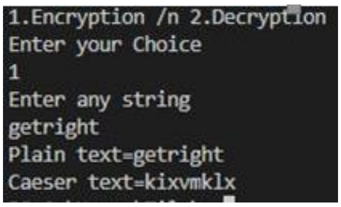
Practical 1

Aim: Write program to implement the following substitution cipher techniques:

input

```
import java.io.*;
class caesarCipher{
        private static String Alphabet ="abcdefghijklmnopqrstuvwxyz";
        public String encryption(String pt,intkey){
                pt=pt.toLowerCase();
                String ct="";
                for (int i=0;i<pt.length();i++){
                        int charposition=Alphabet.indexof(pt.charAt(i));
                        int keyval = (key+charpostion)%26;
                        char replaceval=this.Alphabet.charAt(keyval);
                        ct=ct+replaceval;}
                return ct;
                }
        public String decrypt(String ct,int key){
                ct = ct.toLowerCase();
        String pt = "";
        for(int i=0;i<ct.length();i++){
                int charPosition = this.Alphabet.indexOf(ct.charAt(i));
                int keyval = (charPosition-key)%26;
                if(keyval<0)
                {keyval = this.Alphabet.length()+keyval;}
                char replaceval = this.Alphabet.charAt(keyval);
                pt = pt+replaceval;}
        return pt;
}}
public class caesarCipherDemo{
        public static void main(String args[]) throws IOException{
                int choice;
                System.out.println("1.Encryption /n 2.Decryption");
                System.out.println("Enter your choice");
                BufferedReader br1 = new BufferedReader(new InputStreamReader(System.in));
                choice  = Integer.parseInt(br1.readLine());
                System.out.println("Enter any String");
                BufferedReader br = new BufferedReader(new InputStreamReader(System.in));
                String pt = br.readLine();
                int key= 15;
                caesarCipher cc = new caesarCipher();
                String ct = cc.encryption(pt,key);
                switch(choice){
                        case 1:
                        System.out.println("Plain text =  "+pt);
                        System.out.println("Caesar cipher text= "+ct);
                        break;
                        case 2:
                        System.out.println("Enter any string for decrypt");
                        BufferedReader br2 = new BufferedReader(new InputStreamReader(System.in));
                        String ct1 = br2.readLine();
                        String cpt = cc.decrypt(ct,key);
                        System.out.println("Plain Text "+ct);
                        break;
                        default:
                        System.out.println("Wrong Choice");
                                }}}
```

output

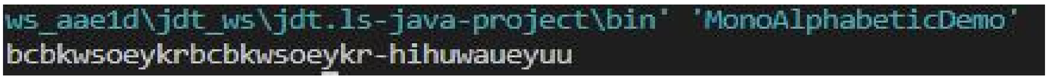


```
1.Encryption /n 2.Decryption
Enter your Choice
1
Enter any string
getright
Plain text=getright
Caeser text=kixvmklx
```

1.bMonoAlphabeticDemo.java

```
import java.io.*;
class monoalpha
{
private final String Alphabet="abcdefghijklmnopqrstuvwxyz";
private String newkey="";
 private static int isGenerated=0;
 private void generatedkey(String userkey)
{
userkey=userkey.toLowerCase();
for(int i=0;i<userkey.length();i++)
{
int flag=0; for(int j=0;j<this.newkey.length();j++)
{
if(userkey.charAt(i)==newkey.charAt(j))
{
flag=1; break;
}
}
if(flag==0)
this.newkey+=userkey.charAt(i);
}
if(isGenerated==0)
{
isGenerated=1;
 this.generatedkey(this.newkey+""+this.Alphabet);
}
}
public String encrypt(String plainText,String userkey)
{
this.generatedkey(userkey);
String cipherText="";
String tmpstr=plainText;
for(int i=0;i<plainText.length();i++)
{
char replaceVal=this.newkey.charAt(this.Alphabet.indexOf(plainText.charAt(i)));
tmpstr=tmpstr.replace(tmpstr.charAt(i),replaceVal);
}
cipherText=tmpstr;
 return cipherText;
}
public String decrypt(String cipherText,String userkey)
{
this.generatedkey(userkey);
 String plainText="";
 String tmpstr=cipherText;
 for(int i=0;i<cipherText.length();i++)
  {
char replaceVal=this.Alphabet.charAt(this.newkey.indexOf(cipherText.charAt(i)));
tmpstr=tmpstr.replace(tmpstr.charAt(i),replaceVal);
}
plainText=tmpstr;
return plainText;
}
}
class MonoAlphabeticDemo
{
public static void main(String args[])
{
monoalpha Ma=new monoalpha();
String en=Ma.encrypt("hihowareyou","student");
System.out.print(en);
String de=Ma.decrypt(en,"student");
System.out.println(en+"-"+de);
}
}
```

output



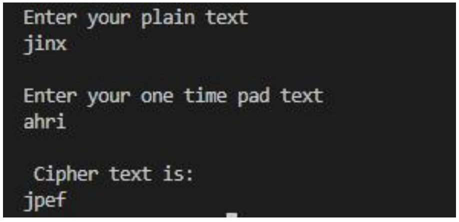
```
ws_aae1d\jdt_ws\jdt.ls-java-project\bin' 'MonoAlphabeticDemo'
bcbkwsoeykrbcbkwsoeykr-hihuwaueyuu
```

Practical 2:Aim: write program to implement the following substitution cipher techniques:

1)Vernam Cipher

```
import java.io.*;
 class vernam
{
public static int getCharValue(char x)
{
int y=(int)'a';
return((int)x-y);
}
public static char getNumberValue(int x)
{
int z=x+(int)'a';
return ((char)z);
}
public static void main(String arg[])throws Exception
{
BufferedReader br=new BufferedReader(new InputStreamReader(System.in));
System.out.println("Enter your plain text");
String accept=br.readLine();
System.out.println("\nEnter your one time pad text");
 String pad=br.readLine();
 int aval[]=new int[accept.length()];
  int pval[]=new int[pad.length()];
  int initval[]=new int[pad.length()];
  if(pad.length()!=accept.length())
{
System.out.println("Invalid one time pad. Application terminates.");
 return;
}
for(int i=0;i<accept.length();i++)
{
int k=getCharValue(accept.charAt(i));
aval[i]=k;
}
for(int i=0;i<pad.length();i++)
{
int k=getCharValue(pad.charAt(i));
pval[i]=k;
}
for(int i=0;i<pad.length();i++)
{
initval[i]=aval[i]+pval[i];
if(initval[i]>25) initval[i]-=26;
}
System.out.println("\n Cipher text is:");
 String cipher="";
 for(int i=0;i<pad.length();i++)
{
cipher+=getNumberValue(initval[i]);
}
System.out.println(cipher);
}
}
```

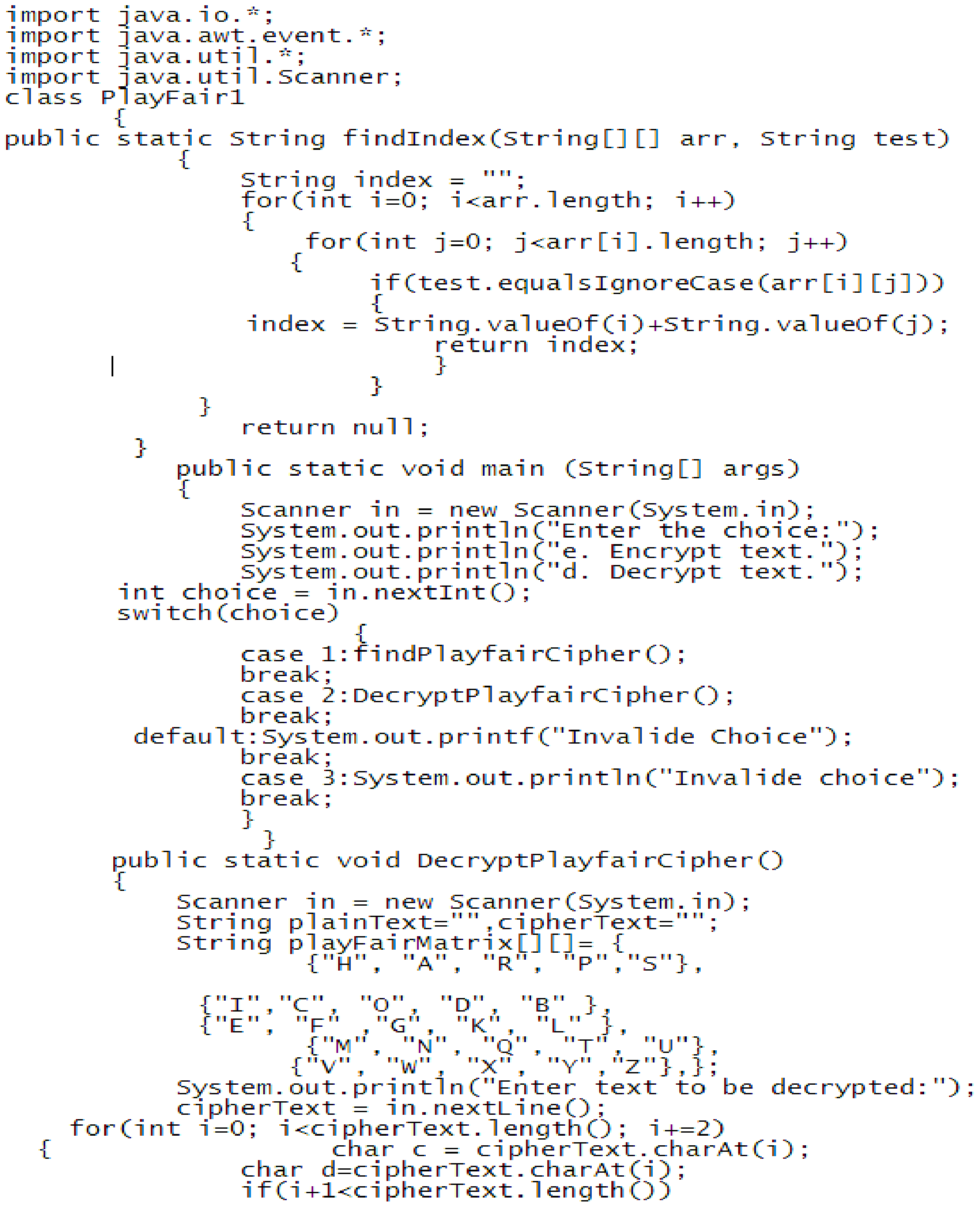
Output



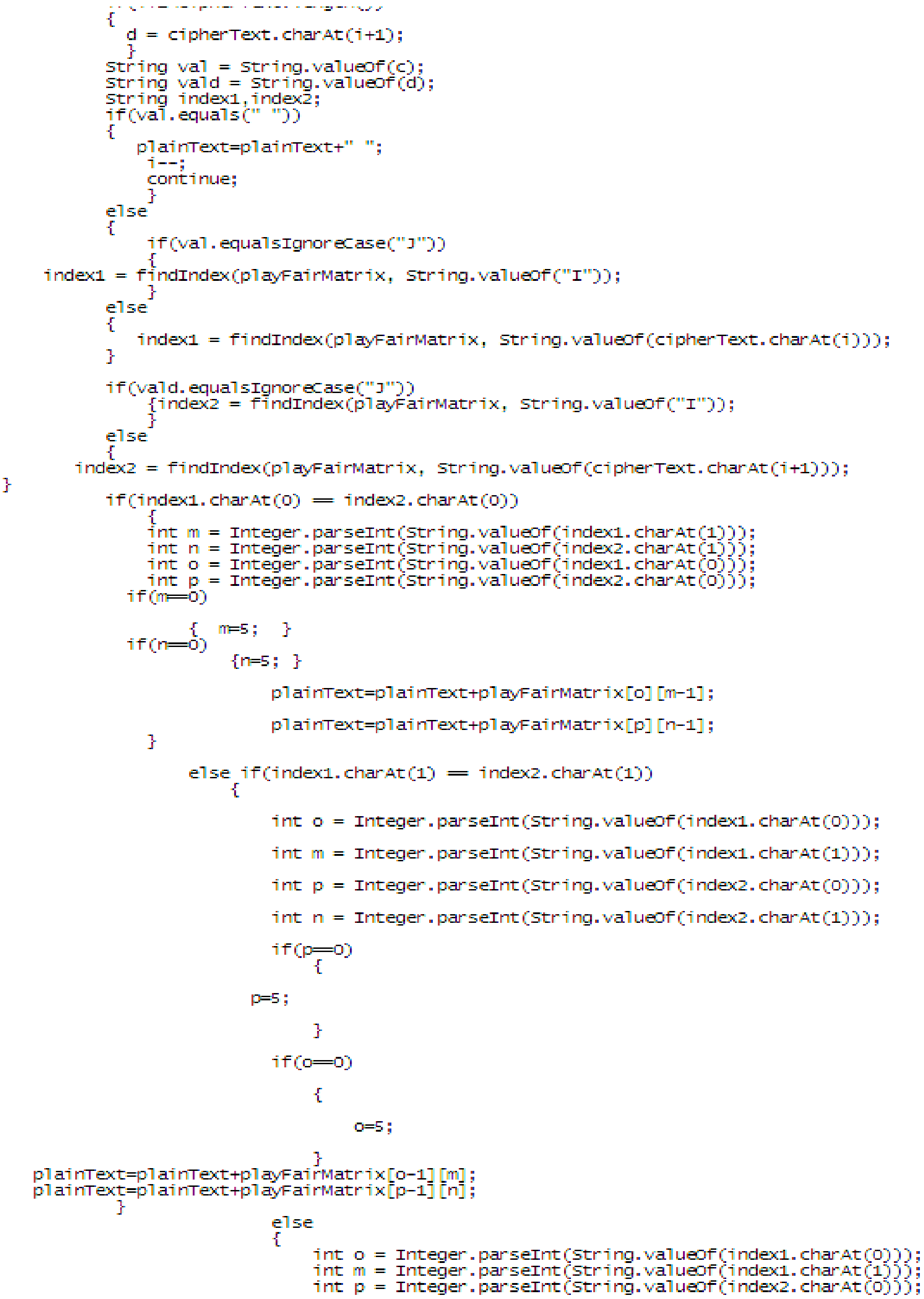
```
Enter your plain text
jinx

Enter your one time pad text
ahri

 Cipher text is:
jpef
```

Playfair cipher

Input

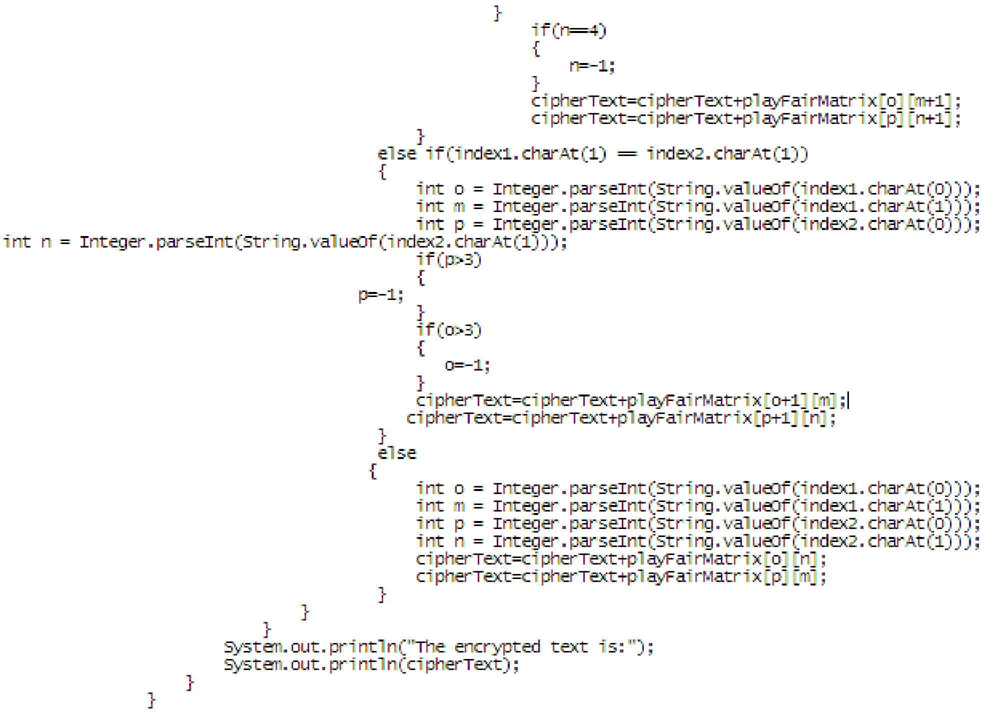


```
import java.io.*;
import java.awt.event.*;
import java.util.*;
import java.util.Scanner;
class PlayFair1
          {
public static String findIndex(String[][] arr, String test)
                {
                     String index = "";
                     for(int i=0; i<arr.length; i++)
                     {
                          for(int j=0; j<arr[i].length; j++)
                         {
                                if(test.equalsIgnoreCase(arr[i][j]))
                                {
                      index = String.valueOf(i)+String.valueOf(j);
                                     return index;
          |                          }
                                }
                  }
                     return null;
            }
                public static void main (String[] args)
                {
                     Scanner in = new Scanner(System.in);
                     System.out.println("Enter the choice:");
                     System.out.println("e. Encrypt text.");
                     System.out.println("d. Decrypt text.");
          int choice = in.nextInt();
          switch(choice)
                            {
                     case 1:findPlayfairCipher();
                     break;
                     case 2:DecryptPlayfairCipher();
                     break;
           default:System.out.printf("Invalide Choice");
                     break;
                     case 3:System.out.println("Invalide choice");
                     break;
                     }
                       }
          public static void DecryptPlayfairCipher()
          {
                Scanner in = new Scanner(System.in);
                String plainText="",cipherText="";
                String playFairMatrix[][]= {
                           {"H", "A", "R", "P","S"},

                  {"I","C", "O", "D", "B" },
                  {"E", "F" ,"G", "K", "L" },
                           {"M", "N", "Q", "T", "U"},
                          {"V", "W", "X", "Y","Z"},};
                System.out.println("Enter text to be decrypted:");
                cipherText = in.nextLine();
        for(int i=0; i<cipherText.length(); i+=2)
   {                          char c = cipherText.charAt(i);
                     char d=cipherText.charAt(i);
                     if(i+1<cipherText.length())
```



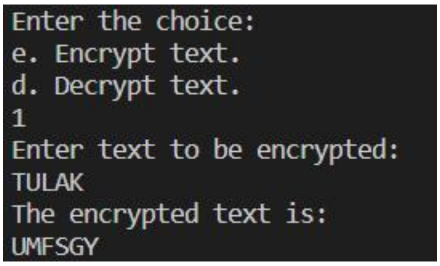
```
          {
            d = cipherText.charAt(i+1);
            }
          String val = String.valueOf(c);
          String vald = String.valueOf(d);
          String index1,index2;
          if(val.equals(" "))
          {
             plainText=plainText+" ";
              i--;
              continue;
              }
          else
          {
              if(val.equalsIgnoreCase("J"))
              {
    index1 = findIndex(playFairMatrix, String.valueOf("I"));
              }
          else
          {
             index1 = findIndex(playFairMatrix, String.valueOf(cipherText.charAt(i)));
          }

          if(vald.equalsIgnoreCase("J"))
              {index2 = findIndex(playFairMatrix, String.valueOf("I"));
              }
          else
          {
       index2 = findIndex(playFairMatrix, String.valueOf(cipherText.charAt(i+1)));
}
          if(index1.charAt(0) == index2.charAt(0))
              {
              int m = Integer.parseInt(String.valueOf(index1.charAt(1)));
              int n = Integer.parseInt(String.valueOf(index2.charAt(1)));
              int o = Integer.parseInt(String.valueOf(index1.charAt(0)));
              int p = Integer.parseInt(String.valueOf(index2.charAt(0)));
            if(m==0)

                  {  m=5;   }
            if(n==0)
                      {n=5; }

                          plainText=plainText+playFairMatrix[o][m-1];

                          plainText=plainText+playFairMatrix[p][n-1];

              }

                  else if(index1.charAt(1) == index2.charAt(1))
                      {

                          int o = Integer.parseInt(String.valueOf(index1.charAt(0)));

                          int m = Integer.parseInt(String.valueOf(index1.charAt(1)));

                          int p = Integer.parseInt(String.valueOf(index2.charAt(0)));

                          int n = Integer.parseInt(String.valueOf(index2.charAt(1)));

                          if(p==0)
                              {

                        p=5;

                              }

                          if(o==0)

                              {

                                  o=5;

                              }
   plainText=plainText+playFairMatrix[o-1][m];
   plainText=plainText+playFairMatrix[p-1][n];
           }
                          else
                          {
                              int o = Integer.parseInt(String.valueOf(index1.charAt(0)));
                              int m = Integer.parseInt(String.valueOf(index1.charAt(1)));
                              int p = Integer.parseInt(String.valueOf(index2.charAt(0)));
```

```
                                      int n = Integer.parseInt(String.valueOf(index2.charAt(1)));
       plainText=plainText+playFairMatrix[o][n];
       plainText=plainText+playFairMatrix[p][m];

                              }
                      }
        }
                  System.out.println("The decrypted text is:");
                  System.out.println(plainText);}
                  public static void findPlayfairCipher()
                  {
                      Scanner in = new Scanner(System.in);
                      String plainText="",plainTxt, cipherText="";
                      String playFairMatrix[][]=
                      {{"H", "A", "R", "P","S"},
                      {"I","C", "O", "D", "B" },
                      {"E", "F" ,"G", "K", "L" },
                      {"M", "N", "Q", "T", "U"},
                      {"V", "W", "X", "Y","Z"},
            };
                      System.out.println("Enter text to be encrypted:");
                      plainTxt = in.nextLine();
                      String temp="";
                      String arr[]=plainTxt.split(" ");
                      for(int j=0;j<arr.length;j++)
                      {
                          temp=arr[j];
                          if(temp.length()%2!=0)
                          {
                              temp=temp+"x";

                          }
                          plainText=plainText+ temp+" ";
                      }
                          for(int i=0; i<plainText.length(); i+=2)
                              {
                                  char c = plainText.charAt(i);
                                  char d=plainText.charAt(i);
                                  if(i+1<plainText.length())
                                  {
                                      d = plainText.charAt(i+1);
                                  }
                                  String val = String.valueOf(c);
                                 String vald = String.valueOf(d);
                                  String index1,index2;
                                  if(val.equals(" "))
                                      {
                                          cipherText=cipherText+" ";
                                          i--;
                                          continue;
                                      }
                                  else
                                  {
                                      if(val.equalsIgnoreCase("J"))
                                      {
                                          index1 = findIndex(playFairMatrix, String.valueOf("I"));
                                      }
                                          else
                                          {
                                              index1 = findIndex(playFairMatrix, String.valueOf(plainText.charAt(i)));
                                          }
                                          if(vald.equalsIgnoreCase("J"))
                                          {

                                              index2 = findIndex(playFairMatrix, String.valueOf("I"));
                                          }
                                          else{
                                                  index2 = findIndex(playFairMatrix, String.valueOf(plainText.charAt(i+1)));
                                              }
                                          if(index1.charAt(0) == index2.charAt(0))
                                             {

                                                      int m = Integer.parseInt(String.valueOf(index1.charAt(1)));
                                                      int n = Integer.parseInt(String.valueOf(index2.charAt(1)));
int o = Integer.parseInt(String.valueOf(index1.charAt(0)));

 int p = Integer.parseInt(String.valueOf(index2.charAt(0)));

                                                      if(m==4)
                                                      {
                                                         m=-1;
```



```
                                                   }
                                                       if(n==4)
                                                       {
                                                           n=-1;
                                                       }
                                                       cipherText=cipherText+playFairMatrix[o][m+1];
                                                       cipherText=cipherText+playFairMatrix[p][n+1];
                                           }
                                       else if(index1.charAt(1) == index2.charAt(1))
                                       {
                                           int o = Integer.parseInt(String.valueOf(index1.charAt(0)));
                                           int m = Integer.parseInt(String.valueOf(index1.charAt(1)));
                                           int p = Integer.parseInt(String.valueOf(index2.charAt(0)));
int n = Integer.parseInt(String.valueOf(index2.charAt(1)));
                                           if(p>3)
                                           {
                                     p=-1;
                                           }
                                           if(o>3)
                                           {
                                              o=-1;
                                           }
                                           cipherText=cipherText+playFairMatrix[o+1][m];
                                          cipherText=cipherText+playFairMatrix[p+1][n];
                                       }
                                       else
                                      {
                                           int o = Integer.parseInt(String.valueOf(index1.charAt(0)));
                                           int m = Integer.parseInt(String.valueOf(index1.charAt(1)));
                                           int p = Integer.parseInt(String.valueOf(index2.charAt(0)));
                                           int n = Integer.parseInt(String.valueOf(index2.charAt(1)));
                                           cipherText=cipherText+playFairMatrix[o][n];
                                           cipherText=cipherText+playFairMatrix[p][m];
                                       }
                               }
                           }
                       System.out.println("The encrypted text is:");
                       System.out.println(cipherText);
                   }
               }
```

output



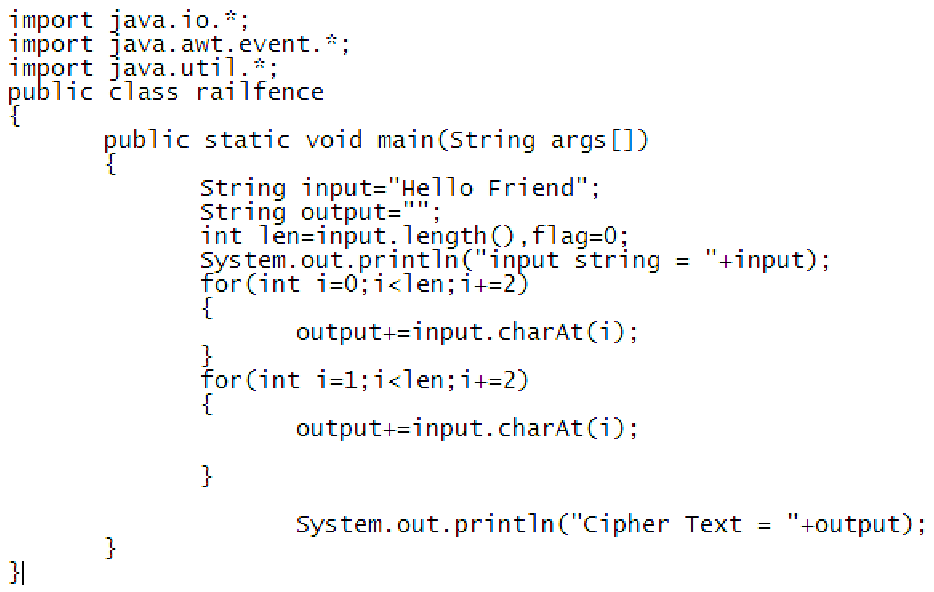
```
Enter the choice:
e. Encrypt text.
d. Decrypt text.
1
Enter text to be encrypted:
TULAK
The encrypted text is:
UMFSGY
```

Practical 3

Aim: Write program to implement the following transposition cipher techniques

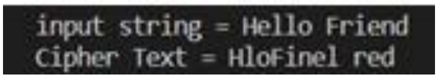
1)Rail fence Cipher

input



```
import java.io.*;
import java.awt.event.*;
import java.util.*;
public class railfence
{
        public static void main(String args[])
        {
                String input="Hello Friend";
                String output="";
                int len=input.length(),flag=0;
                System.out.println("input string = "+input);
                for(int i=0;i<len;i+=2)
                {
                        output+=input.charAt(i);
                }
                for(int i=1;i<len;i+=2)
                {
                        output+=input.charAt(i);

                }

                        System.out.println("Cipher Text = "+output);
        }
}|
```

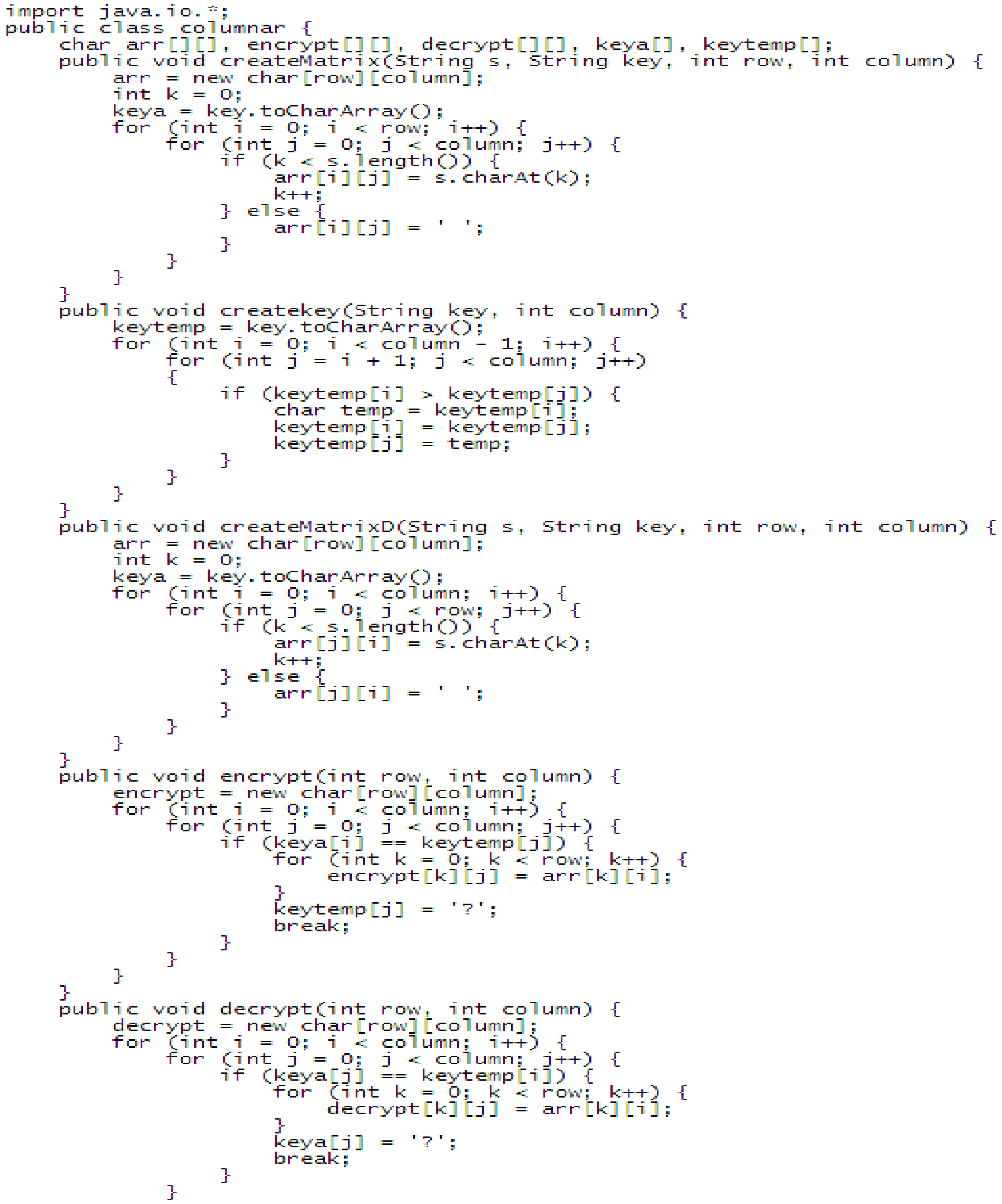
Output



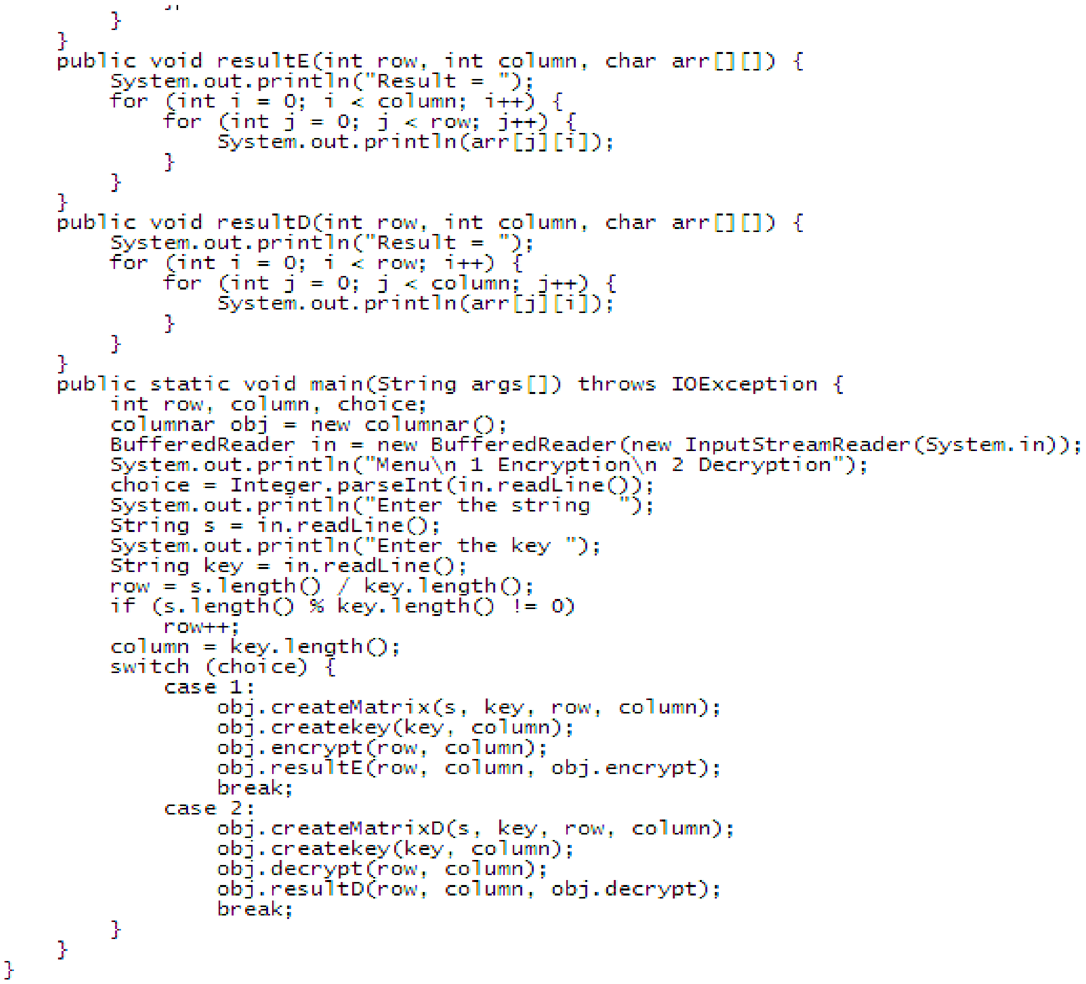
```
input string = Hello Friend
Cipher Text = HloFinel red
```

2)Simple Columnar Technique

Input

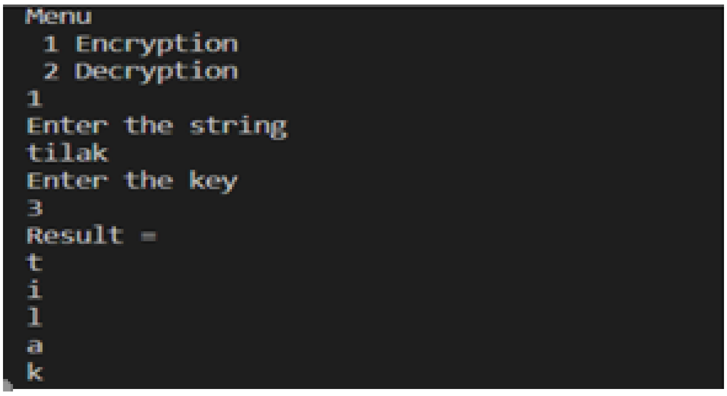


```
import java.io.*;
public class columnar {
    char arr[][], encrypt[][], decrypt[][], keya[], keytemp[];
    public void createMatrix(String s, String key, int row, int column) {
        arr = new char[row][column];
        int k = 0;
        keya = key.toCharArray();
        for (int i = 0; i < row; i++) {
            for (int j = 0; j < column; j++) {
                if (k < s.length()) {
                    arr[i][j] = s.charAt(k);
                    k++;
                } else {
                    arr[i][j] = ' ';
                }
            }
        }
    }
    public void createkey(String key, int column) {
        keytemp = key.toCharArray();
        for (int i = 0; i < column - 1; i++) {
            for (int j = i + 1; j < column; j++)
            {
                if (keytemp[i] > keytemp[j]) {
                    char temp = keytemp[i];
                    keytemp[i] = keytemp[j];
                    keytemp[j] = temp;
                }
            }
        }
    }
    public void createMatrixD(String s, String key, int row, int column) {
        arr = new char[row][column];
        int k = 0;
        keya = key.toCharArray();
        for (int i = 0; i < column; i++) {
            for (int j = 0; j < row; j++) {
                if (k < s.length()) {
                    arr[j][i] = s.charAt(k);
                    k++;
                } else {
                    arr[j][i] = ' ';
                }
            }
        }
    }
    public void encrypt(int row, int column) {
        encrypt = new char[row][column];
        for (int i = 0; i < column; i++) {
            for (int j = 0; j < column; j++) {
                if (keya[i] == keytemp[j]) {
                    for (int k = 0; k < row; k++) {
                        encrypt[k][j] = arr[k][i];
                    }
                    keytemp[j] = '?';
                    break;
                }
            }
        }
    }
    public void decrypt(int row, int column) {
        decrypt = new char[row][column];
        for (int i = 0; i < column; i++) {
            for (int j = 0; j < column; j++) {
                if (keya[j] == keytemp[i]) {
                    for (int k = 0; k < row; k++) {
                        decrypt[k][j] = arr[k][i];
                    }
                    keya[j] = '?';
                    break;
                }
            }
```



```
        }
    }
    public void resultE(int row, int column, char arr[][]) {
        System.out.println("Result = ");
        for (int i = 0; i < column; i++) {
            for (int j = 0; j < row; j++) {
                System.out.println(arr[j][i]);
            }
        }
    }
    public void resultD(int row, int column, char arr[][]) {
        System.out.println("Result = ");
        for (int i = 0; i < row; i++) {
            for (int j = 0; j < column; j++) {
                System.out.println(arr[j][i]);
            }
        }
    }
    public static void main(String args[]) throws IOException {
        int row, column, choice;
        columnar obj = new columnar();
        BufferedReader in = new BufferedReader(new InputStreamReader(System.in));
        System.out.println("Menu\n 1 Encryption\n 2 Decryption");
        choice = Integer.parseInt(in.readLine());
        System.out.println("Enter the string  ");
        String s = in.readLine();
        System.out.println("Enter the key ");
        String key = in.readLine();
        row = s.length() / key.length();
        if (s.length() % key.length() != 0)
            row++;
        column = key.length();
        switch (choice) {
            case 1:
                obj.createMatrix(s, key, row, column);
                obj.createkey(key, column);
                obj.encrypt(row, column);
                obj.resultE(row, column, obj.encrypt);
                break;
            case 2:
                obj.createMatrixD(s, key, row, column);
                obj.createkey(key, column);
                obj.decrypt(row, column);
                obj.resultD(row, column, obj.decrypt);
                break;
        }
    }
}
```

output

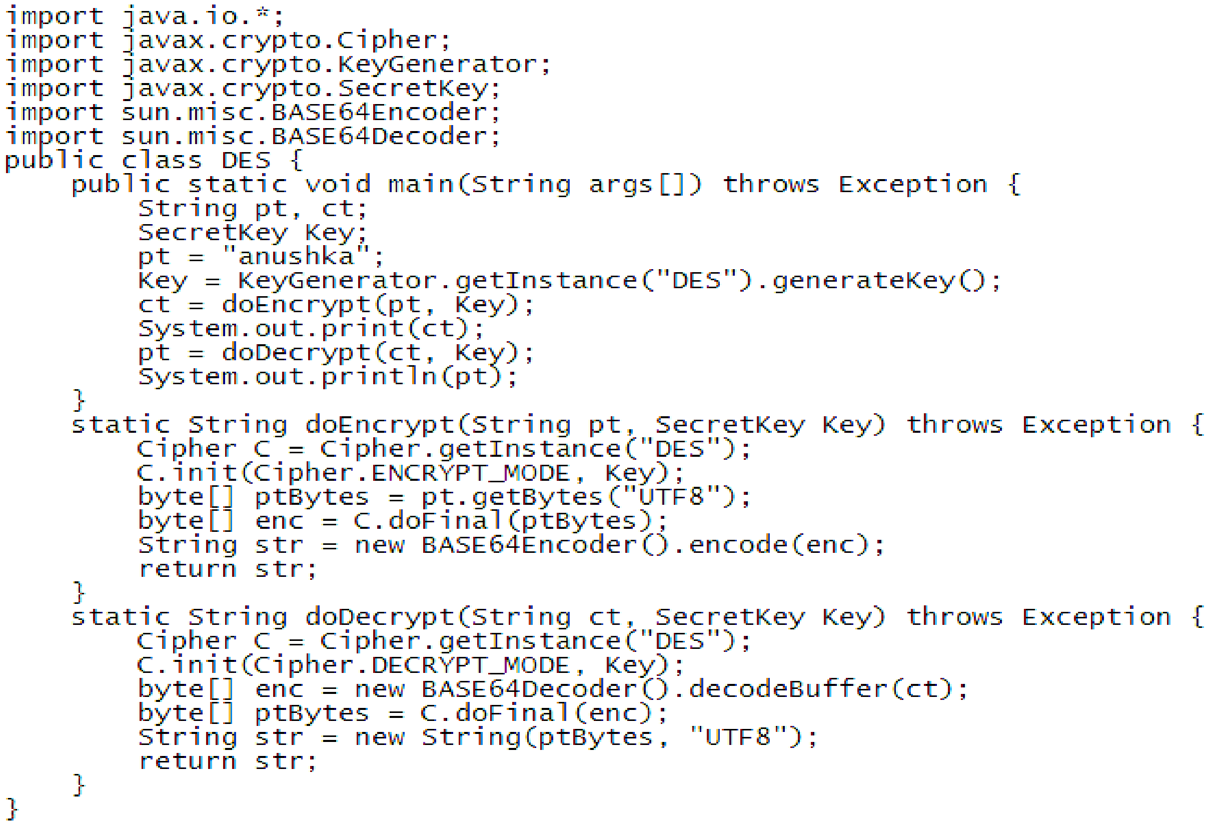


```
Menu
 1 Encryption
 2 Decryption
1
Enter the string
tilak
Enter the key
3
Result =
t
i
l
a
k
```

Practical 4

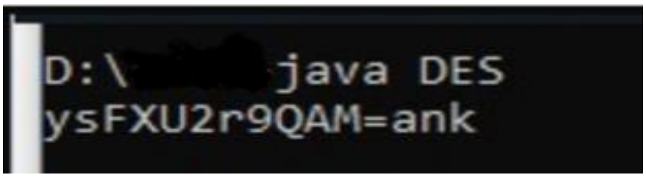
1)DES

input



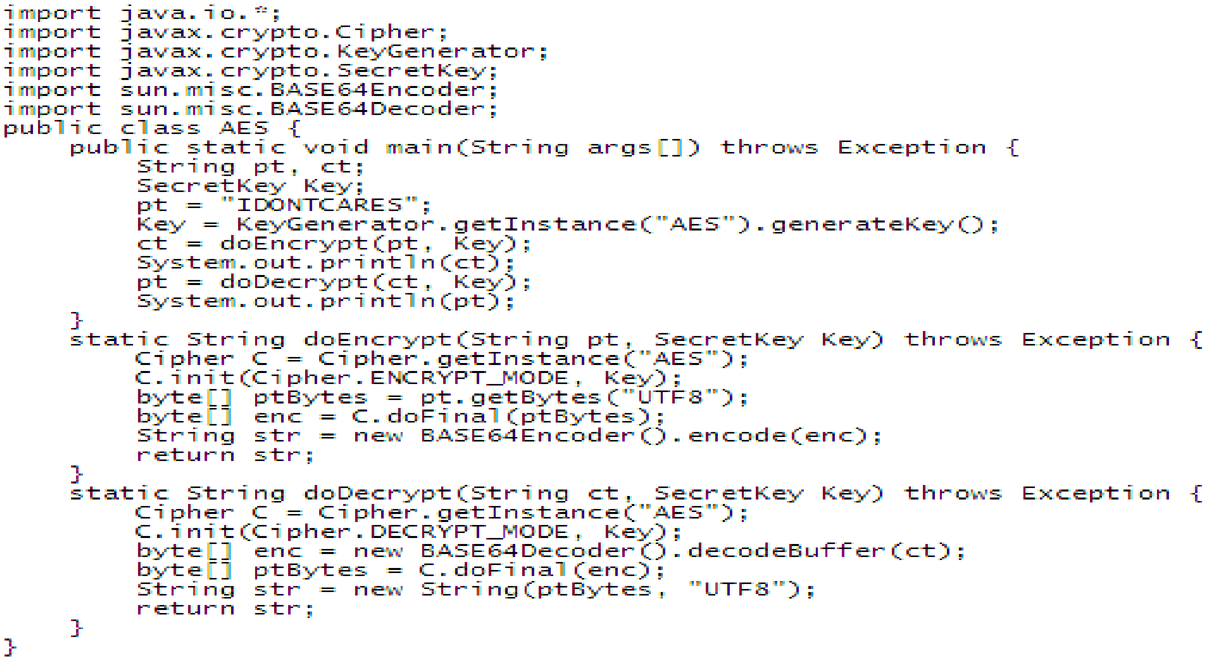
```
import java.io.*;
import javax.crypto.Cipher;
import javax.crypto.KeyGenerator;
import javax.crypto.SecretKey;
import sun.misc.BASE64Encoder;
import sun.misc.BASE64Decoder;
public class DES {
    public static void main(String args[]) throws Exception {
        String pt, ct;
        SecretKey Key;
        pt = "anushka";
        Key = KeyGenerator.getInstance("DES").generateKey();
        ct = doEncrypt(pt, Key);
        System.out.print(ct);
        pt = doDecrypt(ct, Key);
        System.out.println(pt);
    }
    static String doEncrypt(String pt, SecretKey Key) throws Exception {
        Cipher C = Cipher.getInstance("DES");
        C.init(Cipher.ENCRYPT_MODE, Key);
        byte[] ptBytes = pt.getBytes("UTF8");
        byte[] enc = C.doFinal(ptBytes);
        String str = new BASE64Encoder().encode(enc);
        return str;
    }
    static String doDecrypt(String ct, SecretKey Key) throws Exception {
        Cipher C = Cipher.getInstance("DES");
        C.init(Cipher.DECRYPT_MODE, Key);
        byte[] enc = new BASE64Decoder().decodeBuffer(ct);
        byte[] ptBytes = C.doFinal(enc);
        String str = new String(ptBytes, "UTF8");
        return str;
    }
}
```

Output

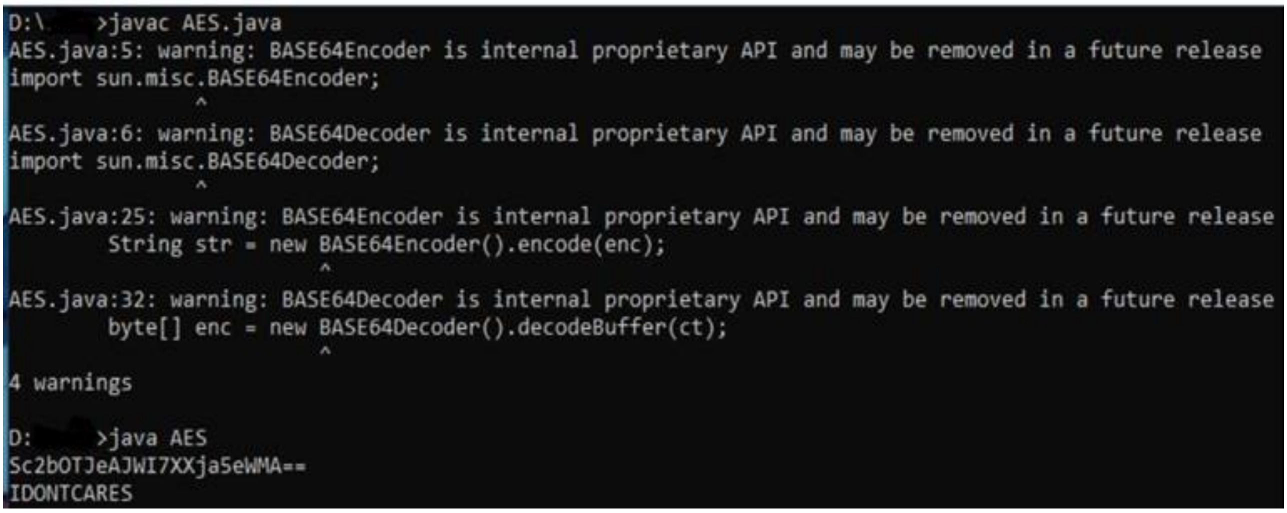


```
D:\[redacted] java DES
ysFXU2r9QAM=ank
```

2)AES



```
import java.io.*;
import javax.crypto.Cipher;
import javax.crypto.KeyGenerator;
import javax.crypto.SecretKey;
import sun.misc.BASE64Encoder;
import sun.misc.BASE64Decoder;
public class AES {
    public static void main(String args[]) throws Exception {
        String pt, ct;
        SecretKey Key;
        pt = "IDONTCARES";
        Key = KeyGenerator.getInstance("AES").generateKey();
        ct = doEncrypt(pt, Key);
        System.out.println(ct);
        pt = doDecrypt(ct, Key);
        System.out.println(pt);
    }
    static String doEncrypt(String pt, SecretKey Key) throws Exception {
        Cipher C = Cipher.getInstance("AES");
        C.init(Cipher.ENCRYPT_MODE, Key);
        byte[] ptBytes = pt.getBytes("UTF8");
        byte[] enc = C.doFinal(ptBytes);
        String str = new BASE64Encoder().encode(enc);
        return str;
    }
    static String doDecrypt(String ct, SecretKey Key) throws Exception {
        Cipher C = Cipher.getInstance("AES");
        C.init(Cipher.DECRYPT_MODE, Key);
        byte[] enc = new BASE64Decoder().decodeBuffer(ct);
        byte[] ptBytes = C.doFinal(enc);
        String str = new String(ptBytes, "UTF8");
        return str;
    }
}
```

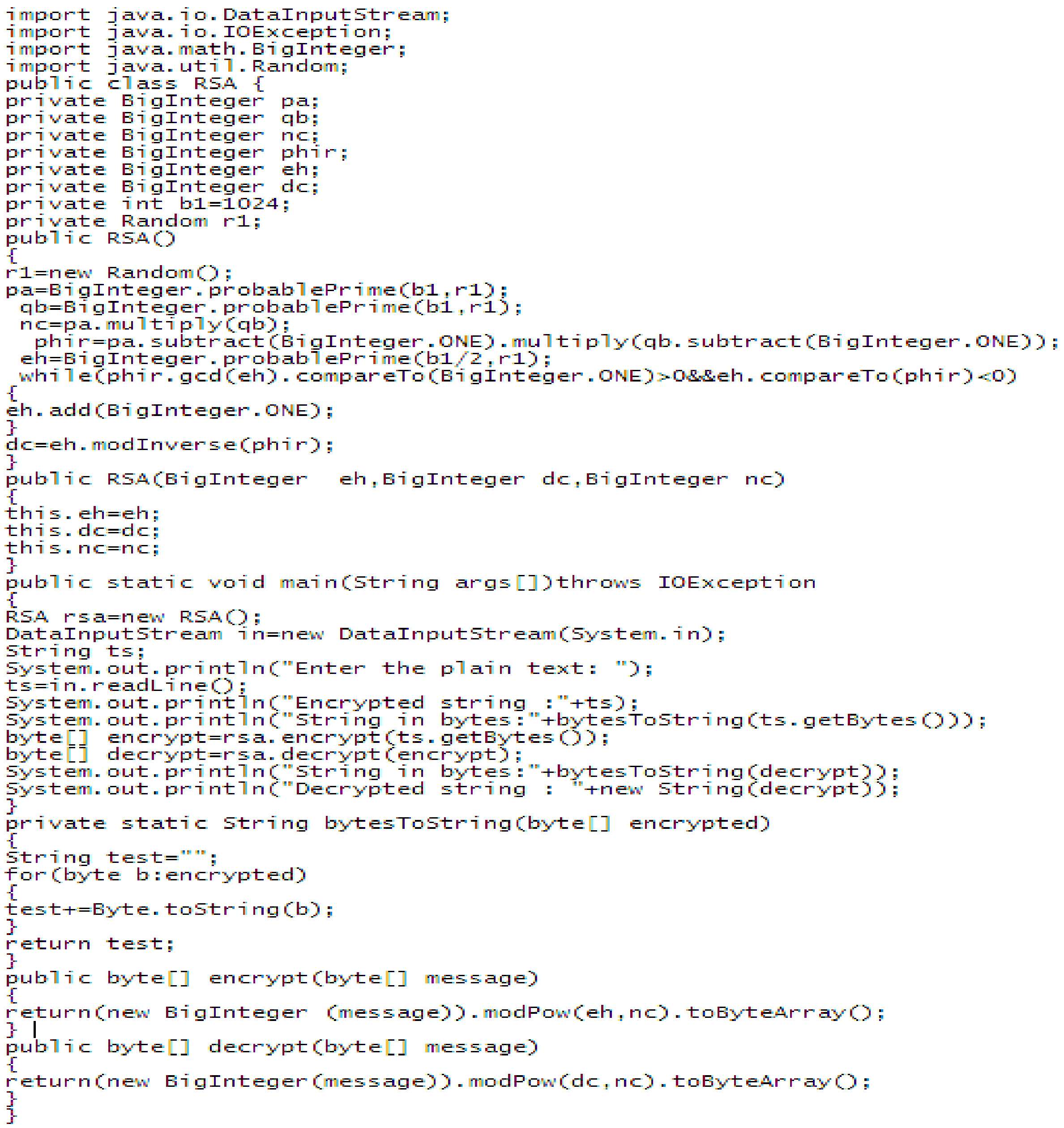


```
D:\[redacted]>javac AES.java
AES.java:5: warning: BASE64Encoder is internal proprietary API and may be removed in a future release
import sun.misc.BASE64Encoder;
               ^
AES.java:6: warning: BASE64Decoder is internal proprietary API and may be removed in a future release
import sun.misc.BASE64Decoder;
               ^
AES.java:25: warning: BASE64Encoder is internal proprietary API and may be removed in a future release
        String str = new BASE64Encoder().encode(enc);
                         ^
AES.java:32: warning: BASE64Decoder is internal proprietary API and may be removed in a future release
        byte[] enc = new BASE64Decoder().decodeBuffer(ct);
                         ^
4 warnings

D:[redacted]>java AES
Sc2bOTJeAJWI7XXja5eWMA==
IDONTCARES
```

Practical 5:

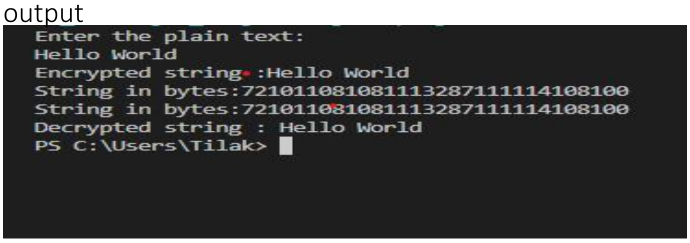
Aim: Write the program to implement RSA algorithm to perform encryption/decryption of a given string.

Input



```
import java.io.DataInputStream;
import java.io.IOException;
import java.math.BigInteger;
import java.util.Random;
public class RSA {
private BigInteger pa;
private BigInteger qb;
private BigInteger nc;
private BigInteger phir;
private BigInteger eh;
private BigInteger dc;
private int b1=1024;
private Random r1;
public RSA()
{
r1=new Random();
pa=BigInteger.probablePrime(b1,r1);
 qb=BigInteger.probablePrime(b1,r1);
 nc=pa.multiply(qb);
  phir=pa.subtract(BigInteger.ONE).multiply(qb.subtract(BigInteger.ONE));
 eh=BigInteger.probablePrime(b1/2,r1);
 while(phir.gcd(eh).compareTo(BigInteger.ONE)>0&&eh.compareTo(phir)<0)
{
eh.add(BigInteger.ONE);
}
dc=eh.modInverse(phir);
}
public RSA(BigInteger  eh,BigInteger dc,BigInteger nc)
{
this.eh=eh;
this.dc=dc;
this.nc=nc;
}
public static void main(String args[])throws IOException
{
RSA rsa=new RSA();
DataInputStream in=new DataInputStream(System.in);
String ts;
System.out.println("Enter the plain text: ");
ts=in.readLine();
System.out.println("Encrypted string :"+ts);
System.out.println("String in bytes:"+bytesToString(ts.getBytes()));
byte[] encrypt=rsa.encrypt(ts.getBytes());
byte[] decrypt=rsa.decrypt(encrypt);
System.out.println("String in bytes:"+bytesToString(decrypt));
System.out.println("Decrypted string : "+new String(decrypt));
}
private static String bytesToString(byte[] encrypted)
{
String test="";
for(byte b:encrypted)
{
test+=Byte.toString(b);
}
return test;
}
public byte[] encrypt(byte[] message)
{
return(new BigInteger (message)).modPow(eh,nc).toByteArray();
}
public byte[] decrypt(byte[] message)
{
return(new BigInteger(message)).modPow(dc,nc).toByteArray();
}
}
```

output

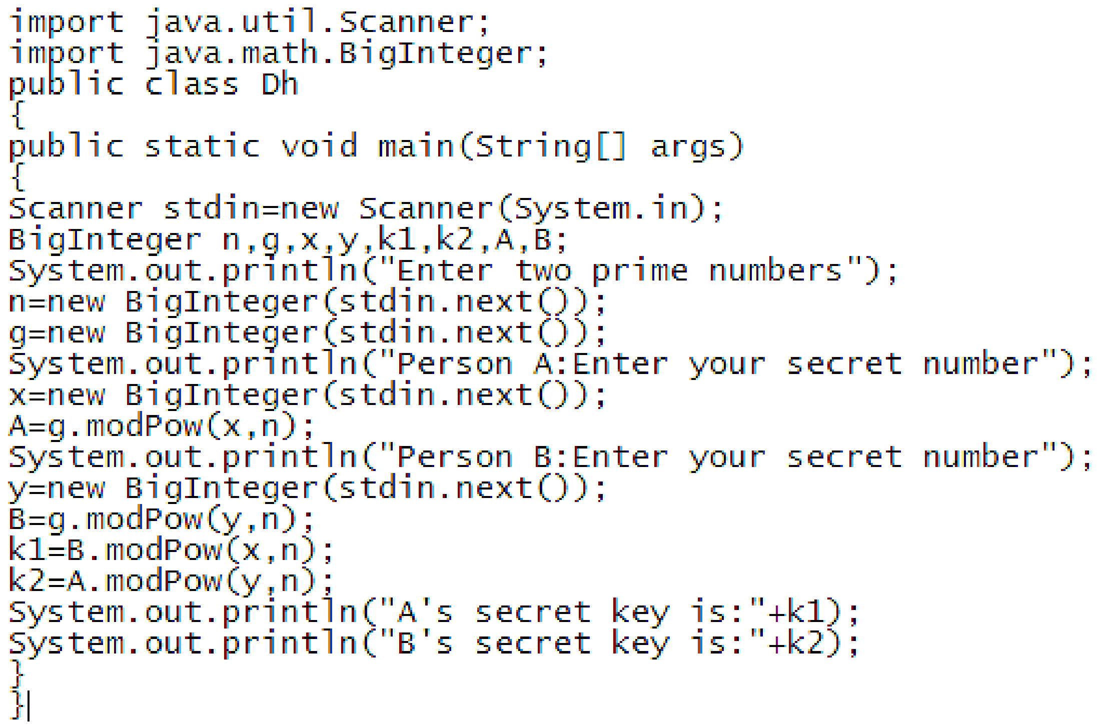


```
Enter the plain text:
Hello World
Encrypted string :Hello World
String in bytes:721011081081113287111114108100
String in bytes:721011081081113287111114108100
Decrypted string : Hello World
PS C:\Users\Tilak> 
```

Practical 6

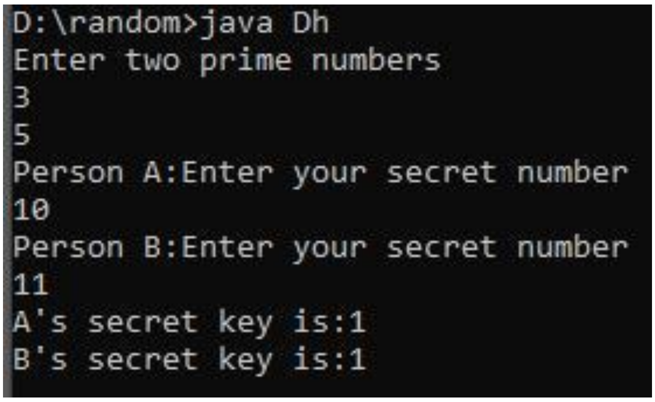
Aim: Write a program to implement the Diffie-Hellman Key agreement algorithm to generate symmetric keys. 1)Diffie-Hellman

Input



```
import java.util.Scanner;
import java.math.BigInteger;
public class Dh
{
public static void main(String[] args)
{
Scanner stdin=new Scanner(System.in);
BigInteger n,g,x,y,k1,k2,A,B;
System.out.println("Enter two prime numbers");
n=new BigInteger(stdin.next());
g=new BigInteger(stdin.next());
System.out.println("Person A:Enter your secret number");
x=new BigInteger(stdin.next());
A=g.modPow(x,n);
System.out.println("Person B:Enter your secret number");
y=new BigInteger(stdin.next());
B=g.modPow(y,n);
k1=B.modPow(x,n);
k2=A.modPow(y,n);
System.out.println("A's secret key is:"+k1);
System.out.println("B's secret key is:"+k2);
}
}
```

Output



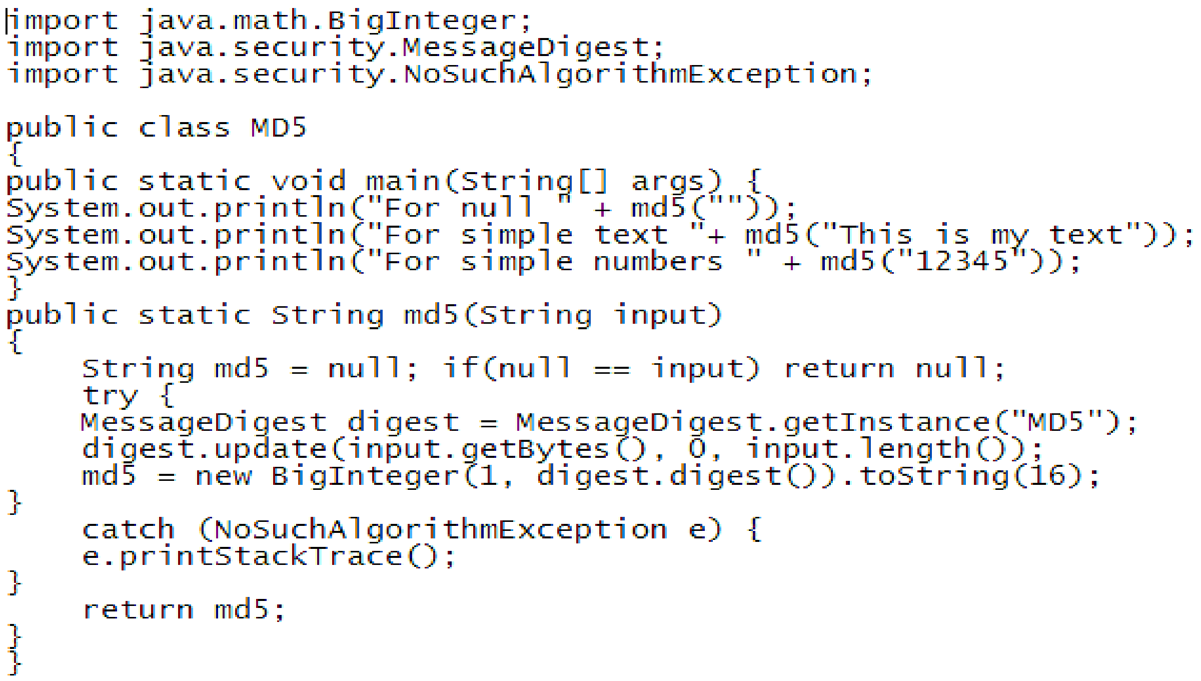
```
D:\random>java Dh
Enter two prime numbers
3
5
Person A:Enter your secret number
10
Person B:Enter your secret number
11
A's secret key is:1
B's secret key is:1
```

Practical 7

Aim: Write a program to implements the MD5 algorithm compute the message

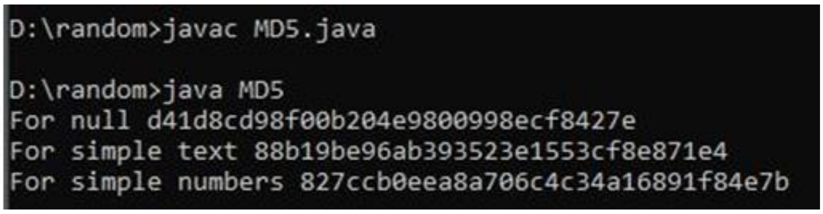
digest.JavaMD5Hash.java

input



```
import java.math.BigInteger;
import java.security.MessageDigest;
import java.security.NoSuchAlgorithmException;

public class MD5
{
public static void main(String[] args) {
System.out.println("For null " + md5(""));
System.out.println("For simple text "+ md5("This is my text"));
System.out.println("For simple numbers " + md5("12345"));
}
public static String md5(String input)
{
    String md5 = null; if(null == input) return null;
    try {
    MessageDigest digest = MessageDigest.getInstance("MD5");
    digest.update(input.getBytes(), 0, input.length());
    md5 = new BigInteger(1, digest.digest()).toString(16);
}
    catch (NoSuchAlgorithmException e) {
    e.printStackTrace();
}
    return md5;
}
}
```

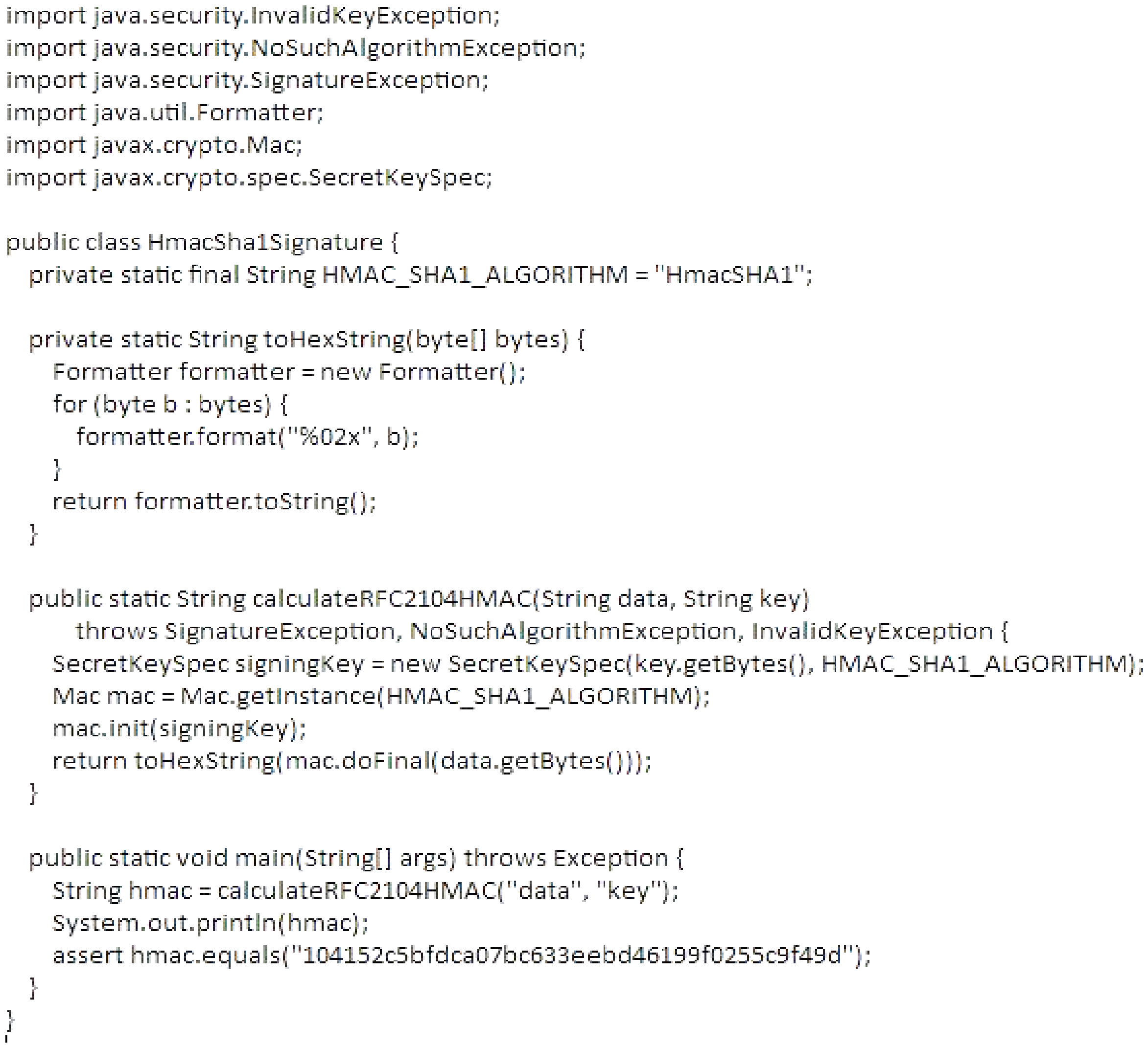
Output



```
D:\random>javac MD5.java

D:\random>java MD5
For null d41d8cd98f00b204e9800998ecf8427e
For simple text 88b19be96ab393523e1553cf8e871e4
For simple numbers 827ccb0eea8a706c4c34a16891f84e7b
```

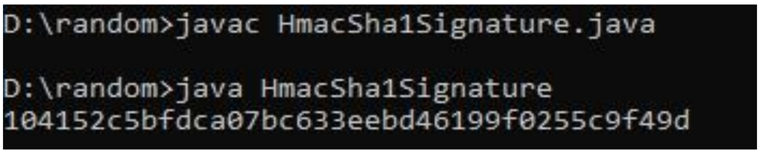
Practical 8:Aim: Write a program to calculate the HMAC-SHA1 signature.HmacSha1Signature.java

input



```
import java.security.InvalidKeyException;
import java.security.NoSuchAlgorithmException;
import java.security.SignatureException;
import java.util.Formatter;
import javax.crypto.Mac;
import javax.crypto.spec.SecretKeySpec;

public class HmacSha1Signature {
  private static final String HMAC_SHA1_ALGORITHM = "HmacSHA1";

  private static String toHexString(byte[] bytes) {
    Formatter formatter = new Formatter();
    for (byte b : bytes) {
      formatter.format("%02x", b);
    }
    return formatter.toString();
  }

  public static String calculateRFC2104HMAC(String data, String key)
      throws SignatureException, NoSuchAlgorithmException, InvalidKeyException {
    SecretKeySpec signingKey = new SecretKeySpec(key.getBytes(), HMAC_SHA1_ALGORITHM);
    Mac mac = Mac.getInstance(HMAC_SHA1_ALGORITHM);
    mac.init(signingKey);
    return toHexString(mac.doFinal(data.getBytes()));
  }

  public static void main(String[] args) throws Exception {
    String hmac = calculateRFC2104HMAC("data", "key");
    System.out.println(hmac);
    assert hmac.equals("104152c5bfdca07bc633eebd46199f0255c9f49d");
  }
}
```

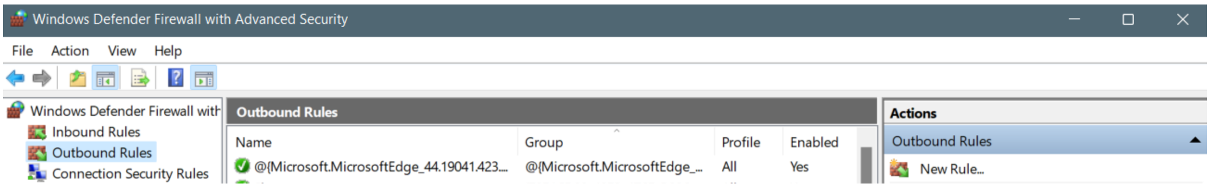
Output



```
D:\random>javac HmacSha1Signature.java

D:\random>java HmacSha1Signature
104152c5bfdca07bc633eebd46199f0255c9f49d
```

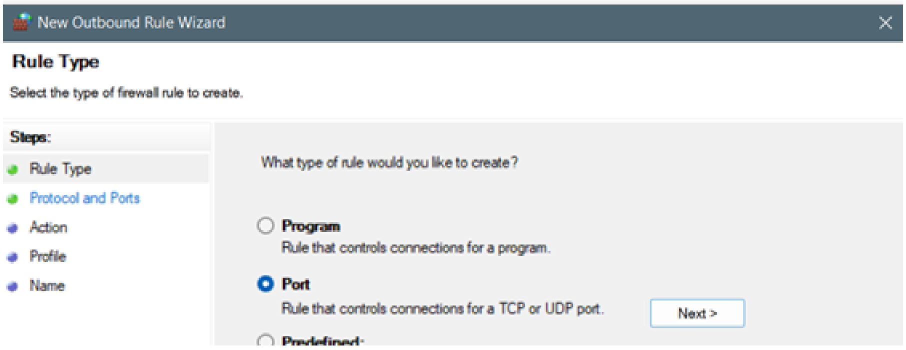
Practical 9: Configure windows firewall to block port/program/website

Port –1) open firewall select outbound rule then create new rule



Windows Defender Firewall with Advanced Security
File Action View Help
Windows Defender Firewall with
Inbound Rules
Outbound Rules
Connection Security Rules
Outbound Rules
Name
Group
Profile
Enabled
@{Microsoft.MicrosoftEdge_44.19041.423...
@{Microsoft.MicrosoftEdge_...
All
Yes
Actions
Outbound Rules
New Rule...

2)Select port then click next



New Outbound Rule Wizard

Rule Type

Select the type of firewall rule to create.

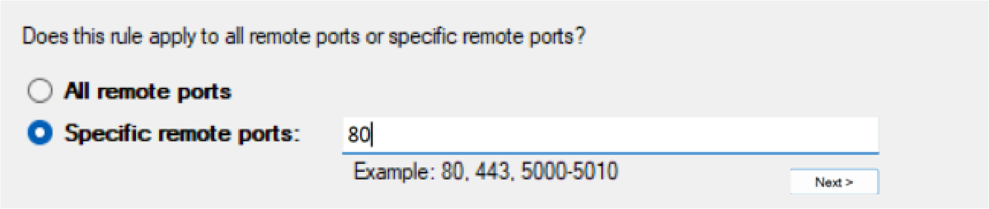
What type of rule would you like to create?

○ **Program**
Rule that controls connections for a program.

● **Port**
Rule that controls connections for a TCP or UDP port.

○ **Predefined:**

3)Choose specific remote port and type 80 then press next



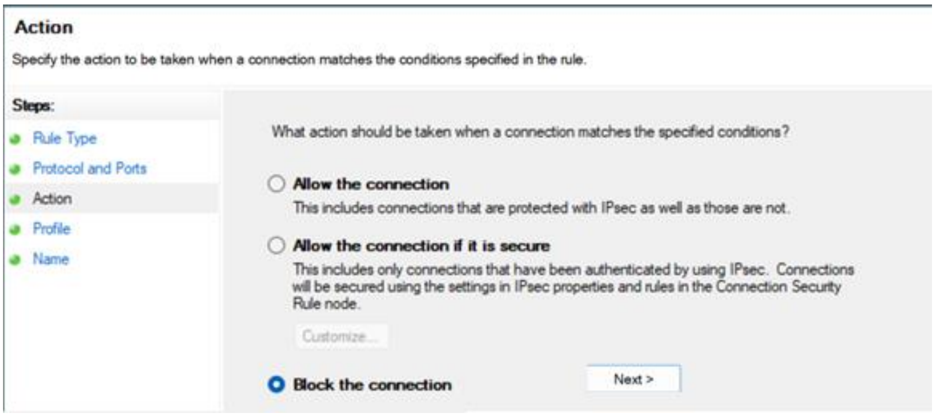
Does this rule apply to all remote ports or specific remote ports?

○ **All remote ports**

● **Specific remote ports:** 80

Example: 80, 443, 5000-5010

4)Choose block connection and next



Action

Specify the action to be taken when a connection matches the conditions specified in the rule.

What action should be taken when a connection matches the specified conditions?

○ **Allow the connection**

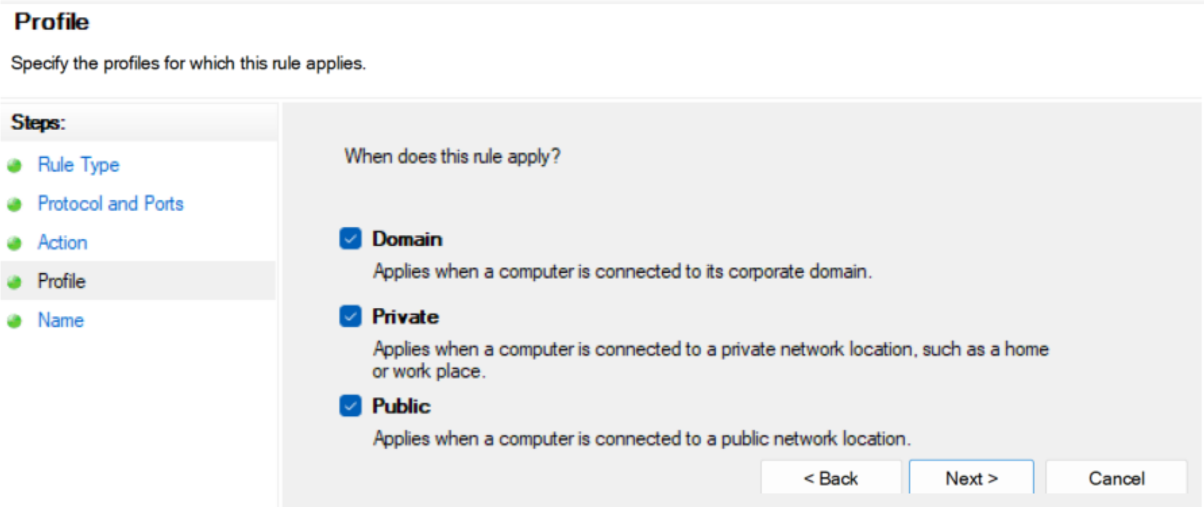
This includes connections that are protected with IPsec as well as those are not.

○ **Allow the connection if it is secure**

This includes only connections that have been authenticated by using IPsec. Connections will be secured using the settings in IPsec properties and rules in the Connection Security Rule node.

● **Block the connection**

5)Press next



Profile

Specify the profiles for which this rule applies.

When does this rule apply?

☑ **Domain**

Applies when a computer is connected to its corporate domain.

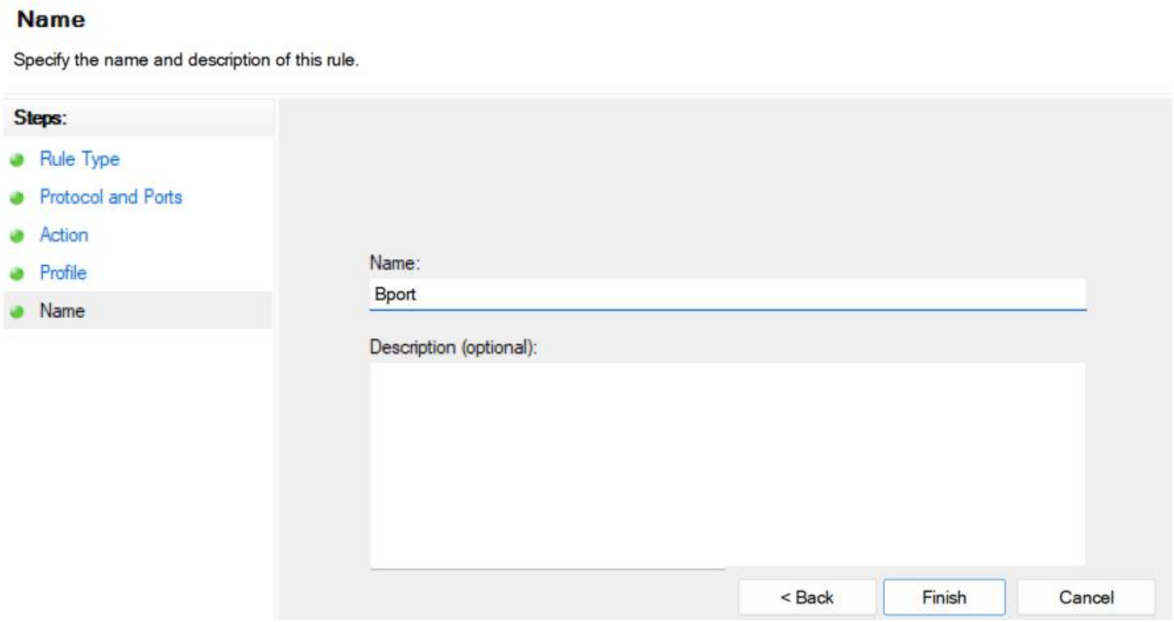
☑ **Private**

Applies when a computer is connected to a private network location, such as a home or work place.

☑ **Public**

Applies when a computer is connected to a public network location.

6)Name it and click finish



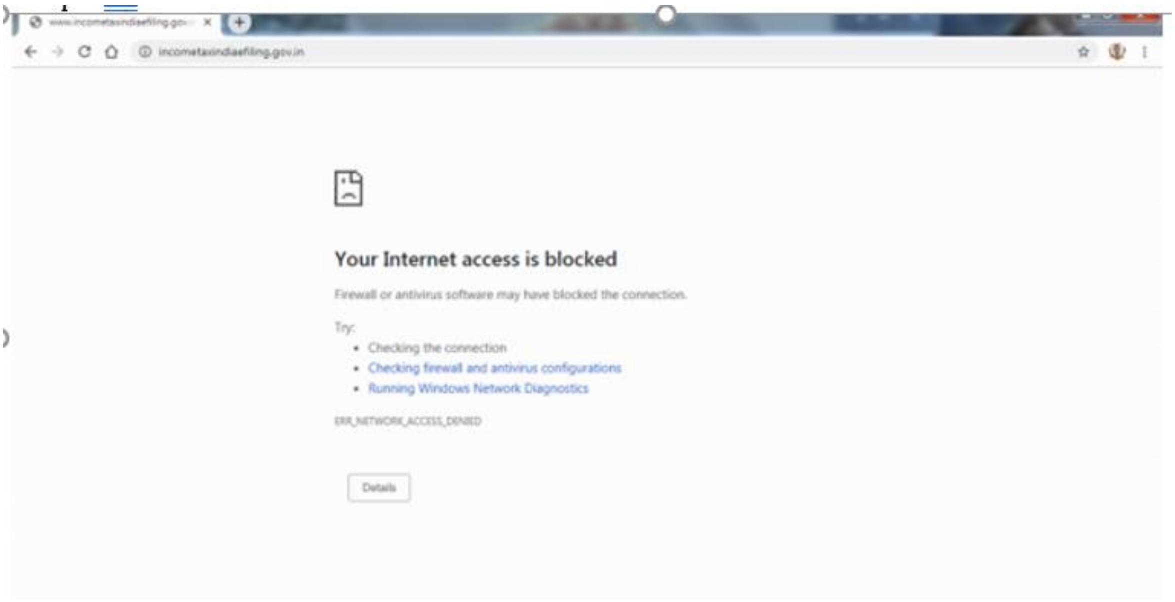
Name

Specify the name and description of this rule.

Name:
Bport

Description (optional):

Then rule will be automatically enabled then try to visit and it will the output



Your Internet access is blocked

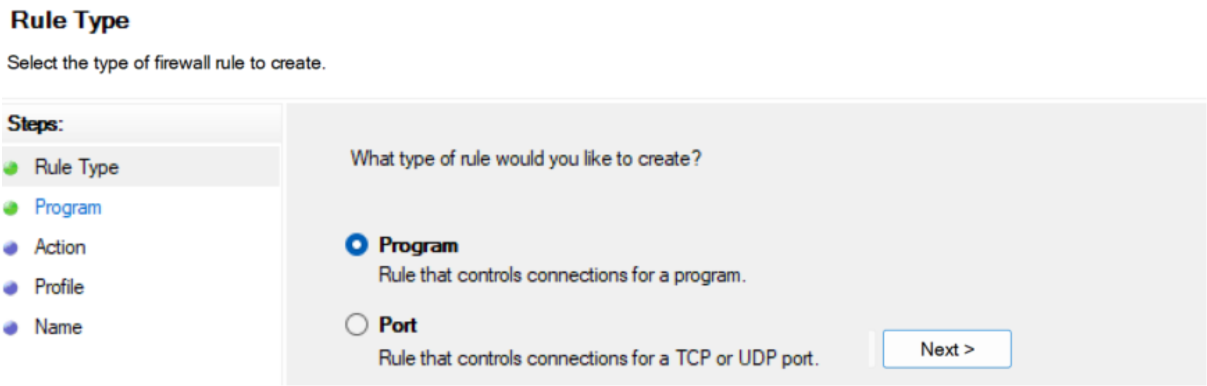
Firewall or antivirus software may have blocked the connection.

Try:

- Checking the connection
- Checking firewall and antivirus configurations
- Running Windows Network Diagnostics

ERR_NETWORK_ACCESS_DENIED

Program-create a new rule and choose program press next



Rule Type

Select the type of firewall rule to create.

Steps:

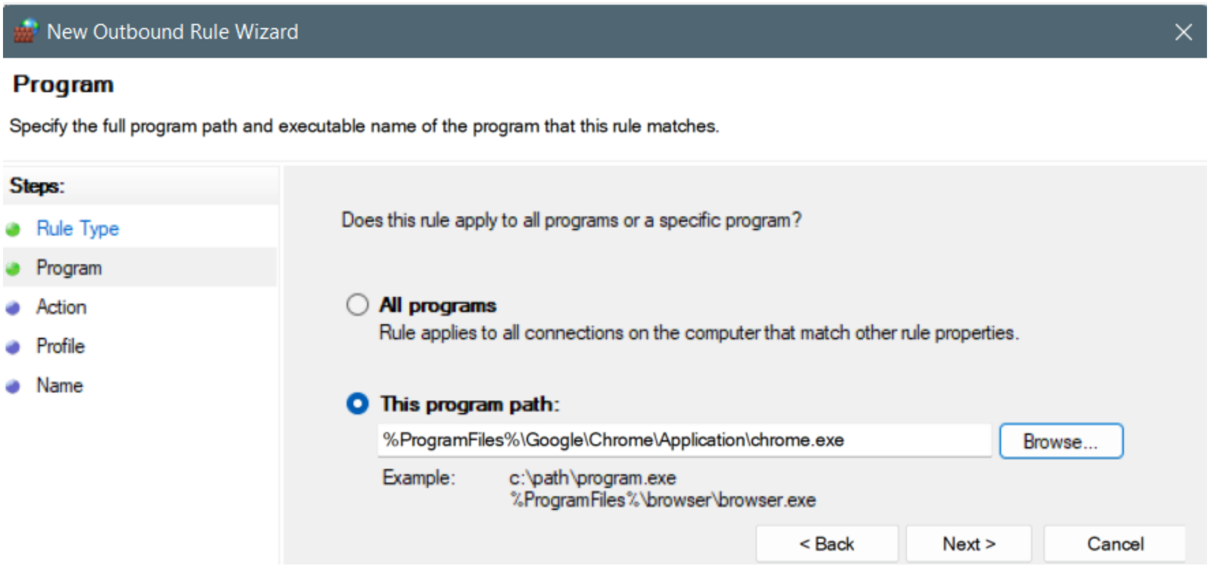
- Rule Type
- Program
- Action
- Profile
- Name

What type of rule would you like to create?

● **Program**
Rule that controls connections for a program.

○ **Port**
Rule that controls connections for a TCP or UDP port.

Select the program which u want press on browse once done click next other step same as 4,5,6



New Outbound Rule Wizard

Program

Specify the full program path and executable name of the program that this rule matches.

Steps:

- Rule Type
- Program
- Action
- Profile
- Name

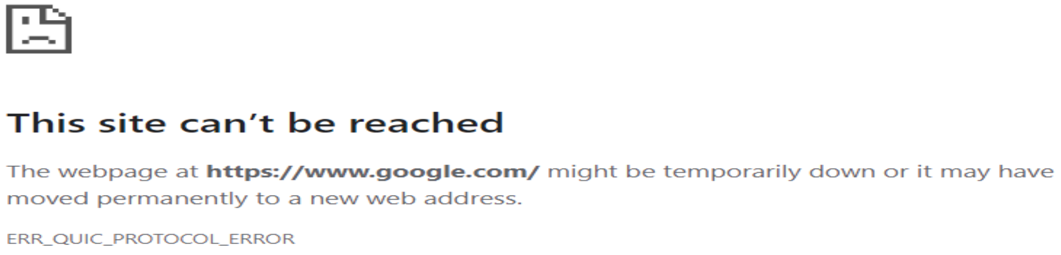
Does this rule apply to all programs or a specific program?

○ **All programs**
Rule applies to all connections on the computer that match other rule properties.

● **This program path:**
%ProgramFiles%\Google\Chrome\Application\chrome.exe

Example: c:\path\program.exe
%ProgramFiles%\browser\browser.exe

Output

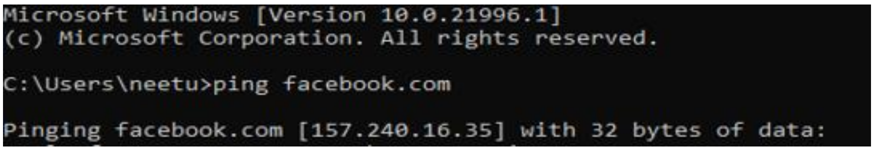


This site can’t be reached

The webpage at **https://www.google.com/** might be temporarily down or it may have moved permanently to a new web address.

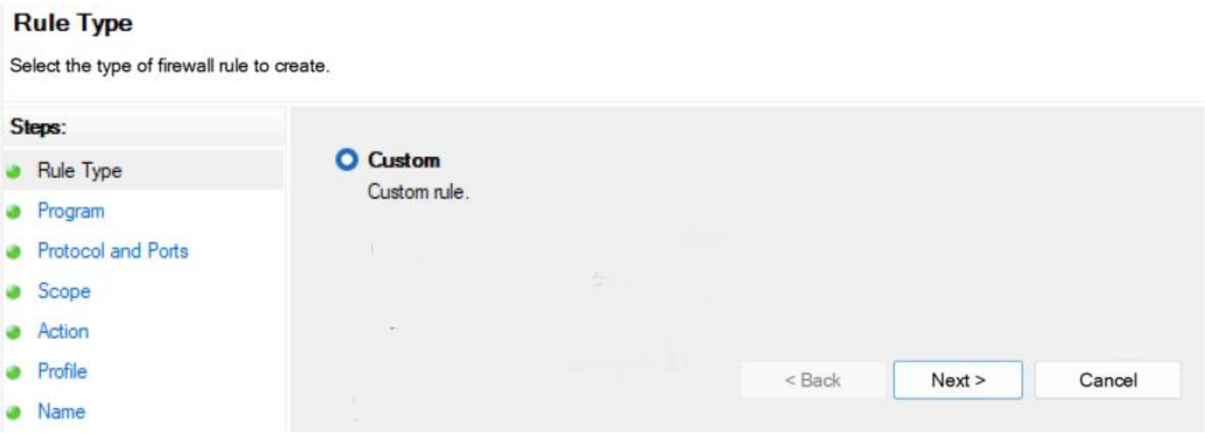
ERR_QUIC_PROTOCOL_ERROR

Website- Find the IP address of any Website in cmd using ping command



```
Microsoft Windows [Version 10.0.21996.1]
(c) Microsoft Corporation. All rights reserved.

C:\Users\neetu>ping facebook.com

Pinging facebook.com [157.240.16.35] with 32 bytes of data:
```

Select custom rule when creating new rule



Rule Type

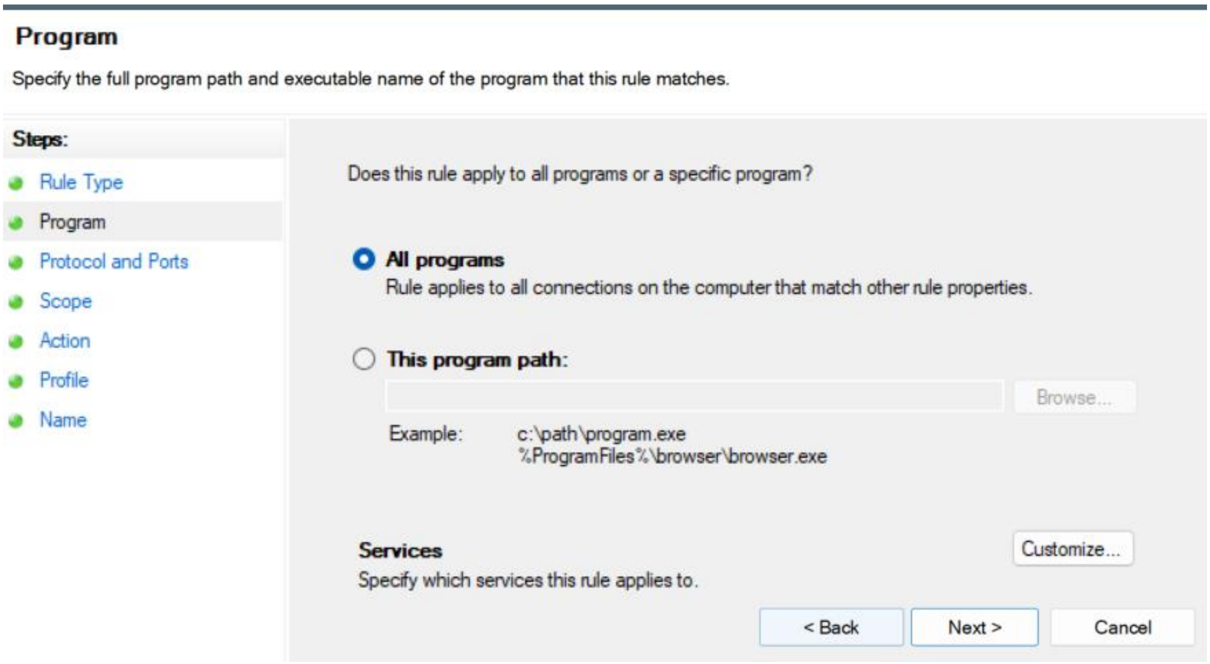
Select the type of firewall rule to create.

Steps:

- Rule Type
- Program
- Protocol and Ports
- Scope
- Action
- Profile
- Name

● **Custom**
Custom rule.

Press next



Program

Specify the full program path and executable name of the program that this rule matches.

Steps:

- Rule Type
- Program
- Protocol and Ports
- Scope
- Action
- Profile
- Name

Does this rule apply to all programs or a specific program?

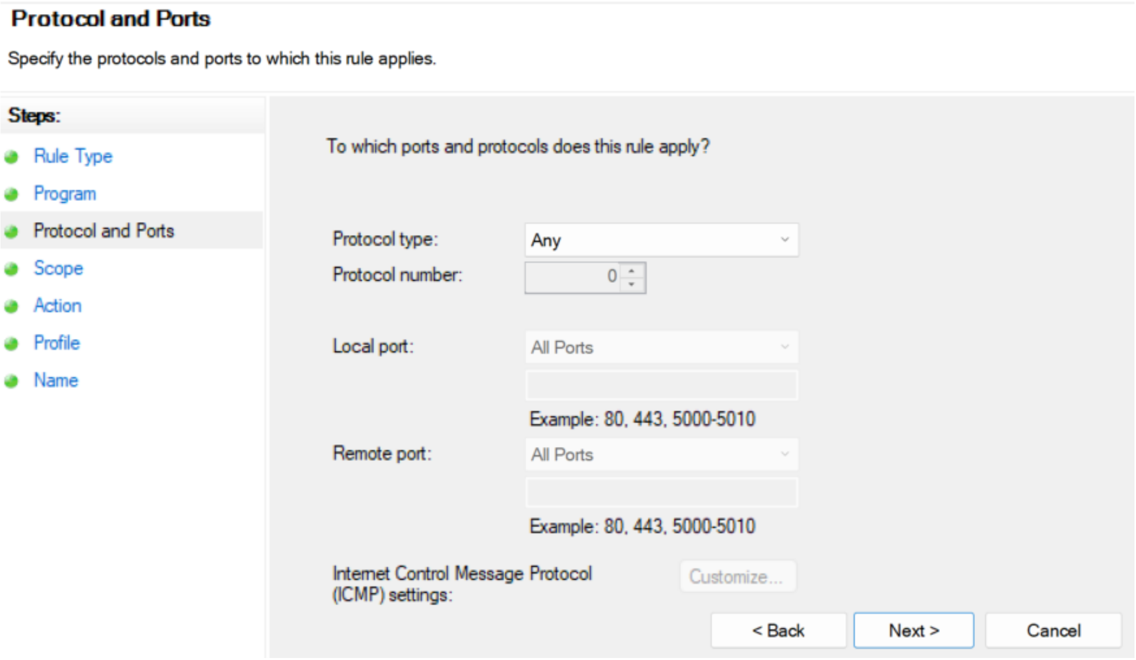
● **All programs**
Rule applies to all connections on the computer that match other rule properties.

○ **This program path:**

Example: c:\path\program.exe
%ProgramFiles%\browser\browser.exe

Services
Specify which services this rule applies to.

Next…



Protocol and Ports

Specify the protocols and ports to which this rule applies.

Steps:

- Rule Type
- Program
- Protocol and Ports
- Scope
- Action
- Profile
- Name

To which ports and protocols does this rule apply?

Protocol type: Any

Protocol number: 0

Local port: All Ports

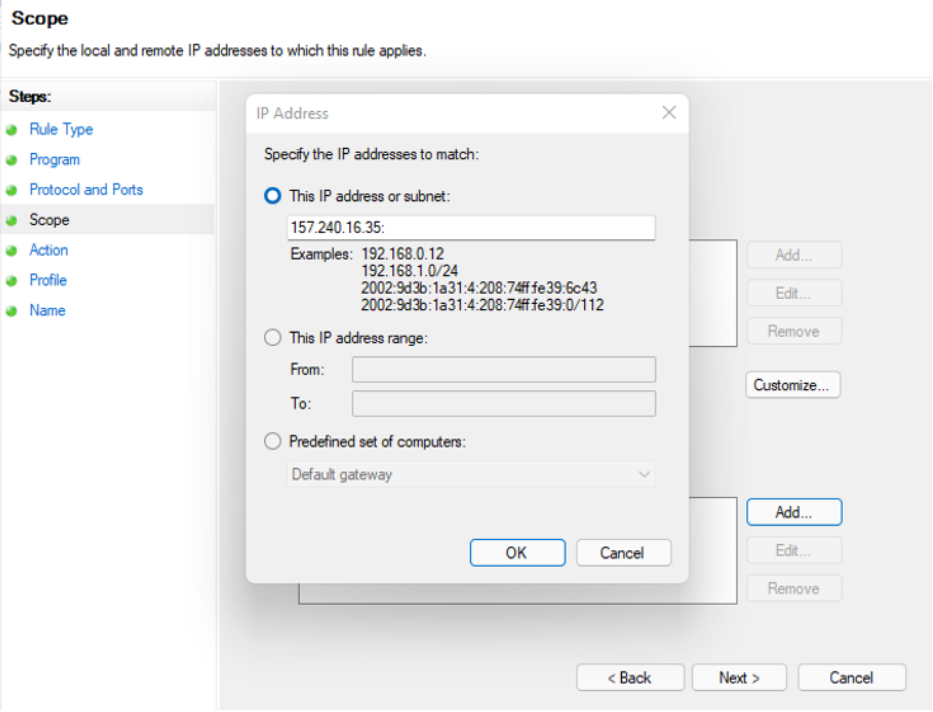
Example: 80, 443, 5000-5010

Remote port: All Ports

Example: 80, 443, 5000-5010

Internet Control Message Protocol (ICMP) settings:

Click on Next and Choose the These IP Address and add the IP Address which we want to Block and click on Ok.



Scope

Specify the local and remote IP addresses to which this rule applies.

Steps:

- Rule Type
- Program
- Protocol and Ports
- Scope
- Action
- Profile
- Name

IP Address

Specify the IP addresses to match:

● This IP address or subnet:

157.240.16.35:

Examples: 192.168.0.12
192.168.1.0/24
2002:9d3b:1a31:4:208:74ff:fe39:6c43
2002:9d3b:1a31:4:208:74ff:fe39:0/112

○ This IP address range:

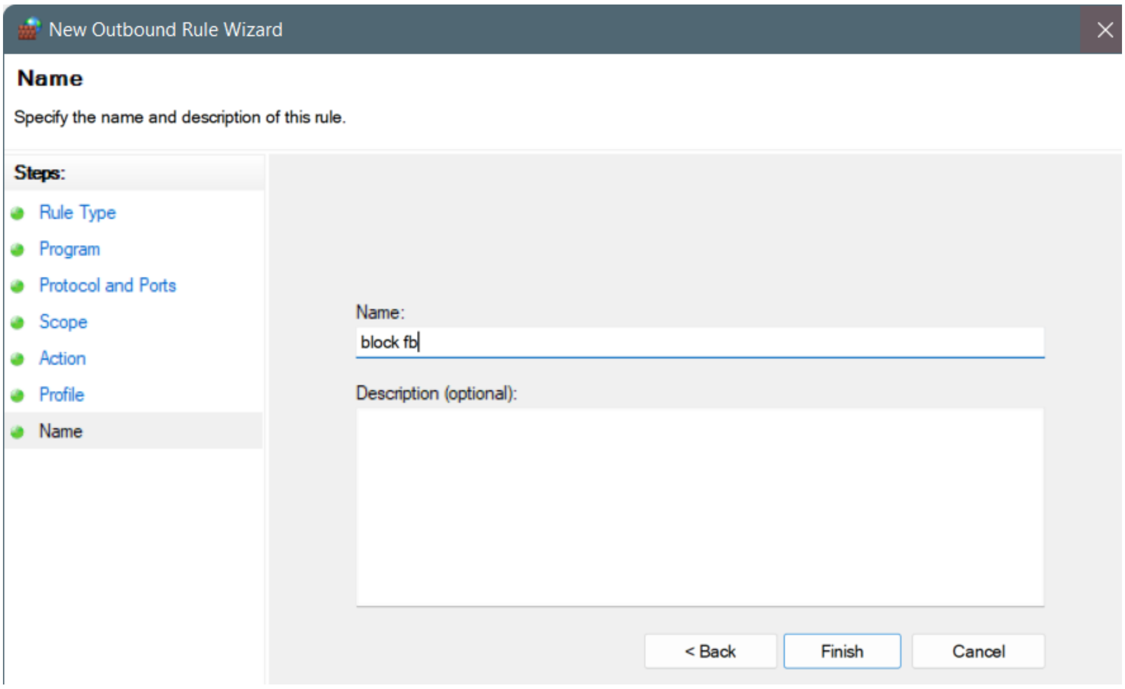
From:

To:

○ Predefined set of computers:

Default gateway

name it and finish


New Outbound Rule Wizard

Name

Specify the name and description of this rule.

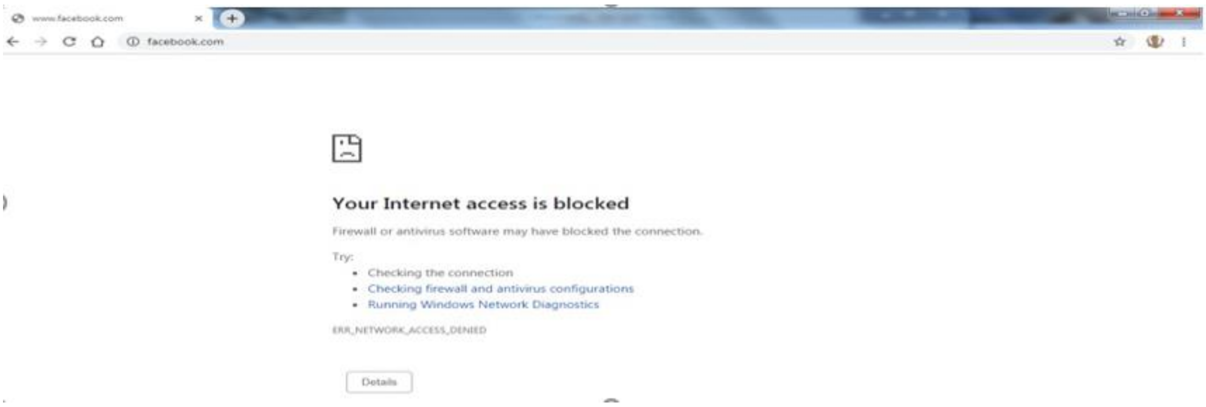
Steps:

- Rule Type
- Program
- Protocol and Ports
- Scope
- Action
- Profile
- Name

Name: block fb

Description (optional):

And the output will be



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- Checking firewall and antivirus configurations
- Running Windows Network Diagnostics

ERR_NETWORK_ACCESS_DENIED