**Experiment -3**

**AIM**: Write a Java program to perform encryption and decryption using the following algorithms:

**a) Ceaser Cipher**

**b) Substitution Cipher**

**c) Hill Cipher**

**a) Ceaser Cipher**

import java.io.BufferedReader;

import java.io.IOException;

import java.io.InputStreamReader;

import java.util.Scanner;

public class CeaserCipher

{

static Scanner sc=new Scanner(System.in);

static BufferedReader br = new BufferedReader(new InputStreamReader(System.in));

public static void main(String[] args) throws IOException

{

System.out.print("Enter any String: ");

String str = br.readLine();

System.out.print("\nEnter the Key: ");

int key = sc.nextInt();

String encrypted = encrypt(str, key);

System.out.println("\nEncrypted String is: " +encrypted);

String decrypted = decrypt(encrypted, key);

System.out.println("\nDecrypted String is: "

+decrypted); System.out.println("\n");

}

public static String encrypt(String str, int key)

{

String encrypted = "";

for(int i = 0; i < str.length(); i++)

{

int c = str.charAt(i);

if (Character.isUpperCase(c))

{

c = c + (key % 26);

if (c > 'Z')

c = c - 26;

}

else if (Character.isLowerCase(c))

{

c = c + (key % 26);

if (c > 'z')

c = c - 26;

}

encrypted += (char) c;

}

return encrypted;

}

public static String decrypt(String str, int key)

{

String decrypted = "";

for(int i = 0; i < str.length(); i++)

{

int c = str.charAt(i);

if (Character.isUpperCase(c))

{

c = c - (key % 26);

if (c < 'A')

c = c + 26;

}

else if (Character.isLowerCase(c))

{

c = c - (key % 26);

if (c < 'a')

c = c + 26;

}

decrypted += (char) c;

}

return decrypted;

}

}

**Output:**

Enter any String: Hello World

Enter the Key: 5

Encrypted String is: Mjqqt Btwqi

Decrypted String is: Hello World

**b) Substitution Cipher**

import java.io.\*;

import java.util.\*;

public class SubstitutionCipher

{

static Scanner sc = new Scanner(System.in);

static BufferedReader br = new BufferedReader(new InputStreamReader(System.in));

public static void main(String[] args) throws IOException

{

String a = "abcdefghijklmnopqrstuvwxyz";

String b = "zyxwvutsrqponmlkjihgfedcba";

System.out.print("Enter any string: ");

String str = br.readLine();

String decrypt = "";

char c;

for(int i=0;i<str.length();i++)

{

c = str.charAt(i);

int j = a.indexOf(c);

decrypt = decrypt+b.charAt(j);

}

System.out.println("The encrypted data is: " +decrypt);

}

}

**Output:**

Enter any string: echo

The encrypted data is: vxsl

**c) Hill Cipher**

import java.io.\*;

import java.util.\*;

import java.io.\*;

public class HillCipher {

static float[][] decrypt = new float[3][1];

static float[][] a = new float[3][3]; static

float[][] b = new float[3][3]; static

float[][] mes = new float[3][1]; static

float[][] res = new float[3][1];

static BufferedReader br = new BufferedReader(new InputStreamReader(System.in)); static Scanner sc = new Scanner(System.in);

public static void main(String[] args) throws IOException

{

getkeymes();

for(int i=0;i<3;i++)

for(int j=0;j<1;j++)

for(int k=0;k<3;k++)

{

res[i][j]=res[i][j]+a[i][k]\*mes[k][j];

}

System.out.print("\nEncrypted string is :");

for(int i=0;i<3;i++)

{

System.out.print((char)(res[i][0]%26+97));

res[i][0]=res[i][0];

}

inverse();

for(int i=0;i<3;i++)

for(int j=0;j<1;j++)

for(int k=0;k<3;k++)

{

decrypt[i][j] = decrypt[i][j]+b[i][k]\*res[k][j];

}

System.out.print("\nDecrypted string is : ");

for(int i=0;i<3;i++)

{

System.out.print((char)(decrypt[i][0]%26+97));

}

System.out.print("\n");

}

public static void getkeymes() throws IOException

{

System.out.println("Enter 3x3 matrix for key (It should be inversible): ");

for(int i=0;i<3;i++)

for(int j=0;j<3;j++)

a[i][j] = sc.nextFloat();

System.out.print("\nEnter a 3 letter string: ");

String msg = br.readLine();

for(int i=0;i<3;i++)

mes[i][0] = msg.charAt(i)-97;

}

public static void inverse()

{

float p,q;

float[][] c = a;

for(int i=0;i<3;i++)

for(int j=0;j<3;j++)

{

if(i==j)

b[i][j]=1;

else b[i][j]=0;

}

for(int k=0;k<3;k++)

{

for(int i=0;i<3;i++)

{

p = c[i][k];

q = c[k][k];

for(int j=0;j<3;j++)

{

if(i!=k)

{

c[i][j] = c[i][j]\*q-p\*c[k][j];

b[i][j] = b[i][j]\*q-p\*b[k][j];

}

}

}

}

for(int i=0;i<3;i++)

for(int j=0;j<3;j++)

{

b[i][j] = b[i][j]/c[i][i];

}

System.out.println("");

System.out.println("\nInverse Matrix is : ");

for(int i=0;i<3;i++)

{

for(int j=0;j<3;j++)

System.out.print(b[i][j] + " ");

System.out.print("\n");

}

}

}

**Output:**

Enter 3x3 matrix for key (It should be invertible):

2 4 1

3 7 2

1 5 3

Enter a 3 letter string: unq

Encrypted string is : ebd

Inverse Matrix is:

5.5 -3.5 0.5

-3.5 2.5 -0.5

4.0 -3.0 1.0

Decrypted string is : unq