PROGRAM:1(a)

CaesarCipher.java

```
class caesarCipher {
public static String encode(String enc, int offset) {
offset = offset % 26 + 26;
StringBuilder encoded = new StringBuilder();
for (char i : enc.toCharArray()) {
if (Character.isLetter(i)) {
if (Character.isUpperCase(i)) {
encoded.append((char) ('A' + (i - 'A' + offset) % 26));
} else {
encoded.append((char) ('a' + (i - 'a' + offset) % 26));
}
} else {
encoded.append(i);
}
}
return encoded.toString();
}
public static String decode(String enc, int offset) {
return encode(enc, 26 - offset);
}
public static void main(String[] args) throws java.lang.Exception {
String msg = "Anna University";
System.out.println("Simulating Caesar Cipher\n---------------------- ");
```

```
System.out.println("Input : " + msg);
System.out.printf("Encrypted Message : ");
System.out.println(caesarCipher.encode(msg, 3));
System.out.printf("Decrypted Message : ");
System.out.println(caesarCipher.decode(caesarCipher.encode(msg, 3), 3));
}
}
```

OUTPUT:

```
Simulating Caesar Cipher
------------------------
Input : Anna University
Encrypted Message : Dqqd Xqlyhuvlwb
Decrypted Message : Anna University
```

PROGRAM: 1(b)

playfairCipher.java

```
import java.awt.Point;
class playfairCipher {
private static char[][] charTable;
private static Point[] positions;
private static String prepareText(String s, boolean chgJtoI) {
s = s.toUpperCase().replaceAll("[^A-Z]", "");
return chgJtoI ? s.replace("J", "I") : s.replace("Q", "");
}
private static void createTbl(String key, boolean chgJtoI) {
charTable = new char[5][5];
positions = new Point[26];
String s = prepareText(key + "ABCDEFGHIJKLMNOPQRSTUVWXYZ",
chgJtoI);
int len = s.length();
for (int i = 0, k = 0; i < len; i++) {
char c = s.charAt(i);
if (positions[c - 'A'] == null) {
charTable[k / 5][k % 5] = c;
positions[c - 'A'] = new Point(k % 5, k / 5);
k++;
}
}
}
```

```
private static String codec(StringBuilder txt, int dir) {
int len = txt.length();
for (int i = 0; i < len; i += 2) {
char a = txt.charAt(i);
char b = txt.charAt(i + 1);
int row1 = positions[a - 'A'].y;
int row2 = positions[b - 'A'].y;
int col1 = positions[a - 'A'].x;
int col2 = positions[b - 'A'].x;
if (row1 == row2) {
col1 = (col1 + dir) % 5;
col2 = (col2 + dir) % 5;
} else if (col1 == col2) {
row1 = (row1 + dir) % 5;
row2 = (row2 + dir) % 5;
} else {
int tmp = col1;
col1 = col2;
col2 = tmp;
}
txt.setCharAt(i, charTable[row1][col1]);
txt.setCharAt(i + 1, charTable[row2][col2]);
}
return txt.toString();
}
private static String encode(String s) {
```

```
StringBuilder sb = new StringBuilder(s);
for (int i = 0; i < sb.length(); i += 2) {
if (i == sb.length() - 1) {
sb.append(sb.length() % 2 == 1 ? 'X' : "");
} else if (sb.charAt(i) == sb.charAt(i + 1)) {
sb.insert(i + 1, 'X');
}
}
return codec(sb, 1);
}
private static String decode(String s) {
return codec(new StringBuilder(s), 4);
}
public static void main(String[] args) throws java.lang.Exception {
String key = "CSE";
String txt = "Security Lab"; /* make sure string length is even */ /* change J
to I */
boolean chgJtoI = true;
createTbl(key, chgJtoI);
String enc = encode(prepareText(txt, chgJtoI));
System.out.println("Simulating Playfair Cipher\n ---------- ");
System.out.println("Input Message : " + txt);
System.out.println("Encrypted Message : " + enc);
System.out.println("Decrypted Message : " + decode(enc));
}
}
```

OUTPUT:

Simulating Playfair Cipher

Input Message : Security Lab

Encrypted Message : EABPUGYANSEZ

Decrypted Message : SECURITYLABX

PROGRAM: 1(c)

HillCipher.java

```
class hillCipher {
/* 3x3 key matrix for 3 characters at once */
public static int[][] keymat = new int[][] { { 1, 2, 1 }, { 2, 3, 2 },
{ 2, 2, 1 } }; /* key inverse matrix */
public static int[][] invkeymat = new int[][] { { -1, 0, 1 }, { 2, -1, 0 }, { -2, 2, -1
} };
public static String key = "ABCDEFGHIJKLMNOPQRSTUVWXYZ";
private static String encode(char a, char b, char c) {
String ret = "";
int x, y, z;
int posa = (int) a - 65;
int posb = (int) b - 65;
int posc = (int) c - 65;
x = posa * keymat[0][0] + posb * keymat[1][0] + posc * keymat[2][0];
y = posa * keymat[0][1] + posb * keymat[1][1] + posc * keymat[2][1];
z = posa * keymat[0][2] + posb * keymat[1][2] + posc * keymat[2][2];
a = key.charAt(x % 26);
b = key.charAt(y % 26);
c = key.charAt(z % 26);
ret = "" + a + b + c;
return ret;}
private static String decode(char a, char b, char c) {
String ret = "";
```

```
int x, y, z;
int posa = (int) a - 65;
int posb = (int) b - 65;
int posc = (int) c - 65;
x = posa * invkeymat[0][0] + posb * invkeymat[1][0] + posc *
invkeymat[2][0];
y = posa * invkeymat[0][1] + posb * invkeymat[1][1] + posc *
invkeymat[2][1];
z = posa * invkeymat[0][2] + posb * invkeymat[1][2] + posc *
invkeymat[2][2];
a = key.charAt((x % 26 < 0) ? (26 + x % 26) : (x % 26));
b = key.charAt((y % 26 < 0) ? (26 + y % 26) : (y % 26));
c = key.charAt((z % 26 < 0) ? (26 + z % 26) : (z % 26));
ret = "" + a + b + c;
return ret;
}
public static void main(String[] args) throws java.lang.Exception {
String msg;
String enc = "";
String dec = "";
int n;
msg = ("SecurityLaboratory");
System.out.println("simulation of Hill Cipher\n ---------------------- ");
System.out.println("Input message : " + msg);
msg = msg.toUpperCase();
msg = msg.replaceAll("\\s", "");
```

```
/* remove spaces */ n = msg.length() % 3;
/* append padding text X */ if (n != 0) {
for (int i = 1; i <= (3 - n); i++) {
msg += 'X';
}}
System.out.println("padded message : " + msg);
char[] pdchars = msg.toCharArray();
for (int i = 0; i < msg.length(); i += 3) {
enc += encode(pdchars[i], pdchars[i + 1], pdchars[i + 2]);
}
System.out.println("encoded message : " + enc);
char[] dechars = enc.toCharArray();
for (int i = 0; i < enc.length(); i += 3) {
dec += decode(dechars[i], dechars[i + 1], dechars[i + 2]);
}
System.out.println("decoded message : " + dec);
}
}
```

OUTPUT:

```
Simulating Hill Cipher
------------------------------
Input Message : SecurityLaboratory
Padded Message : SECURITYLABORATORY
Encrypted Message : EACSDKLCAEFQDUKSXU
Decrypted Message : SECURITYLABORATORY
```

PROGRAM:1(d)

vigenereCipher.java

```
public class vigenereCipher {
static String encode(String text, final String key) {
String res = "";
text = text.toUpperCase();
for (int i = 0, j = 0; i < text.length(); i++) {
char c = text.charAt(i);
if (c < 'A' || c > 'Z') {
continue;
}
res += (char) ((c + key.charAt(j) - 2 * 'A') % 26 + 'A');
j = ++j % key.length();
}
return res;
}
static String decode(String text, final String key) {
String res = "";
text = text.toUpperCase();
for (int i = 0, j = 0; i < text.length(); i++) {
char c = text.charAt(i);
if (c < 'A' || c > 'Z') {
continue;
}
res += (char) ((c - key.charAt(j) + 26) % 26 + 'A');
```

```
j = ++j % key.length();
}
return res;
}
public static void main(String[] args) throws java.lang.Exception {
String key = "VIGENERECIPHER";
String msg = "SecurityLaboratory";
System.out.println("Simulating Vigenere Cipher\n---------------------- ");
System.out.println("Input Message : " + msg);
String enc = encode(msg, key);
System.out.println("Encrypted Message : " + enc);
System.out.println("Decrypted Message : " + decode(enc, key));
}
}
```

OUTPUT:

```
Simulating Vigenere Cipher
----------------------
Input Message : SecurityLaboratory
Encrypted Message : NMIYEMKCNIQVVROWXC
Decrypted Message : SECURITYLABORATORY
```

PROGRAM: 2(a)

railFenceCipher.java

```
class railfenceCipherHelper {
int depth;
String encode(String msg, int depth) throws Exception {
int r = depth;
int l = msg.length();
int c = l / depth;
int k = 0;
char mat[][] = new char[r][c];
String enc = "";
for (int i = 0; i < c; i++) {
for (int j = 0; j < r; j++) {
if (k != l) {
mat[j][i] = msg.charAt(k++);
} else {
mat[j][i] = 'X';
}
}
}
for (int i = 0; i < r; i++) {
for (int j = 0; j < c; j++) {
enc += mat[i][j];
}
}
```

```
return enc;
}
String decode(String encmsg, int depth) throws Exception {
int r = depth;
int l = encmsg.length();
int c = l / depth;
int k = 0;
char mat[][] = new char[r][c];
String dec = "";
for (int i = 0; i < r; i++) {
for (int j = 0; j < c; j++) {
mat[i][j] = encmsg.charAt(k++);
}
}
for (int i = 0; i < c; i++) {
for (int j = 0; j < r; j++) {
dec += mat[j][i];
}
}
return dec;
}
}
class railFenceCipher {
public static void main(String[] args) throws java.lang.Exception {
railfenceCipherHelper rf = new railfenceCipherHelper();
String msg, enc, dec;
```

```
msg = "Anna University, Chennai";
int depth = 2;
enc = rf.encode(msg, depth);
dec = rf.decode(enc, depth);
System.out.println("Simulating Railfence Cipher\n ------------------------");
System.out.println("Input Message : " + msg);
System.out.println("Encrypted Message : " + enc);
System.out.printf("Decrypted Message : " + dec);
}
}
```

OUTPUT:

```
Simulating Railfence Cipher
---------------------------------------
Input Message : Anna University, Chennai
Encrypted Message : An nvriy hnanaUiest,Ceni
Decrypted Message : Anna University, Chennai
```

PROGRAM: 2(b)

TransCipher.java

```
import java.util.*;
class TransCipher {
public static void main(String args[]) {
Scanner sc = new Scanner(System.in);
System.out.println("Enter the plain text");
String pl = sc.nextLine();
sc.close();
String s = "";
int start = 0;
for (int i = 0; i < pl.length(); i++) {
if (pl.charAt(i) == ' ') {
s = s + pl.substring(start, i);
start = i + 1;
}
}
s = s + pl.substring(start);
System.out.print(s);
System.out.println();
// end of space deletion
int k = s.length();
int l = 0;
int col = 4;
int row = s.length() / col;
```

```
char ch[][] = new char[row][col];
for (int i = 0; i < row; i++) {
for (int j = 0; j < col; j++) {
if (l < k) {
ch[i][j] = s.charAt(l);
l++;
} else {
ch[i][j] = '#';
}
}
}
// arranged in matrix
char trans[][] = new char[col][row];
for (int i = 0; i < row; i++) {
for (int j = 0; j < col; j++) {
trans[j][i] = ch[i][j];
}}
for (int i = 0; i < col; i++) {
for (int j = 0; j < row; j++) {
System.out.print(trans[i][j]);
}
}
// display
System.out.println();
}
}
```

OUTPUT:

Enter the plain text

Security Lab

SecurityLab

Sreictuy

PROGRAM:3

DES.java

```
import java.security.InvalidKeyException;
import java.security.NoSuchAlgorithmException;
import javax.crypto.BadPaddingException;
import javax.crypto.Cipher;
import javax.crypto.IllegalBlockSizeException;
import javax.crypto.KeyGenerator;
import javax.crypto.NoSuchPaddingException;
import javax.crypto.SecretKey;
public class DES
{
public static void main(String[] argv) {
try{
System.out.println("Message Encryption Using DES Algorithm\n ------ ");
KeyGenerator keygenerator = KeyGenerator.getInstance("DES");
SecretKey myDesKey = keygenerator.generateKey();
Cipher desCipher;
desCipher =Cipher.getInstance("DES/ECB/PKCS5Padding");
desCipher.init(Cipher.ENCRYPT_MODE, myDesKey);
byte[] text = "Secret Information ".getBytes();
System.out.println("Message [Byte Format] : " + text);
System.out.println("Message : " + new String(text));
byte[] textEncrypted = desCipher.doFinal(text);
System.out.println("Encrypted Message: " + textEncrypted);
```

```
desCipher.init(Cipher.DECRYPT_MODE, myDesKey);
byte[] textDecrypted = desCipher.doFinal(textEncrypted);
System.out.println("Decrypted Message: " + new
String(textDecrypted));
}catch(NoSuchAlgorithmException e){
e.printStackTrace();
}catch(NoSuchPaddingException e){
e.printStackTrace();
}catch(InvalidKeyException e){
e.printStackTrace();
}catch(IllegalBlockSizeException e){
e.printStackTrace();
}catch(BadPaddingException e){
e.printStackTrace();
}
}
}
```

OUTPUT:

```
Message Encryption Using DES Algorithm
-----------------------------------------------------
Message [Byte Format] : [B@4dcbadb4
Message : Secret Information
Encrypted Message: [B@504bae78
Decrypted Message: Secret Information
```

PROGRAM: 4

AES.java

```
import java.io.UnsupportedEncodingException;
import java.security.MessageDigest;
import java.security.NoSuchAlgorithmException;
import java.util.Arrays;
import java.util.Base64;
import javax.crypto.Cipher;
import javax.crypto.spec.SecretKeySpec;
public class AES {
private static SecretKeySpec secretKey;
private static byte[] key;
public static void setKey(String myKey) {
MessageDigest sha = null;
try {
key = myKey.getBytes("UTF-8");
sha = MessageDigest.getInstance("SHA-1");
key = sha.digest(key);
key = Arrays.copyOf(key, 16);
secretKey = new SecretKeySpec(key, "AES");
} catch (NoSuchAlgorithmException e) {
e.printStackTrace();
} catch (UnsupportedEncodingException e) {
e.printStackTrace();
}
```

```
}
public static String encrypt(String strToEncrypt, String secret) {
try {
setKey(secret);
Cipher cipher = Cipher.getInstance("AES/ECB/PKCS5Padding");
cipher.init(Cipher.ENCRYPT_MODE, secretKey);
return
Base64.getEncoder().encodeToString(cipher.doFinal(strToEncrypt.getBytes("UTF
-8")));
} catch (Exception e) {
System.out.println("Error while encrypting: " + e.toString());
}
return null;
}
public static String decrypt(String strToDecrypt, String secret) {
try {
setKey(secret);
Cipher cipher = Cipher.getInstance("AES/ECB/PKCS5PADDING");
cipher.init(Cipher.DECRYPT_MODE, secretKey);
return new
String(cipher.doFinal(Base64.getDecoder().decode(strToDecrypt)));
} catch (Exception e) {
System.out.println("Error while decrypting: " + e.toString());
}
return null;
}
```

```
public static void main(String[] args) {
final String secretKey = "annaUniversity";
String originalString = "www.annauniv.edu";
String encryptedString = AES.encrypt(originalString, secretKey);
String decryptedString = AES.decrypt(encryptedString, secretKey);
System.out.println("URL Encryption Using AES Algorithm\n---------- ");
System.out.println("Original URL : " + originalString);
System.out.println("Encrypted URL : " + encryptedString);
System.out.println("Decrypted URL : " + decryptedString);
}
}
```

OUTPUT:

```
URL Encryption Using AES Algorithm
-----------------------------------------------
Original URL : www.annauniv.edu
Encrypted URL : vibpFJW6Cvs5Y+L7t4N6YWWe07+JzS1d3CU2h3mEvEg=
Decrypted URL : www.annauniv.edu
```

PROGRAM: 5

rsa.html

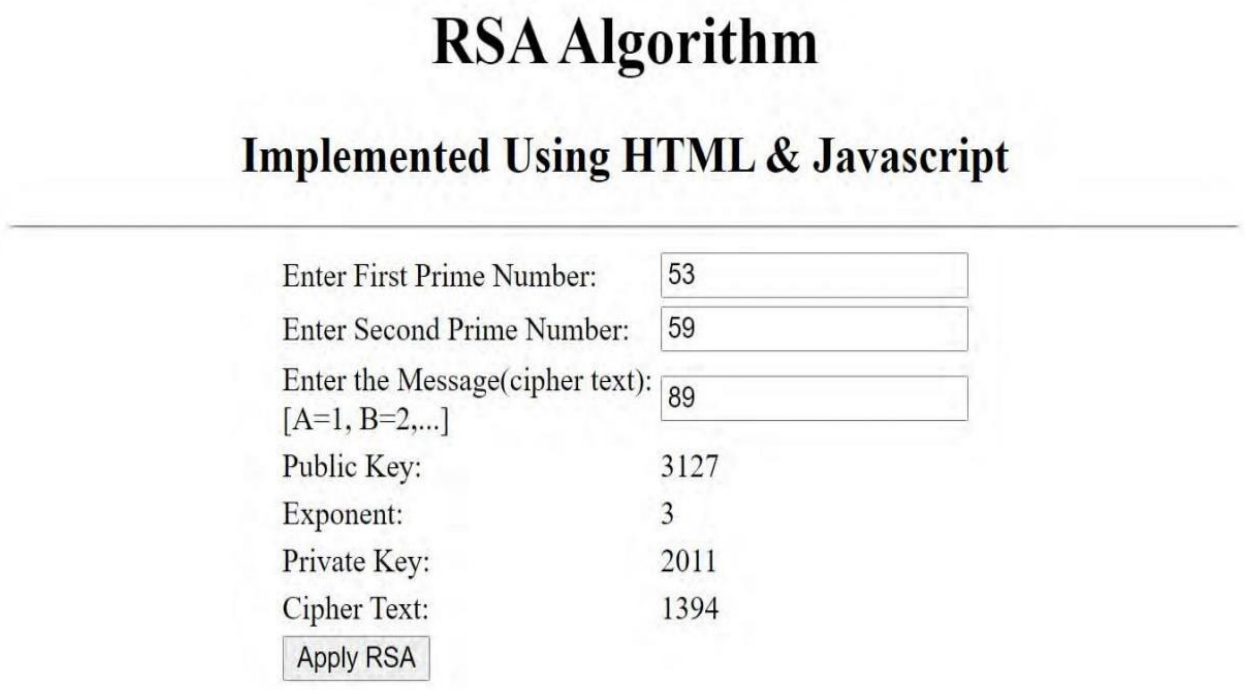
```
<html>
<head>
<title>RSA Encryption</title>
<meta name="viewport" content="width=device-width, initial-scale=1.0">
</head>
<body>
<center>
<h1>RSA Algorithm</h1>
<h2>Implemented Using HTML & Javascript</h2>
<hr>
<table>
<tr>
<td>Enter First Prime Number:</td>
<td><input type="number" value="53" id="p"></td>
</tr>
<tr>
<td>Enter Second Prime Number:</td>
<td><input type="number" value="59" id="q"></p>
</td>
</tr>
<tr>
<td>Enter the Message(cipher text):<br>[A=1, B=2,...]</td>
```

```
<td><input type="number" value="89" id="msg"></p>
</td>
</tr>
<tr>
<td>Public Key:</td>
<td>
<p id="publickey"></p>
</td>
</tr>
<tr>
<td>Exponent:</td>
<td>
<p id="exponent"></p>
</td>
</tr>
<tr>
<td>Private Key:</td>
<td>
<p id="privatekey"></p>
</td>
</tr>
<tr>
<td>Cipher Text:</td>
<td>
<p id="ciphertext"></p>
</td>
```

```
</tr>
<tr>
<td><button onclick="RSA();">Apply RSA</button></td>
</tr>
</table>
</center>
</body>
<script type="text/javascript">
function RSA() {
var gcd, p, q, no, n, t, e, i, x;
gcd = function (a, b) { return (!b) ? a : gcd(b, a % b); };
p = document.getElementById('p').value;
q = document.getElementById('q').value;
no = document.getElementById('msg').value;
n = p * q;
t = (p - 1) * (q - 1);
for (e = 2; e < t; e++) {
if (gcd(e, t) == 1) {
break;
}
}
for (i = 0; i < 10; i++) {
x = 1 + i * t
if (x % e == 0) {
d = x / e;
break;
```

```
}
}
ctt = Math.pow(no, e).toFixed(0);
ct = ctt % n;
dtt = Math.pow(ct, d).toFixed(0);
dt = dtt % n;
document.getElementById('publickey').innerHTML = n;
document.getElementById('exponent').innerHTML = e;
document.getElementById('privatekey').innerHTML = d;
document.getElementById('ciphertext').innerHTML = ct;
}
</script>
</html>
```

OUTPUT:



PROGRAM: 6

DiffieHellman.java

```
class DiffieHellman {
public static void main(String args[]) {
int p = 23; /* publicly known (prime number) */
int g = 5; /* publicly known (primitive root) */
int x = 4; /* only Alice knows this secret */
int y = 3; /* only Bob knows this secret */
double aliceSends = (Math.pow(g, x)) % p;
double bobComputes = (Math.pow(aliceSends, y)) % p;
double bobSends = (Math.pow(g, y)) % p;
double aliceComputes = (Math.pow(bobSends, x)) % p;
double sharedSecret = (Math.pow(g, (x * y))) % p;
System.out.println("simulation of Diffie-Hellman key exchange algorithm\n--
----------------------------------------");
System.out.println("Alice Sends : " + aliceSends);
System.out.println("Bob Computes : " + bobComputes);
System.out.println("Bob Sends : " + bobSends);
System.out.println("Alice Computes : " + aliceComputes);
System.out.println("Shared Secret : " + sharedSecret);
/* shared secrets should match and equality is transitive */
if ((aliceComputes == sharedSecret) && (aliceComputes == bobComputes))
System.out.println("Success: Shared Secrets Matches! " + sharedSecret);
else
```

```
System.out.println("Error: Shared Secrets does not Match");
}
}
```

OUTPUT:

```
simulation of Diffie-Hellman key exchange algorithm
---------------------------------------------------------------
Alice Sends : 4.0
Bob Computes : 18.0
Bob Sends : 10.0
Alice Computes : 18.0
Shared Secret : 18.0
Success: Shared Secrets Matches! 18.0
```

PROGRAM: 7

sha1.java

```
import java.security.*;
public class sha1 {
public static void main(String[] a) {
try {
MessageDigest md = MessageDigest.getInstance("SHA1");
System.out.println("Message digest object info:\n---------------- ");
System.out.println("Algorithm=" + md.getAlgorithm());
System.out.println("Provider=" + md.getProvider());
System.out.println("ToString=" + md.toString());
String input = "";
md.update(input.getBytes());
byte[] output = md.digest();
System.out.println();
System.out.println("SHA1(\"" + input + "\")=" + bytesToHex(output));
input = "abc";
md.update(input.getBytes());
output = md.digest();
System.out.println();
System.out.println("SHA1(\"" + input + "\")=" + bytesToHex(output));
input = "abcdefghijklmnopqrstuvwxyz";
md.update(input.getBytes());
output = md.digest();
```

```
System.out.println();
System.out.println("SHA1(\"" + input + "\")=" + bytesToHex(output));
System.out.println();
} catch (Exception e) {
System.out.println("Exception:" + e);
}}
private static String bytesToHex(byte[] b) {
char hexDigit[] = { '0', '1', '2', '3', '4', '5', '6', '7', '8', '9', 'A', 'B', 'C', 'D', 'E', 'F' };
StringBuffer buf = new StringBuffer();
for (byte aB : b) {
buf.append(hexDigit[(aB >> 4) & 0x0f]);
buf.append(hexDigit[aB & 0x0f]);
}
return buf.toString();
}
}
```

OUTPUT:

```
Message digest object info:
----------------------------------
Algorithm=SHA1
Provider=SUN version 12
ToString=SHA1 Message Digest from SUN, <initialized>
SHA1("")=DA39A3EE5E6B4B0D3255BFEF95601890AFD80709
SHA1("abc")=A9993E364706816ABA3E25717850C26C9CD0D89D
SHA1("abcdefghijklmnopqrstuvwxyz")=32D10C7B8CF96570CA04CE37F2A19
D84240D3A89
```

PROGRAM:8

```
import java.security.KeyPair;
import java.security.KeyPairGenerator;
import java.security.PrivateKey;
import java.security.Signature;
import java.util.Scanner;
public class CreatingDigitalSignature {
public static void main(String args[]) throws Exception {
Scanner sc = new Scanner(System.in);
System.out.println("Enter some text");
String msg = sc.nextLine();
KeyPairGenerator keyPairGen = KeyPairGenerator.getInstance("DSA");
keyPairGen.initialize(2048);
KeyPair pair = keyPairGen.generateKeyPair();
PrivateKey privKey = pair.getPrivate();
Signature sign = Signature.getInstance("SHA256withDSA");
sign.initSign(privKey);
byte[] bytes = "msg".getBytes();
sign.update(bytes);
byte[] signature = sign.sign();
System.out.println("Digital signature for given text: "+new String(signature,
"UTF8"));
}
}
```

OUTPUT:

Enter some text

Hi how are you

Digital signature for given text: 0=@gRD???-?.???? /yGL?i??a!?