
        j = j - 1;
     arr[j + 1] = key;
}
// A utility function to print an array of size n
void printArray(int arr∏, int n)
{
  int i;
  for (i = 0; i < n; i++)
     cout << arr[i] << " ";
  cout << endl;
}
/* Driver code */
int main()
{
  int arr[5];
  int n = 5;
cout<<endl<<endl;
```

```
cout<<"Insertion_Sort\nMade By: Ramit Batra\nCSE-A\nRoll
no:23\nenter array:\n";
for(int i=0;i<n;i++)
    cin>>arr[i];
    insertionSort(arr, n);
    printArray(arr, n);

return 0;
}
```

```
Insertion_Sort
Made By: Ramit Batra
CSE-A
Roll no:23
enter array:
12
5
3
4
1
1 3 4 5 12
ramits-MacBook-Air:ADA ramitbatra$ ■
```

Linear Search

```
#include <iostream>
#include <stdio.h>
using namespace std;
class Array {
    public:
        int linearsearch(int arr[], int size, int item) {
             for (int i=0; i<size; i++) {
                 if (arr[i]==item) {
                     int pos = i+1;
                     return (pos);
                 }
             }
             return (-1);
        }
};
int main() {
    int item, n;
    Array obj;
    cout << "Enter the size of array: ";</pre>
    cin >> n;
    int *arr = new int[n];
    cout << "Enter the elements of array: ";</pre>
    for (int i=0; i<n; i++)
        cin >> arr[i];
    cout << "Enter the element to be searched: ";</pre>
    cin >> item;
    int pos = obj.linearsearch(arr, n, item);
    (pos == -1)
        ? cout << "Element is not present in the array."</pre>
```

```
: cout << "Element "<< item <<" is present at position "
<< pos;
return 0;
}</pre>
```

```
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```

Binary Search

```
#include <iostream>
#include <stdio.h>
using namespace std;
class Array {
  public:
    int binarysearch(int arr[], int item, int l, int r) {
        if (r >= l) {
            int mid = l + (r - l) / 2;
            // Item in middle
            if (arr[mid] == item)
                 return mid;
            // Item in left sub-array
            if (arr[mid] > item)
                 return binarysearch(arr, item, l, mid - 1);
            // Item in right sub-array
            return binarysearch(arr, item, mid + 1, r);
        }
        return -1;
    }
};
int main() {
    Array obj;
    int n;
    cout << "Enter the size of array: ";</pre>
    cin >> n;
    int *arr = new int[n];
    cout << "Enter " << n*n << " elements in the array: ";
    for (int i=0; i<n; i++)
        cin >> arr[i];
    int item;
    cout << "Enter the element to be searched: ";</pre>
```

```
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```

Matrix Multiplication

```
#include<stdio.h>
#include<limits.h>
#include<iostream>
int m[10][10]=\{0\}, s[10][10]=\{0\}, l, k, i, j, q, p[8], n, min, d;
void mat_ch(int);
void optimal(int ,int);
    void mat ch(int n) {
    for(d=1;d<n;d++) {
        for(i=1;i<=n-d;i++){
            j=i+d;
            min=INT_MAX;
            for(k=i;k<=j-1;k++) {
                 q=m[i][k]+m[k+1][j]+p[i-1]*p[k]*p[j];
                 if(q<min) {</pre>
                     min=q;
                     s[i][j]=k;
                 }
                 m[i][j]=min;
            }
        }
    }
}
void optimal(int i,int j) {
    if(i==j) {
        printf("A%d",i);
    }
    else {
        printf("(");
        optimal(i,s[i][j]);
        optimal((s[i][j]+1),j);
        printf(")");
    }
}
int main() {
    printf("enter the matrix size: ");
```

```
scanf("%d",&n);
printf("enter the matrix elements: ");
for(i=0;i<n;i++)
    scanf("%d",&p[i]);
for(i=1;i<n;i++)
                %d * %d\n",i,p[i-1],p[i]);
    printf("A%d
mat ch(n);
printf(" the M matrix\n");
for(i=0;i<=n;i++) {
    for(j=0;j<=n;j++) {
        if(i>j)
            printf("-\t ");
        else
            printf("%d\t ",m[i][j]);
    printf("\n");
printf(" the S matrix\n");
for(i=0;i<=n;i++) {
    for(j=0;j<=n;j++) {
        if(i>j)
            printf("-\t ");
        else
            printf("%d\t ",s[i][j]);
    }
    printf("\n");
}
optimal(1,n);
printf(" \n Minimum Product = %d",m[1][n]);
// getch();
return 0;
```

}

```
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```

LCS

```
#include <iostream>
using namespace std;
void lcsAlgo(char *S1, char *S2, int m, int n) {
  int LCS table [m + 1][n + 1];
  // Building the mtrix in bottom-up way
  for (int i = 0; i \le m; i++) {
    for (int j = 0; j \le n; j++) {
      if (i == 0 || i == 0)
        LCS_{table[i][j] = 0;
      else if (S1[i - 1] == S2[j - 1])
        LCS table[i][j] = LCS table[i - 1][j - 1] + 1;
      else
        LCS_table[i][j] = max(LCS_table[i - 1][j], LCS_table[i][j
- 1]);
    }
  }
  int index = LCS_table[m][n];
  char lcsAlgo[index + 1];
  lcsAlgo[index] = '\0';
  int i = m, j = n;
 while (i > 0 \&\& j > 0) {
    if (S1[i-1] == S2[j-1]) {
      lcsAlgo[index - 1] = S1[i - 1];
      i--;
      j--;
      index--;
    }
    else if (LCS_table[i - 1][j] > LCS_table[i][j - 1])
      i--;
    else
      j--;
  }
```

```
// Printing the sub sequences
  cout << "S1 : " << S1 << "\nS2 : " << S2 << "\nLCS: " << lcsAlgo
<< "\n";
}

int main() {
  char S1[] = "ACADBDA";
  char S2[] = "CBDA";
  int m = strlen(S1);
  int n = strlen(S2);

lcsAlgo(S1, S2, m, n);
}</pre>
```

```
ramits-MacBook-Air:Exp_6 ramitbatna$ ud "//sers/ramitbatra/Desktap/Cuting 5th Sem/AGA/Exp_6/" && grv LC3-u.gr =u LC3 && "/Users/ramitbatra/Desktup/Cuting 5th Sem/AGA/Exp_6/" && grv LC3-u.gr =u LC3 && "/Users/ramitbatra/Desktup/Cuting 5th Sem/AGA/Exp_6/" && grv LC3-u.gr =u LC3 && "/Users/ramitbatra/Desktup/Cuting 5th Sem/AGA/Exp_6/" && grv LC3-u.gr =u LC3 && "/Users/ramitbatra to the semilar semi
```