***NETWORK SECURITY AND CRYPTOGRAPHY***

***LAB MANUAL***

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**CMR INSTITUTE OF TECHNOLOGY**

Kandlakoya(V), Medchal Road, Hyderabad – 501 401

Ph. No. 08418-222042, 22106 Fax No. 08418-222106

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**CRYPTOGRAPHY AND NETWORK SECURITY LAB**

**B.Tech. III Year II Sem. L T P C Course Code: CS604PC 0 0 3 2**

1. Write a C program that contains a string (char pointer) with a value ‘Hello world’.

The program should XOR each character in this string with 0 and displays the result.

2. Write a C program that contains a string (char pointer) with a value ‘Hello world’.

The program should AND or and XOR each character in this string with 127 and

display the result.

3. Write a Java program to perform encryption and decryption using the following

algorithms

a. Ceaser cipher b. Substitution cipher c. Hill Cipher

4. Write a C/JAVA program to implement the DES algorithm logic.

5. Write a C/JAVA program to implement the Blowfish algorithm logic.

6. Write a C/JAVA program to implement the Rijndael algorithm logic.

7. Write the RC4 logic in Java Using Java cryptography; encrypt the text “Hello world”

using Blowfish. Create your own key using Java key tool.

8. Write a Java program to implement RSA algorithm.

9. Implement the Diffie-Hellman Key Exchange mechanism using HTML andJavaScript.

10. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.

11. Calculate the message digest of a text using the MD5 algorithm in JAVA.

**Table of Contents**

|  |  |  |
| --- | --- | --- |
| **S.NO** | **PROGRAM NAME** | **PAGE NO.** |
| 1 | XOR a string with a Zero | 4 |
| 2 | XOR a String With 127 | 5 |
| 3 | Encryption & Decryption using Cryptographic Algorithms | 6 |
| 4 | JAVA program for DES algorithm logic | 11 |
| 5 | Program to implement BlowFish algorithm logic | 13 |
| 6 | Program to implement Rijndael algorithm logic | 14 |
| 7 | RC4 and Encrypt a string using BlowFish algorithm | 15 |
| 8 | RSA Algorithm | 18 |
| 9 | Diffie-Hellman | 20 |
| 10 | SHA | 22 |
| 11 | MD5 | 24 |

1. **XOR a string with a Zero**

**AIM:** Write a C program that contains a string (char pointer) with a value ‘Hello world’.

The program should XOR each character in this string with 0 and displays the result.

**PROGRAM:**

#include<stdlib.h>

#include<conio.h>

#include<string.h>

main()

{

char str[]="Hello World";

char str1[11];

int i,len;

clrscr();

len=strlen(str);

printf(“%d”,len);

for(i=0;i<len;i++)

{

str1[i]=str[i]^0;

printf("%c",str1[i]);

}

printf("\n");

getch();

return 0;

}

**Output:**

Hello World

Hello World

**2. XOR a String With 127**

**AIM:** Write a C program that contains a string (char pointer) with a value \HelloWorld’. The program should AND and XOR each character in this string with127 and display the result.

**PROGRAM:**

**#include<stdlib.h>**

**#include<conio.h>**

**#include<string.h>**

**#include<stdio.h>**

**main()**

**{**

**char str[]={"hello world"};**

**char str1[11];**

**char str2[11];**

**char str3[11];**

**int i,len;**

**strcpy(str2,str);**

**clrscr();**

**len=strlen(str);**

**printf("length=%d\n",len);**

**for(i=0;i<len;i++)**

**{**

**str1[i]=str[i]&127;**

**printf("%c",str1[i]);**

**}**

**printf("\n");**

**for(i=0;i<len;i++)**

**{**

**str3[i]=str2[i]^1111111;**

**printf("%c",str3[i]);**

**}**

**printf("\n");**

**getch();**

**return 0;**

**}**

**Output:**

Hello World

Hello World

Hello World

**3. Encryption & Decryption using Cryptographic Algorithms**

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

following algorithms:

**a)** Ceaser Cipher

**b)** Substitution Cipher

**c)** Hill Cipher

**PROGRAM:**

**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 {

// TODO code application logic here

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: MjqqtBtwqi

Decrypted String is: Hello World

**b) Substitution Cipher**

**PROGRAM:**

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 {

// TODO code application logic here

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: aceho

The encrypted data is: zxvsl

**c) Hill Cipher**

**PROGRAM:**

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 {

// TODO code application logic here

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++) {

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

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 a 3 letter string: hai

Encrypted string is :fdx

Inverse Matrix is :

0.083333336 0.41666666 -0.33333334

-0.41666666 -0.083333336 0.6666667

0.5833333 -0.083333336 -0.33333334

Decrypted string is :hai

**4. JAVA program for DES algorithm logic**

**AIM:** Write a Java program to implement the DES algorithm logic.

**PROGRAM:**

import javax.swing.\*;

import java.security.SecureRandom;

import javax.crypto.Cipher;

import javax.crypto.KeyGenerator;

import javax.crypto.SecretKey;

import javax.crypto.spec.SecretKeySpec;

import java.util.Random ;

class DES {

byte[] skey = new byte[1000];

String skeyString;

static byte[] raw;

String inputMessage,encryptedData,decryptedMessage;

public DES() {

try {

generateSymmetricKey();

inputMessage=JOptionPane.showInputDialog(null,"Enter message to encrypt");

byte[] ibyte = inputMessage.getBytes();

byte[] ebyte=encrypt(raw, ibyte);

String encryptedData = new String(ebyte);

System.out.println("Encrypted message "+encryptedData);

JOptionPane.showMessageDialog(null,"Encrypted Data "+"\n"+encryptedData);

byte[] dbyte= decrypt(raw,ebyte);

String decryptedMessage = new String(dbyte);

System.out.println("Decrypted message "+decryptedMessage);

JOptionPane.showMessageDialog(null,"Decrypted Data "+"\n"+decryptedMessage);

}

catch(Exception e) {

System.out.println(e);

}

}

void generateSymmetricKey() {

try {

Random r = new Random();

int num = r.nextInt(10000);

String knum = String.valueOf(num);

byte[] knumb = knum.getBytes();

skey=getRawKey(knumb);

skeyString = new String(skey);

System.out.println("DES Symmetric key = "+skeyString);

}

catch(Exception e) {

System.out.println(e);

}

}

private static byte[] getRawKey(byte[] seed) throws Exception {

KeyGenerator kgen = KeyGenerator.getInstance("DES");

SecureRandom sr = SecureRandom.getInstance("SHA1PRNG");

sr.setSeed(seed);

kgen.init(56, sr);

SecretKey skey = kgen.generateKey();

raw = skey.getEncoded();

return raw;

}

private static byte[] encrypt(byte[] raw, byte[] clear) throws Exception {

SecretKeySpec skeySpec = new SecretKeySpec(raw, "DES");

Cipher cipher = Cipher.getInstance("DES");

cipher.init(Cipher.ENCRYPT\_MODE, skeySpec);

byte[] encrypted = cipher.doFinal(clear);

return encrypted;

}

private static byte[] decrypt(byte[] raw, byte[] encrypted) throws Exception {

SecretKeySpec skeySpec = new SecretKeySpec(raw, "DES");

Cipher cipher = Cipher.getInstance("DES");

cipher.init(Cipher.DECRYPT\_MODE, skeySpec);

byte[] decrypted = cipher.doFinal(encrypted);

return decrypted;

}

public static void main(String args[]) {

DES des = new DES();

}

}

**OUTPUT:**

Enter the string: Welcome

String To Encrypt: Welcome

Encrypted Value : BPQMwc0wKvg=

Decrypted Value : Welcome

**5. Program to implement BlowFish algorithm logic**

**AIM:** Write a C/JAVA program to implement the BlowFish algorithm logic.

**PROGRAM:**

import javax.crypto.Cipher;

import javax.crypto.KeyGenerator;

import javax.crypto.SecretKey;

import javax.swing.JOptionPane;

/\*\*

\* This program demonstrates how to encrypt/decrypt input

\* using the Blowfish Cipher with the Java Cryptograhpy.

\*

\*/

public class BlowfishCipher {

public static void main(String[] args) throws Exception {

// create a key generator based upon the Blowfish cipher

KeyGenerator keygenerator = KeyGenerator.getInstance("Blowfish");

// create a key

SecretKey secretkey = keygenerator.generateKey();

Cipher cipher = Cipher.getInstance("Blowfish");

// initialise cipher to with secret key

cipher.init(Cipher.ENCRYPT\_MODE, secretkey);

// get the text to encrypt

String inputText = JOptionPane.showInputDialog("Input your message: ");

// encrypt message

byte[] encrypted = cipher.doFinal(inputText.getBytes());

// re-initialise the cipher to be in decrypt mode

cipher.init(Cipher.DECRYPT\_MODE, secretkey);

// decrypt message

byte[] decrypted = cipher.doFinal(encrypted);

// and display the results

JOptionPane.showMessageDialog(JOptionPane.getRootFrame(),

"encrypted text: " + new String(encrypted) + "\n" +

"decrypted text: " + new String(decrypted));

// end example

System.exit(0);

}

}

**OUTPUT:**

Initialization Vector of the Cipher: dI1MXzW97oQ=

Contents of inputFile.txt: Hello World

Contents of outputFile.txt: ùJÖ˜ NåI“

**6. Program to implement Rijndael algorithm logic**

**AIM:** Write a C/JAVA program to implement the Rijndael algorithm logic.

**PROGRAM:**

import java.security.\*;

import javax.crypto.\*;

import javax.crypto.spec.\*;

import java.io.\*;

public class AES {

public static String asHex (byte buf[]) {

StringBuffer strbuf = new StringBuffer(buf.length \* 2);

int i;

for (i = 0; i < buf.length; i++) {

if (((int) buf[i] & 0xff) < 0x10)

strbuf.append("0");

strbuf.append(Long.toString((int) buf[i] & 0xff, 16)); }

return strbuf.toString(); }

public static void main(String[] args) throws Exception {

String message="AES still rocks!!";

// Get the KeyGenerator

KeyGenerator kgen = KeyGenerator.getInstance("AES");

kgen.init(128); // 192 and 256 bits may not be available

// Generate the secret key specs.

SecretKey skey = kgen.generateKey();

byte[] raw = skey.getEncoded();

SecretKeySpec skeySpec = new SecretKeySpec(raw, "AES");

// Instantiate the cipher

Cipher cipher = Cipher.getInstance("AES");

cipher.init(Cipher.ENCRYPT\_MODE, skeySpec);

byte[] encrypted = cipher.doFinal((args.length == 0 ? message : args[0]).getBytes());

System.out.println("encrypted string: " + asHex(encrypted));

cipher.init(Cipher.DECRYPT\_MODE, skeySpec);

byte[] original = cipher.doFinal(encrypted);

String originalString=new String(original);

System.out.println("Original string: " + originalString + " " + asHex(original)); } }

**7. RC4**

**AIM:** Write the RC4 logic in Java Using Java cryptography

**PROGRAM:**

import java.io.\*;  
class rc4  
{  
public static void main(String args[])throws IOException  
{  
int temp=0;  
String ptext;  
String key;  
int s[]=new int[256];  
int k[]=new int[256];  
DataInputStream in=new DataInputStream(System.in);  
System.out.print(“\nENTER PLAIN TEXT\t”);  
ptext=in.readLine();  
System.out.print(“\n\nENTER KEY TEXT\t\t”);  
key=in.readLine();  
char ptextc[]=ptext.toCharArray();  
char keyc[]=key.toCharArray();  
int cipher[]=new int[ptext.length()];  
int decrypt[]=new int[ptext.length()];

int ptexti[]=new int[ptext.length()];  
int keyi[]=new int[key.length()];  
for(int i=0;i<ptext.length();i++)  
{  
ptexti[i]=(int)ptextc[i];  
}  
for(int i=0;i<key.length();i++)  
{  
keyi[i]=(int)keyc[i];  
}  
for(int i=0;i<255;i++)  
{  
s[i]=i;  
k[i]=keyi[i%key.length()];  
}  
int j=0;  
for(int i=0;i<255;i++)  
{  
j=(j+s[i]+k[i])%256;  
temp=s[i];  
s[i]=s[j];  
s[j]=temp;  
}  
int i=0;  
j=0;  
int z=0;  
for(int l=0;l<ptext.length();l++)  
{  
i=(l+1)%256;  
j=(j+s[i])%256;  
temp=s[i];  
s[i]=s[j];  
s[j]=temp;  
z=s[(s[i]+s[j])%256];  
cipher[l]=z^ptexti[l];  
decrypt[l]=z^cipher[l];  
}  
System.out.print(“\n\nENCRYPTED:\t\t”);  
display(cipher);  
System.out.print(“\n\nDECRYPTED:\t\t”);  
display(decrypt);  
}

static void display(int disp[])  
{  
char convert[]=new char[disp.length];  
for(int l=0;l<disp.length;l++)  
{  
convert[l]=(char)disp[l];  
System.out.print(convert[l]);  
}  
}

} /\*

**Output :**

ENTER PLAIN TEXT RC4 PROGRAM

ENTER KEY TEXT A

ENCRYPTED: ??-??‚±?‚µFJ|

DECRYPTED: RC4 PROGRAM

**Encrypt a string using BlowFish algorithm**

**AIM:** Using Java Cryptography, encrypt the text “Hello world” using BlowFish.

Create your own key using Java keytool.

**PROGRAM:**

import javax.crypto.Cipher;

import javax.crypto.KeyGenerator;

import javax.crypto.SecretKey;

import javax.swing.JOptionPane;

public class BlowFishCipher {

public static void main(String[] args) throws Exception {

// create a key generator based upon the Blowfish cipher

KeyGeneratorkeygenerator = KeyGenerator.getInstance("Blowfish");

// create a key

SecretKeysecretkey = keygenerator.generateKey();

// create a cipher based upon Blowfish

Cipher cipher = Cipher.getInstance("Blowfish");

// initialise cipher to with secret key

cipher.init(Cipher.ENCRYPT\_MODE, secretkey);

// get the text to encrypt

String inputText = JOptionPane.showInputDialog("Input your message: ");

// encrypt message

byte[] encrypted = cipher.doFinal(inputText.getBytes());

// re-initialise the cipher to be in decrypt mode

cipher.init(Cipher.DECRYPT\_MODE, secretkey);

// decrypt message

byte[] decrypted = cipher.doFinal(encrypted);

// and display the results

JOptionPane.showMessageDialog(JOptionPane.getRootFrame(),

"\nEncrypted text: " + new String(encrypted) + "\n" +

"\nDecrypted text: " + new String(decrypted));

System.exit(0);

} }

**OUTPUT:**

Input your message: Hello world

Encrypted text: 3ooo&&(\*&\*4r4

Decrypted text: Hello world

**8. RSA Algorithm**

**AIM:** Write a Java program to implement RSA Algoithm.

**PROGRAM:**

import java.io.DataInputStream;

import java.io.IOException;

import java.math.BigInteger;

import java.util.Random;

public class RSA

{

private BigInteger p;

private BigInteger q;

private BigInteger N;

private BigInteger phi;

private BigInteger e;

private BigInteger d;

private int bitlength = 1024;

private Random r;

public RSA()

{

r = new Random();

p = BigInteger.probablePrime(bitlength, r);

q = BigInteger.probablePrime(bitlength, r);

N = p.multiply(q);

phi = p.subtract(BigInteger.ONE).multiply(q.subtract(BigInteger.ONE));

e = BigInteger.probablePrime(bitlength / 2, r);

while (phi.gcd(e).compareTo(BigInteger.ONE) > 0 && e.compareTo(phi) < 0)

{

e.add(BigInteger.ONE);

}

d = e.modInverse(phi);

}

public RSA(BigInteger e, BigInteger d, BigInteger N)

{

this.e = e;

this.d = d;

this.N = N;

}

@SuppressWarnings("deprecation")

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

{

RSA rsa = new RSA();

DataInputStream in = new DataInputStream(System.in);

String teststring;

System.out.println("Enter the plain text:");

teststring = in.readLine();

System.out.println("Encrypting String: " + teststring);

System.out.println("String in Bytes: "

+ bytesToString(teststring.getBytes()));

// encrypt

byte[] encrypted = rsa.encrypt(teststring.getBytes());

// decrypt

byte[] decrypted = rsa.decrypt(encrypted);

System.out.println("Decrypting Bytes: " + bytesToString(decrypted));

System.out.println("Decrypted String: " + new String(decrypted));

}

private static String bytesToString(byte[] encrypted)

{

String test = "";

for (byte b : encrypted)

{

test += Byte.toString(b);

}

return test;

}

// Encrypt message

public byte[] encrypt(byte[] message)

{

return (new BigInteger(message)).modPow(e, N).toByteArray();

}

// Decrypt message

public byte[] decrypt(byte[] message)

{

return (new BigInteger(message)).modPow(d, N).toByteArray();

}

}

**OUTPUT:**

Enter a Prime number: 5

Enter another prime number: 11

Encryption keys are: 33, 55

Decryption keys are: 17, 55

**9. Diffie-Hellman**

**AIM:** Implement the Diffie-Hellman Key Exchange mechanism using HTML and

JavaScript. Consider the end user as one of the parties (Alice) and the JavaScript

application as other party (bob).

**PROGRAM:**

import java.math.\*;

import java.security.\*;

import javax.crypto.spec.DHParameterSpec;

import javax.crypto.spec.DHPublicKeySpec;

public class DiffeHellman

{ public final static int pValue = 47;

public final static int gValue = 71;

public final static int XaValue = 9;

public final static int XbValue = 14;

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

{ // TODO code application logic here

BigInteger p = new BigInteger(Integer.toString(pValue));

BigInteger g = new BigInteger(Integer.toString(gValue));

BigInteger Xa = new BigInteger(Integer.toString(XaValue));

BigInteger Xb = new BigInteger(Integer.toString(XbValue));

createKey();

int bitLength = 512; // 512 bits

SecureRandom rnd = new SecureRandom();

p = BigInteger.probablePrime(bitLength, rnd);

g = BigInteger.probablePrime(bitLength, rnd);

createSpecificKey(p, g);

}

public static void createKey() throws Exception

{ KeyPairGenerator kpg = KeyPairGenerator.getInstance("DiffieHellman");

kpg.initialize(512);

KeyPair kp = kpg.generateKeyPair();

KeyFactory kfactory = KeyFactory.getInstance("DiffieHellman");

DHPublicKeySpec kspec = (DHPublicKeySpec) kfactory.getKeySpec(kp.getPublic(),DHPublicKeySpec.class);

System.out.println("Public key is: (createKey) : " + kspec);

}

public static void createSpecificKey(BigInteger p, BigInteger g) throws Exception

{ KeyPairGenerator kpg = KeyPairGenerator.getInstance("DiffieHellman");

DHParameterSpec param = new DHParameterSpec(p, g);

kpg.initialize(param);

KeyPair kp = kpg.generateKeyPair();

KeyFactory kfactory = KeyFactory.getInstance("DiffieHellman");

DHPublicKeySpec kspec = (DHPublicKeySpec) kfactory.getKeySpec(kp.getPublic(),

DHPublicKeySpec.class);

System.out.println("\nPublic key is : (createSpecificKey) : " + kspec);

}

}

**OUTPUT:**

Public key is: javax.crypto.spec.DHPublicKeySpec@5afd29

Public key is: [javax.crypto.spec.DHPublicKeySpec@9971ad](mailto:javax.crypto.spec.DHPublicKeySpec@9971ad)

**10. SHA-1**

**AIM:** Calculate the message digest of a text using the SHA-1 algorithm in JAVA.

**PROGRAM:**

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: ");

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);

}

}

public 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 (int j=0; j<b.length; j++)

{

buf.append(hexDigit[(b[j] >> 4) & 0x0f]);

buf.append(hexDigit[b[j] & 0x0f]);

}

return buf.toString();

}

}

**OUTPUT:**

Message digest object info:

Algorithm = SHA1

Provider = SUN version 1.6

ToString = SHA1 Message Digest from SUN, <initialized>

SHA1("") = DA39A3EE5E6B4B0D3255BFEF95601890AFD80709

SHA1("abc") = A9993E364706816ABA3E25717850C26C9CD0D89D

SHA1("abcdefghijklmnopqrstuvwxyz")=32D10C7B8CF96570CA04CE37F2A19D8424

0D3A89

**11. MD5**

**AIM:** Calculate the message digest of a text using the SHA-1 algorithm in JAVA.

**PROGRAM:**

import java.security.\*;

public class MD5 {

public static void main(String[] a) {

// TODO code application logic here

try {

MessageDigest md = MessageDigest.getInstance("MD5");

System.out.println("Message digest object info: ");

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("MD5(\""+input+"\") = " +bytesToHex(output));

input = "abc";

md.update(input.getBytes());

output = md.digest();

System.out.println();

System.out.println("MD5(\""+input+"\") = " +bytesToHex(output));

input = "abcdefghijklmnopqrstuvwxyz";

md.update(input.getBytes());

output = md.digest();

System.out.println();

System.out.println("MD5(\"" +input+"\") = " +bytesToHex(output));

System.out.println("");

}

catch (Exception e) {

System.out.println("Exception: " +e); }

}

public static String bytesToHex(byte[] b) {

char hexDigit[] = {'0', '1', '2', '3', '4', '5', '6', '7', '8', '9', 'A', 'B', 'C', 'D', 'E', 'F'};

StringBufferbuf = new StringBuffer();

for (int j=0; j<b.length; j++) {

buf.append(hexDigit[(b[j] >> 4) & 0x0f]);

buf.append(hexDigit[b[j] & 0x0f]); }

return buf.toString(); } }

**OUTPUT:**

Message digest object info:

Algorithm = MD5

Provider = SUN version 1.6

ToString = MD5 Message Digest from SUN, <initialized>

MD5("") = D41D8CD98F00B204E9800998ECF8427E

MD5("abc") = 900150983CD24FB0D6963F7D28E17F72

MD5("abcdefghijklmnopqrstuvwxyz") = C3FCD3D76192E4007DFB496CCA67E13B