Computer Science and Engineering

KPR Institute of Engineering and Technology

B.E. – COMPUTER SCIENCE AND ENGINEERING

LABORATORY RECORD

U19CS703 –SECURITY LABORATORY

(Regulation 2019)

KPR INSTITUTE OF ENGINEERING AND TECHNOLOGY

KPRIET

(Autonomous)

COIMBATORE - 641 407

LABORATORY RECORD

Name

Roll Number

Subject Code & Title: .....

Department

Year & Semester

This is the certified record of work done by.....

Register Number .....

Staff In- Charge

Head of the Department

Place:

Date:

He/ She has submitted the record for the End Semester Practical Examination held on .....

Internal Examiner

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Vision of the Institution

To become a premier institute of academic excellence by imparting technical, intellectual and professional skills to students for meeting the diverse needs of the industry, society, the nation and the world at large.

Mission of the Institution

1. Commitment to offer value-based education and enhancement of practical skills 2. Continuous assessment of teaching and learning process through scholarly activities 3. Enriching research and innovative activities in collaboration with industry and institute of repute
4. Ensuring the academic process to uphold culture, ethics and social responsibility

Vision of the Department

To foster the students by providing learner centric teaching environment, continuous learning, research and development to become thriving professionals and entrepreneurs to excel in the field of computer science and contribute to the society.

Mission of the Department

1. Providing value-based education and contented learning experience to the students 2. Educating the students with the state of art technologies and cultivating their proficiency in analytical and designing skills
3. Enabling the students to achieve a successful career in Computer Science and Engineering or related fields to meet the changing needs of various stakeholders 4. Guiding the students in research by nurturing their interest in continuous learning towards serving the society and the country.

LIST OF EXPERIMENTS

S.NO	DATE	NAME OF THE EXPERIMENTS	Pg No	Marks	Sign
01		Perform encryption, decryption using the following substitution techniques (i) Ceaser cipher, (ii) playfair cipher iii) Hill Cipher iv) Vigenere cipher.			
02		Perform encryption and decryption using following transposition techniques i) Rail fence ii) row & Column Transformation			
03		Apply DES algorithm for practical applications.			
04		Apply AES algorithm for practical applications			
05		Suppose Alice wants her friends to encrypt email messages before sending them to her. Computers represent text as long numbers (01 for “A”, 02, 02 for “B” and so on), so an email message is just a very big number. Implement RSA Encryption Scheme to encrypt and then decrypt electronic communications.			
06		The First requirement is for institutions, governments, or enterprises that need to assure their constituents that forms or documents are authentic and have maintained their integrity. The second requirement is for employees, customers, or citizens that need to provide approval or acknowledgement that a document or form has been read and approval or agreed to in principle. Implement the solution for above said requirements.			
07		Demonstrate intrusion detection system(ids) using any tool e.g., Snort or any other s/w.			

08		Calculate the Message Digest of a text using SHA-1 algorithm			
09		Case Study - MD5 Algorithm			
		TOTAL			

Ex. No : 1(a) Date:	Encryption and Decryption Using Ceaser Cipher

AIM:

To encrypt and decrypt the given message by using Ceaser Cipher encryption algorithm.

ALGORITHMS:

1. In Ceaser Cipher each letter in the plaintext is replaced by a lettersome fixed number of positions down the alphabet.
2. For example, with a **left shift of 3**, **D** would be replaced by **A**, **E** would become **B**, and so on.
3. The encryption can also be represented using modular arithmetic by first transforming the letters into numbers, according to the scheme, **A = 0, B = 1, Z = 25.**
4. Encryption of a letter x by a shift n can be described mathematically as,

$$En(x) = (x + n) \bmod 26$$

5. Decryption is performed similarly,

$$Dn(x) = (x - n) \bmod 26$$

PROGRAM:

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
        = "Harish ";
        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 : Harish

Encrypted Message : Dqdqwk

Decrypted Message : Harish
```

RESULT:

Thus the program for ceaser cipher encryption and decryption algorithm has been implemented and the output verified successfully.

Ex. No : 1(b) Date:	Playfair Cipher

AIM:

To implement a program to encrypt a plain text and decrypt a cipher text using play fair Cipher substitution technique.

ALGORITHM:

1. To encrypt a message, one would break the message into digrams (groups of 2 letters)
2. For example, "HelloWorld" becomes "HE LL OW OR LD".
3. These digrams will be substituted using the key table.
4. Since encryption requires pairs of letters, messages with an odd number of characters usually append an uncommon letter, such as "X", to completethe final digram.
5. The two letters of the digram are considered opposite corners of arectangle in the key table. To perform the substitution, apply the following 4 rules, in order, to each pair of letters in the plaintext:

PROGRAM:

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){ String key = "CSE";
    String txt = "Harish "; /* 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 : Harish

Encrypted Message : HTHTYN

Decrypted Message : HARISH
```

RESULT:

Thus the program for playfair cipher encryption and decryption algorithm has been implemented and the output verified successfully.

Ex. No : 1(c) Date:	Hill Cipher

AIM:

To implement a program to encrypt and decrypt using the Hill cipher substitution technique

ALGORITHM:

1. In the Hill Cipher Each letter is represented by a number modulo 26.
2. To encrypt a message, each block of n letters is multiplied by an invertible n x n matrix, again modulus 26.
3. To decrypt the message, each block is multiplied by the inverse of the matrix used for encryption.
4. The matrix used for encryption is the cipher key, and it should be chosen randomly from the set of invertible n × n matrices (modulo 26).
5. The cipher can, be adapted to an alphabet with any number of letters.
6. All arithmetic just needs to be done modulo the number of letters instead of modulo 26.

PROGRAM:

HillCipher.java

```
class Main {
    /* 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){


        String msg;
        String enc = "";
        String dec = "";
        int n;
        msg = ("Harish ");
        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:

simulation of Hill Cipher

Input message : Harish

padded message : HARISH

encoded message : ANANTG

decoded message : HARISH

RESULT:

Thus the program for hill cipher encryption and decryption algorithm has been implemented and the output verified successfully.

Ex. No : 1(d) Date:	Vigenere Cipher

AIM:

To implement a program for encryption and decryption using vigenere cipher substitution technique

ALGORITHM:

1. The Vigenere cipher is a method of encrypting alphabetic text by using a series of different Caesar ciphers based on the letters of a keyword.
2. It is a simple form of *polyalphabetic* substitution.
3. To encrypt, a table of alphabets can be used, termed a Vigenere square, or Vigenere table.
4. It consists of the alphabet written out 26 times in different rows, each alphabet shifted cyclically to the left compared to the previous alphabet corresponding to the 26 possible Caesar ciphers.
5. At different points in the encryption process, the cipher uses a different alphabet from one of the rows used.
6. The alphabet at each point depends on a repeating keyword.

PROGRAM:

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 = "Harish ";
        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 : Harish
Encrypted Message : VVGRGL
Decrypted Message : HARISH
```

Aim & Algorithm	
Program & Execution	
Experiment & Results	
Viva	
Total	

RESULT:

Thus the program for vigenere cipher encryption and decryption algorithm has been implemented and the output verified successfully.

Ex. No : 2(a) Date:	Rail Fence Cipher Transposition Technique

AIM:

To implement a program for encryption and decryption using rail fence transposition technique.

ALGORITHM:

1. In the rail fence cipher, the plaintext is written downwards and diagonally on successive "rails" of an imaginary fence, then moving up when we reach the bottom rail.
2. When we reach the top rail, the message is written downwards again until the whole plaintext is written out.
3. The message is then read off in rows.

PROGRAM:

railFenceCipher.java

```
class Main{
int depth;
static String encode(String msg, int depth) {
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;
}
static String decode(String encmsg, int depth){
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;
}
public static void main(String[] args){
String msg, enc, dec;
msg = "Harish ";
int depth = 2;
enc =encode(msg, depth);
dec =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 : Harish
Encrypted Message : Aatnnh
Decrypted Message : Harish
```

RESULT:

Thus the java program for Rail Fence Transposition Technique has been implemented and the output verified successfully.

Ex. No : 2(b) Date:	Row and Column Transformation Technique

AIM:

To implement a program for encryption and decryption by using row and column transformation technique.

ALGORITHM:

1. Consider the plain text hello world, and let us apply the simple columnar transposition technique as shown below

h	e	l	l
o	w	o	r
l	d		

2. The plain text characters are placed horizontally and the cipher textis created with vertical format as: **holewdlo lr**.
3. Now, the receiver has to use the same table to decrypt the cipher textto plain text.

PROGRAM:

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();
        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] = '#';
                }
            }
        }
        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 :
Harish
Ana
Harish
```

Aim & Algorithm	
Program & Execution	
Experiment & Results	
Viva	
Total	

RESULT:

Thus the java program for Row and Column Transposition Technique has been implemented and the output verified successfully.

Ex. No : 3 Date:	Data Encryption Standard (DES) Algorithm (User Message Encryption)

AIM:

To use Data Encryption Standard (DES) Algorithm for a practical application like User Message Encryption.

ALGORITHM:

1. Create a DES Key.
2. Create a Cipher instance from Cipher class, specify thefollowing information and separated by a slash (/).
   a. Algorithm name
   b. Mode (optional)
   c. Padding scheme (optional)
3. Convert String into ***Byte[]*** array format.
4. Make Cipher in encrypt mode, and encrypt it with ***Cipher.doFinal()*** method.
5. Make Cipher in decrypt mode, and decrypt it with ***Cipher.doFinal()*** method.

PROGRAM:

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 Main
{
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 = "Harish ".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@18be83e4
Message : Harish
Encrypted Message: [B@26be92ad
Decrypted Message: Harish
```

Aim & Algorithm	
Program & Execution	
Experiment & Results	
Viva	
Total	

RESULT:

Thus the java program for DES Algorithm has been implemented and the output verified successfully.

Ex. No : 4 Date :	Advanced Encryption Standard (DES) Algorithm (URL Encryption)

AIM:

To use Advanced Encryption Standard (AES) Algorithm for a practical application like URL Encryption.

ALGORITHM:

1. AES is based on a design principle known as a substitution–permutation.
2. AES does not use a Feistel network like DES, it uses variant of Rijndael.
3. It has a fixed block size of 128 bits, and a key size of 128, 192, or 256 bits.
4. AES operates on a 4 × 4 column-major order array of bytes, termed the state

PROGRAM:

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("UT
    F -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 = "Harish ";

            String originalString = " www.kpriet.ac.in";
            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.kpriet.ac.in
Encrypted URL : PVxNg16Ue6KTZSHC3dZwVzQSkaLhFnTJ+KwOnhnK78s=
Decrypted URL : www.kpriet.ac.in

Aim & Algorithm	
Program & Execution	
Experiment & Results	
Viva	
Total	

RESULT:

Thus the java program for AES Algorithm has been implemented for URL Encryption and the output verified successfully.

Ex. No : 5 Date :	RSA Algorithm

AIM:

To implement RSA (Rivest–Shamir–Adleman) algorithm by using HTML and Javascript.

ALGORITHM:

1. Choose two prime number p and q
2. Compute the value of n and **p**
3. Find the value of ***e*** (public key)
4. Compute the value of ***d*** (private key) using gcd()
5. Do the encryption and decryption
   a. Encryption is given as,

      $c = t^e \bmod n$

   b. Decryption is given as,

      $t = c^d \bmod n$

PROGRAM:

```
import java.io.DataInputStream;

import java.io.IOException;

import java.math.BigInteger;

import java.util.Random;


public class Main

{

 private BigInteger P;

 private BigInteger Q;

 private BigInteger N;

 private BigInteger PHI;

 private BigInteger e;
```

```
 private BigInteger d;



private int maxLength = 1024;
 private Random R;


 public Main()
 {
 R = new Random();
 P = BigInteger.probablePrime(maxLength, R);
 Q = BigInteger.probablePrime(maxLength, R);
 N = P.multiply(Q);
 PHI = P.subtract(BigInteger.ONE).multiply( Q.subtract(BigInteger.ONE));  e
= BigInteger.probablePrime(maxLength / 2, R);
 while (PHI.gcd(e).compareTo(BigInteger.ONE) > 0 && e.compareTo(PHI) < 0) {
 e.add(BigInteger.ONE);
 }
 d = e.modInverse(PHI);
 }


 public Main(BigInteger e, BigInteger d, BigInteger N)
 {
 this.e  =  e;
 this.d  =  d;
 this.N = N;
 }
 public static void main (String [] arguments) throws IOException  {
```

```
 Main rsa = new Main();
 DataInputStream input = new DataInputStream(System.in);
String inputString;
 System.out.println("Enter message you wish to send.");
 inputString = input.readLine();
 System.out.println("Encrypting the message: " + inputString);
System.out.println("The message in bytes is:: " + bToS(inputString.getBytes()));  //
encryption
 byte[] cipher = rsa.encryptMessage(inputString.getBytes()); //
decryption
 byte[] plain = rsa.decryptMessage(cipher);
 System.out.println("Decrypting Bytes: " + bToS(plain));
 System.out.println("Plain message is: " + new String(plain));  }

 private static String bToS(byte[] cipher)
 {
 String temp = "";
 for (byte b : cipher)
 {
 temp += Byte.toString(b);
 }
 return temp;
}

// Encrypting the message
 public byte[] encryptMessage(byte[] message)
 {
```

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

// Decrypting the message
public byte[] decryptMessage(byte[] message)
{
return (new BigInteger(message)).modPow(d, N).toByteArray();
}
}
```

OUTPUT:

```
Enter message you wish to send.
Harish
\Encrypting the message: Harish
The message in bytes is:: 6511097110116104
Decrypting Bytes: 6511097110116104
Plain message is: Harish
```

Aim & Algorithm	
Program & Execution	
Experiment & Results	
Viva	
Total	

RESULT:

Thus the RSA algorithm has been implemented using HTML & CSS and theoutput has been verified successfully.

Ex. No : 6 Date :	Digital Signature Standard

AIM:

To implement the SIGNATURE SCHEME - Digital Signature Standard.

ALGORITHM:

1. Create a KeyPairGenerator object.
2. Initialize the KeyPairGenerator object.
3. Generate the KeyPairGenerator. ...
4. Get the private key from the pair.
5. Create a signature object.
6. Initialize the Signature object.
7. Add data to the Signature object
8. Calculate the Signature

PROGRAM:

```
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
Harish
Digital signature for given text:
0=L{)<G=gq;eCk qi;8KS;:Y

Aim & Algorithm	
Program & Execution	
Experiment & Results	
Viva	
Total	

RESULT:

Thus the Digital Signature Standard Signature Scheme has been implemented and the output has been verified successfully.

Ex. No : 7 Date :	Demonstration of Intrusion Detection System(IDS)

AIM:

To demonstrate Intrusion Detection System (IDS) using Snort software tool.

STEPS ON CONFIGURING AND INTRUSION DETECTION:

1. Download Snort from the Snort.org website. (http://www.snort.org/snort-downloads)
2. Download Rules(https://www.snort.org/snort-rules). You must register to get therules. (You should download these often)
3. Double click on the .exe to install snort. This will install snort in the "C:\Snort"folder.It is important to have WinPcap (https://www.winpcap.org/install/) installed
4. Extract the Rules file. You will need WinRAR for the .gz file.
5. Copy all files from the "rules" folder of the extracted folder. Now paste therules into *"C:\Snort\rules"* folder.
6. Copy "snort.conf" file from the "etc" folder of the extracted folder. You mustpaste it into "C:\Snort\etc" folder. Overwrite any existing file. Remember if you modify your snort.conf file and download a new file, you must modify it forSnort to work.
7. Open a command prompt (cmd.exe) and navigate to folder "C:\Snort\bin"folder. (at the Prompt, type cd\snort\bin)
8. To start (execute) snort in sniffer mode use following command:snort -dev -i 3

   -i indicates the interface number. You must pick the correct interface number. Inmy case, It is 3.
   -dev is used to run snort to capture packets on your network.

   To check the interface list, use following command:
   snort -W

Finding an interface

You can tell which interface to use by looking at the Index number and findingMicrosoft. As you can see in the above example, the other interfaces are for VMWare. My interface is 3.

9. To run snort in IDS mode, you will need to configure the file “snort.conf”according to your network environment.

10. To specify the network address that you want to protect in snort.conf file, lookfor the following line.

var HOME_NET 192.168.1.0/24 (You will normally see any here)

11. You may also want to set the addresses of DNS_SERVERS, if you have someon your network.

Example:

example snort

12. Change the RULE_PATH variable to the path of rules folder.var RULE_PATH c:\snort\rules

Path to rules

13. Change the path of all library files with the name and path on your system. andyou must change the pathof snort_dynamicpreprocessorvariable. C:\Snort\lib\snort_dynamiccpreprocessor

You need to do this to all library files in the “C:\Snort\lib” folder. The old path might be: “/usr/local/lib/…”. you will need to replace that path with your system

path. Using C:\Snort\lib

14. Change the path of the “dynamicengine” variable value in the “snort.conf”file..

Example:

dynamicengine C:\Snort\lib\snort_dynamicengine\sf_engine.dll

15. Add the paths for “include classification.config” and “include reference.config”files.
include c:\snort\etc\classification.configinclude c:\snort\etc\reference.config

16. Remove the comment (#) on the line to allow ICMP rules, if it is commentedwith a #.

include $RULE_PATH/icmp.rules

17. You can also remove the comment of ICMP-info rules comment, if it iscommented.

include $RULE_PATH/icmp-info.rules

18. To add log files to store alerts generated by snort, search for the “output log”test in snort.conf and add the following line:

output alert_fast: snort-alerts.ids

19. Comment (add a #) the whitelist $WHITE_LIST_PATH/white_list.rules andthe blacklist

Change the nested_ip inner , \ to nested_ip inner #, \

20. Comment out (#) following lines:#preprocessor normalize_ip4

#preprocessor normalize_tcp: ips ecn stream
#preprocessor normalize_icmp4
#preprocessor normalize_ip6
#preprocessor normalize_icmp6

21. Save the “snort.conf” file.

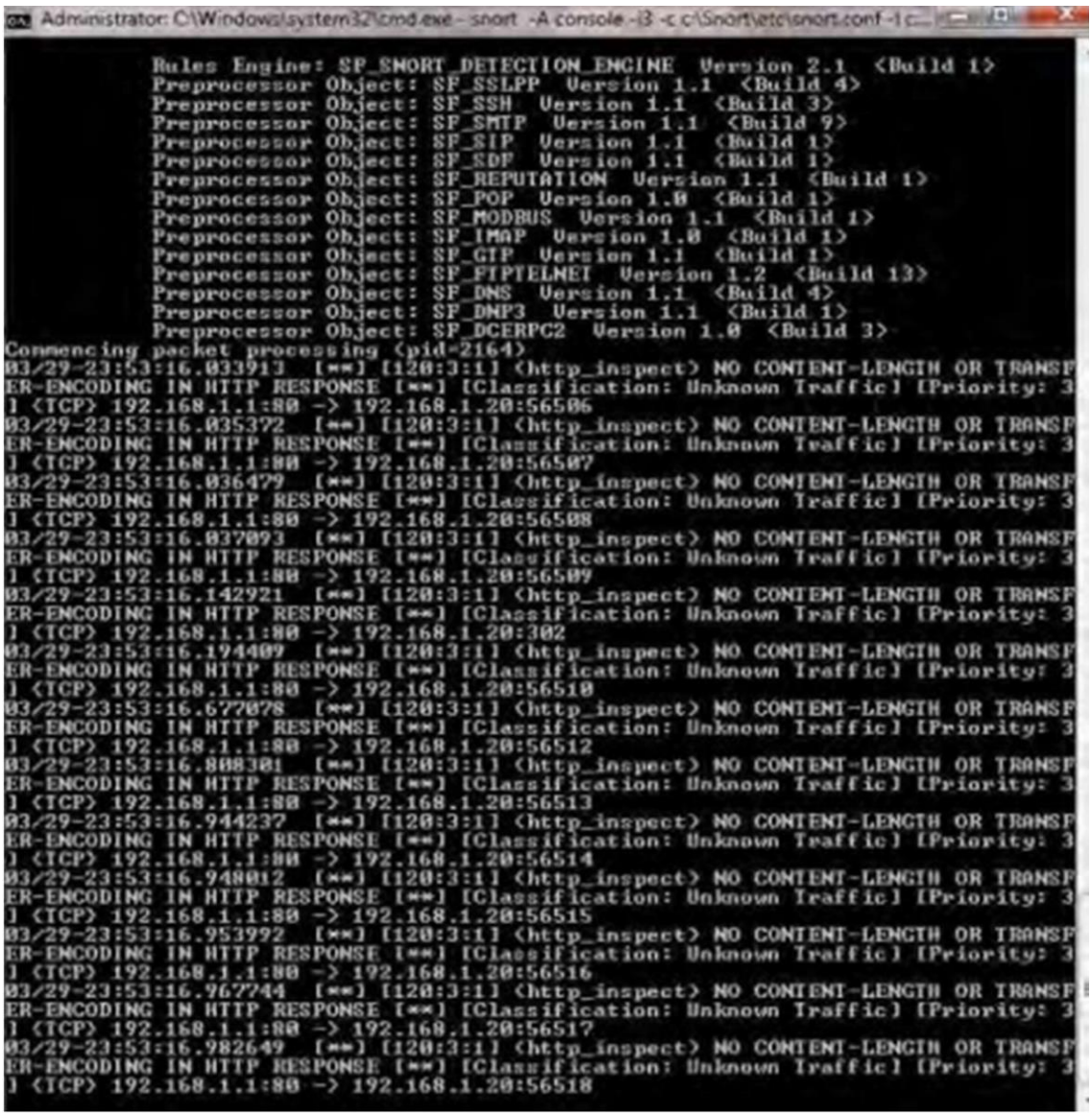
22. To start snort in IDS mode, run the following command: snort -c c:\snort\etc\snort.conf -l c:\snort\log -i 3(Note: 3 is used for my interface card) If a log is created, select the appropriate program to open it. You can use WordPard or NotePad++ to read the file.

To generate Log files in ASCII mode, you can use following command whilerunning snort in IDS mode:
snort -A console -i3 -c c:\Snort\etc\snort.conf -l c:\Snort\log -K ascii

23. Scan the computer that is running snort from another computer by using PINGor NMap (ZenMap).

After scanning or during the scan you can check the snort-alerts.ids file in the log folder to insure it is logging properly. You will see IP address folders appear.

Snort monitoring traffic –



Aim & Algorithm	
Program & Execution	
Experiment & Results	
Viva	
Total	

RESULT:

Thus the Intrusion Detection System(IDS) has been demonstrated by using the Open Source Snort Intrusion Detection Tool.

Ex. No : 8 Date :	Demonstration of Intrusion Detection System(IDS)

AIM:

To calculate the Message Digest of a text using SHA-1 algorithm

ALGORITHM:

SHA-1 works by feeding a message as a bit string of length less than 2^{64}264 bits, and producing a 160-bit hash value known as a *message digest*. Note that the message below is represented in hexadecimal notation for compactness.

PROGRAM:

```
// Java program to calculate SHA-1 hash value

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

public class GFG {
    public static String encryptThisString(String input)
    {
            try {
                    // getInstance() method is called with algorithm SHA-1
                    MessageDigest md = MessageDigest.getInstance("SHA-1");

                    // digest() method is called
                    // to calculate message digest of the input string
                    // returned as array of byte
                    byte[] messageDigest = md.digest(input.getBytes());

                    // Convert byte array into signum representation
                    BigInteger no = new BigInteger(1, messageDigest);

                    // Convert message digest into hex value
                    String hashtext = no.toString(16);

                    // Add preceding 0s to make it 32 bit
                    while (hashtext.length() < 32) {
                            hashtext = "0" + hashtext;
                    }
```

```
            // return the HashText
            return hashtext;
        }

        // For specifying wrong message digest algorithms
        catch (NoSuchAlgorithmException e) {
            throw new RuntimeException(e);
        }
    }

    // Driver code
    public static void main(String args[]) throws
                                                    NoSuchAlgorithmException
    {

        System.out.println("HashCode Generated by SHA-1 for: ");

        String s1 = "KPR";
        System.out.println("\n" + s1 + " : " + encryptThisString(s1));

        String s2 = "Harish ";
        System.out.println("\n" + s2 + " : " + encryptThisString(s2));
    }
}
```

OUTPUT:

HashCode Generated by SHA-1 for:

KPR : 89eebce68fa116a31805550540abbeae9529e7ce

Harish : ee626494f3fb0019862a1c017262bd6f1eb19f5f

Aim & Algorithm	
Program & Execution	
Experiment & Results	
Viva	
Total	

RESULT:

Thus, to Calculate the Message Digest of a text using SHA-1 algorithm has been executed Succesfully.

Ex. No : 9 Date :	Case Study – MD5 Algorithm

AIM:

Real-time case study on MD5 Algorithm.

CASE STUDY:

Introduction:

Since the invention of computers, keeping information in databases rather than on paper documents has been more productive. The true passwords, which are frequently kept in the secret databases of the firm, are generally compared to the input passwords to validate them in web applications that need user authentication. If the database and subsequently these passwords were to be hacked, the attackers would have unrestricted access to the personal information of these people. Today, databases utilize a hash technique to protect the passwords they save, but security flaws still exist. A "secure" hash function should be able to fend against collision and pre-image assaults. The most often used hash function is the MD5 method.

The Challenges:

Digital signatures, password authentication, and other industries frequently use the MD5 algorithm. The security of the password stored in the database as an MD5 information abstract value is at risk due to both dictionary attacks from hackers and the possibility that MD5 will be cracked. The values of the computed information abstract should be the same since the primary method of attacking MD5 is through collision attacks, which require the discovery of two distinct types of beginning information. Assume, for instance, that one kind of starting information (M1) calculates the value of information abstract as H by MD5 algorithm. If the other type of beginning information (M2) is found, the value of information abstract by MD5 algorithm is still H, meaning that M1 and M2 are a pair of collisions. The technique of checking for collisions is called deciphering MD5. Passwords stored in databases as MD5 information abstract values will be vulnerable once MD5 is cracked. Otherwise, there are three ways to attack a password that is stored in a database as an abstract value of MD5 information. Start by searching for MD5 information abstract value online. Some websites offer an online look-up service for MD5 values; after entering the MD5 value, if the database has the value, the password value may be quickly found. Utilize MD5 encoding tools next. To decode MD5 using a dictionary setup, there are several specialized programs available. Lastly, employ social engineering to get or reset the users' passwords. Simple MD5 encryption cannot thus be completely secure.

To counter the aforementioned attack, the MD5 algorithm's processing could be switched, or it could use an encryption algorithm, or it could be interfered with by adding information, making the information abstract value processed by MD5 in the database no longer be a straightforward MD5 information abstract value.

The Solution:

Add an alphabetic string with specific content during the MD5 processing to tamper with the data being processed. The user name and system time are supplied as extra pieces of information, and the MD5 algorithm is then run on "user name + password + system time." Even if a hacker is able to comprehend the MD5 method, it is tough for him to fill out a comparison table with a lot of characters from the dictionary set up to crack lots of users' passwords and lessen the likelihood that the password will be cracked. The strategies mentioned above are the most effective ways to boost password security when the MD5 algorithm isn't changed. The MD5 exchange mechanism outlined above might significantly improve the complexity to decrypt the password and boost MD5 security in the password authentication application if any vulnerabilities lead to user password data disclosure.

The Results:

Given that the majority of systems nowadays demand a password-based authentication technique, password storage security is a crucial component of data security. Due to its one-way encryption characteristic, hashing algorithms like MD5 are frequently employed to encrypt plaintext passwords into strings that, theoretically, cannot be decoded by hackers. However, throughout time, the usage of dictionary tables and rainbow tables made assaults conceivable. The MD5 method has fixed the issues with plain code transmission and storage as well as other classic password security issues, but it is still vulnerable to dictionary and collision attacks. More secure techniques are required. This case study has examined how the MD5 2219 algorithm is used in password authentication security and has made recommendations for improving the process of exchanging or interfering MD5 pointed to collision attack and dictionary attack.