



## Class project

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Section: C9A

**A project submitted for Computer Security course –  
CS 433**

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- **Steps to open the project**

1- Unzip the folder.

2- Open the NetBeans program, then go to:

File -> Open Project -> select path of unzip (filetest) Project

3- Now the project is ready for implementation.

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- **Project run steps**

A menu appears to choose whether the user wants encryption (asymmetric encryption (RSA) or hashing

If the user presses:

1- Selects encryption, a new menu appears:

1.1 - encryption option

1.2 - Decryption option

In each menu appears 1 to encrypt/decrypt a .txt text file, such as all.txt 2 to encrypt/decrypt an entire folder, such as test\_RSA

After choosing the option that the user wants, he enters the file name .txt / folder name

Note: The file/folder must be within the project file

Two keys will be generated, a public key and a private key

The public key is used in encryption as public1.pub

The private key is used to decrypt as private1.key

We will enter the name of the public key file when encrypting,  
and private when decrypting

When encrypting the file name.txt

When decrypted the input: file name.encrypted, the output file  
name.decrypted

\*\*\*\*\*

### **If user select hashing:**

The program asks to enter the file name, for example, test\_hash.txt,  
then the user chooses the algorithm SHA-256, SHA-512, and the output  
is test\_hash.msgdigest.

### **Notes:**

- The two algorithms work in the same principle, but the difference between them is the number of bytes.
- Hashing is one-way encryption (encryption only).

## Screenshots for run project

### First: RSA code:

```

1 package asymmetric_hash;
2
3 import java.io.*;
4 import java.nio.file.Files;
5 import java.nio.file.NoSuchFileException;
6 import java.security.*;
7 import java.security.spec.InvalidKeySpecException;
8 import java.security.spec.PKCS8EncodedKeySpec;
9 import java.security.spec.X509EncodedKeySpec;
10 import javax.crypto.Cipher;
11 import java.util.*;
12
13 public class RSA {
14     private PrivateKey privateKey;
15     private PublicKey publicKey;
16     private KeyPair pair;
17     public RSA() {
18         try {
19             KeyPairGenerator generator = KeyPairGenerator.getInstance("RSA");
20             generator.initialize(1024);
21             pair = generator.generateKeyPair();
22             privateKey = pair.getPrivate();
23             publicKey = pair.getPublic();
24             int i = 1;
25             File pri = new File("private"+i+".key");
26             while(pri.exists()) {
27                 i++;
28                 pri = new File("private"+i+".key");
29             }
30             FileOutputStream out = new FileOutputStream("private"+i+".key");
31             out.write(privateKey.getEncoded());
32             out.close();
33             File pub = new File("public"+i+".key");
34             while(pub.exists()) {
35                 i++;
36                 pub = new File("public"+i+".pub");
37             }
38             FileOutputStream out1 = new FileOutputStream("public"+i+".pub");
39             out1.write(publicKey.getEncoded());
40             out1.close();
41         } catch (Exception e) {
42             System.out.println("Error: " + e.toString());
43         }
44     }
45 }

```

```

46 } catch (Exception e) {
47     System.out.println("Error: " + e.toString());
48 }
49
50 public static void encrypt(String filename, PublicKey p) throws Exception {
51     try {
52         Cipher encryptCipher = Cipher.getInstance("RSA/ECB/PKCS1Padding");
53         encryptCipher.init(Cipher.DIRECT_MODE, p);
54         FileOutputStream newf = new FileOutputStream(filename.replace(".txt", "")+".encrypted");
55         byte[] input_file = Files.readAllBytes(new File(filename).toPath());
56         byte[] cipherText = encryptCipher.doFinal(input_file);
57         byte[] encodedBytes = Base64.getEncoder().encode(cipherText);
58         newf.write(encodedBytes);
59         newf.close();
60         System.out.println("-----");
61         System.out.println("Done! File "+filename+" is encrypted using RSA.");
62         System.out.println("Output file is "+filename.replace(".txt", "")+".encrypted");
63         System.out.println("-----");
64     } catch (NoSuchAlgorithmException e) {
65         System.out.println();
66         System.out.println("File not found!");
67         System.out.println("Please make sure to write the full file name with the extension");
68     } catch (FileNotFoundException e) {
69         System.out.println("Maybe you misspelled the folder name...");
70     } catch (Exception e) {
71         System.out.println();
72     }
73 }
74
75 public static void decrypt(String filename, PrivateKey p) throws Exception {
76     try {
77         if(filename.contains(".encrypted")){
78             FileOutputStream newf = new FileOutputStream(filename.replace(".encrypted", "")+".decrypted");
79             byte[] input_file = Files.readAllBytes(new File(filename).toPath());
80             byte[] bytes = Base64.getDecoder().decode(input_file);
81             Cipher decryptCipher = Cipher.getInstance("RSA/ECB/PKCS1Padding");
82             decryptCipher.init(Cipher.DIRECT_MODE, p);
83             byte[] encodedBytes = decryptCipher.doFinal(bytes);
84             newf.write(encodedBytes);
85             newf.close();
86             System.out.println("-----");
87             System.out.println("Done! File "+filename+" is decrypted using RSA.");
88             System.out.println("Output file is "+filename.replace(".encrypted", "")+".decrypted");
89             System.out.println("-----");
90         }
91     } catch (NoSuchAlgorithmException e) {
92         System.out.println();
93     }
94 }

```

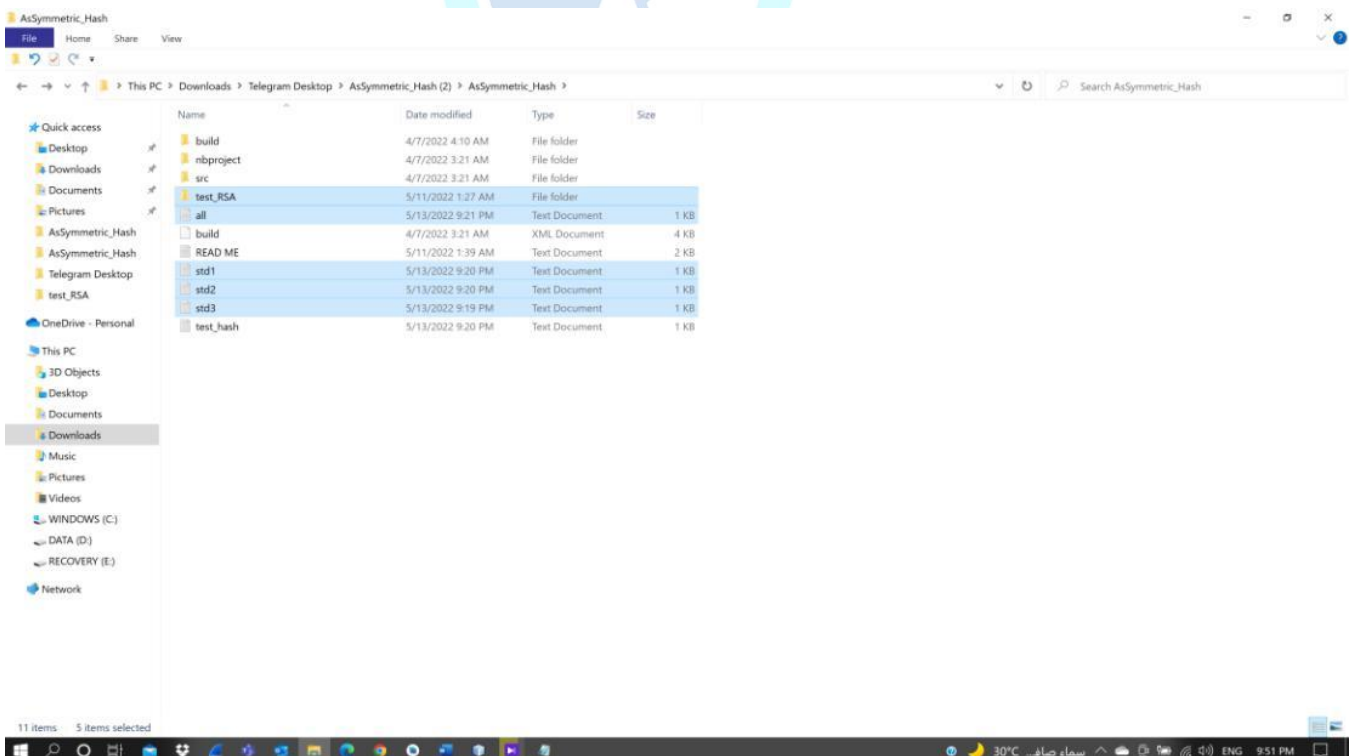
```

82  byte[] input_file = Files.readAllBytes(new File(filename).toPath());
83  byte[] bytes = Base64.getDecoder().decode(input_file);
84  Cipher decipherCipher = Cipher.getInstance("RSA/ECB/PKCS1Padding");
85  decipherCipher.init(Cipher.DECRYPT_MODE, p);
86  byte[] encodedBytes = decipherCipher.doFinal(bytes);
87  newf.write(encodedBytes);
88  newf.close();
89  System.out.println("=====");
90  System.out.println("Input File " + filename + " is decrypted using RSA");
91  System.out.println("Output File is " + filename.replace("encrypted", "") + ".decrypted");
92  System.out.println("=====");
93
94  catch (NoSuchAlgorithmException e) {
95      System.out.println();
96      System.out.println("File not found!");
97      System.out.println("Please make sure to write the full file name with the extension");
98  }
99  catch (NullPointerException e) {
100     System.out.println("Maybe you misspelled the folder name...");
101     catch (Exception e) {
102         System.out.println();
103     }
104 }
105
106
107 public static PublicKey get_public(String pub) throws NoSuchAlgorithmException, IOException, NoSuchProviderException, InvalidKeySpecException {
108     byte[] keyBytes = Files.readAllBytes(new File(pub).toPath());
109     X509EncodedKeySpec spec = new X509EncodedKeySpec(keyBytes);
110     KeyFactory kf = KeyFactory.getInstance("RSA");
111     return kf.generatePublic(spec);
112 }
113
114 public static PrivateKey get_private(String privet) throws NoSuchAlgorithmException, IOException, NoSuchProviderException, InvalidKeySpecException {
115     byte[] keyBytes = Files.readAllBytes(new File(privet).toPath());
116     PKCS8EncodedKeySpec spec = new PKCS8EncodedKeySpec(keyBytes);
117     KeyFactory kf = KeyFactory.getInstance("RSA");
118     return kf.generatePrivate(spec);
119 }
120
121
122
123

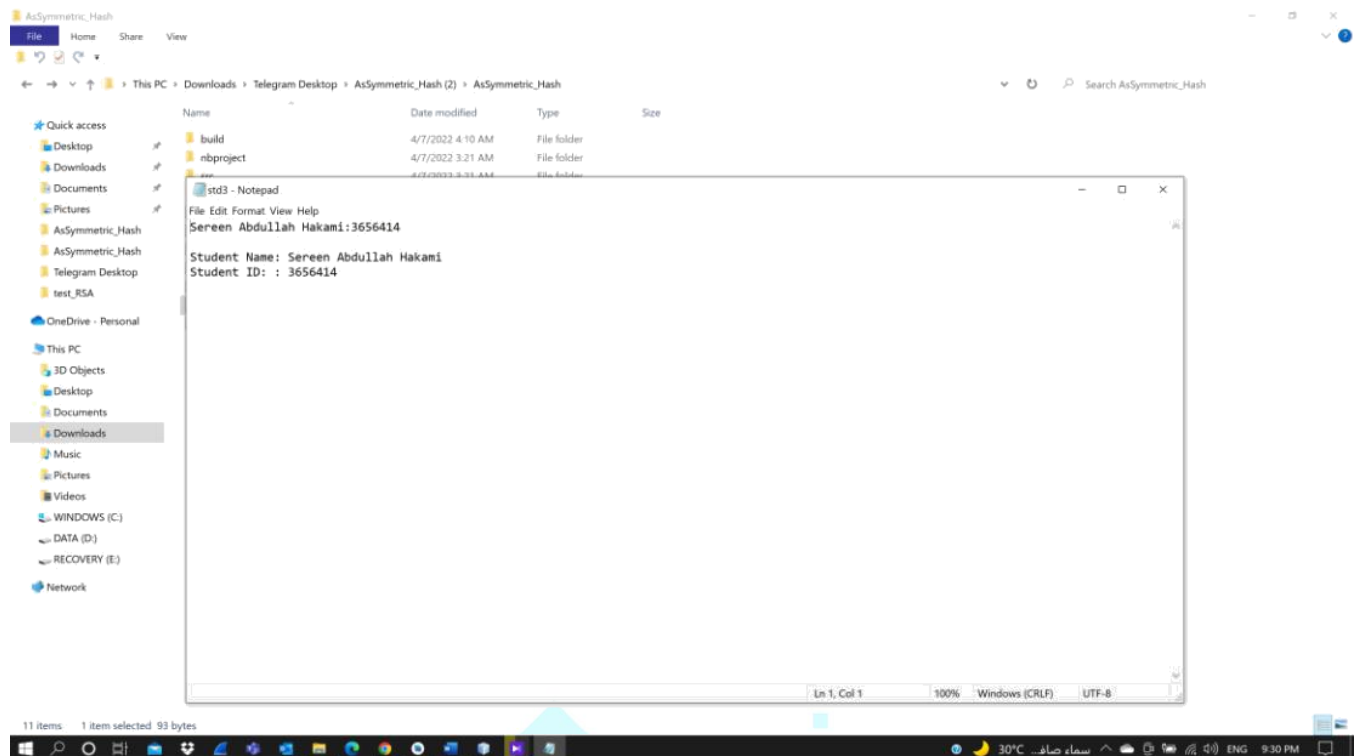
```

**Run code:**

**Before RSA Algorithm running:**

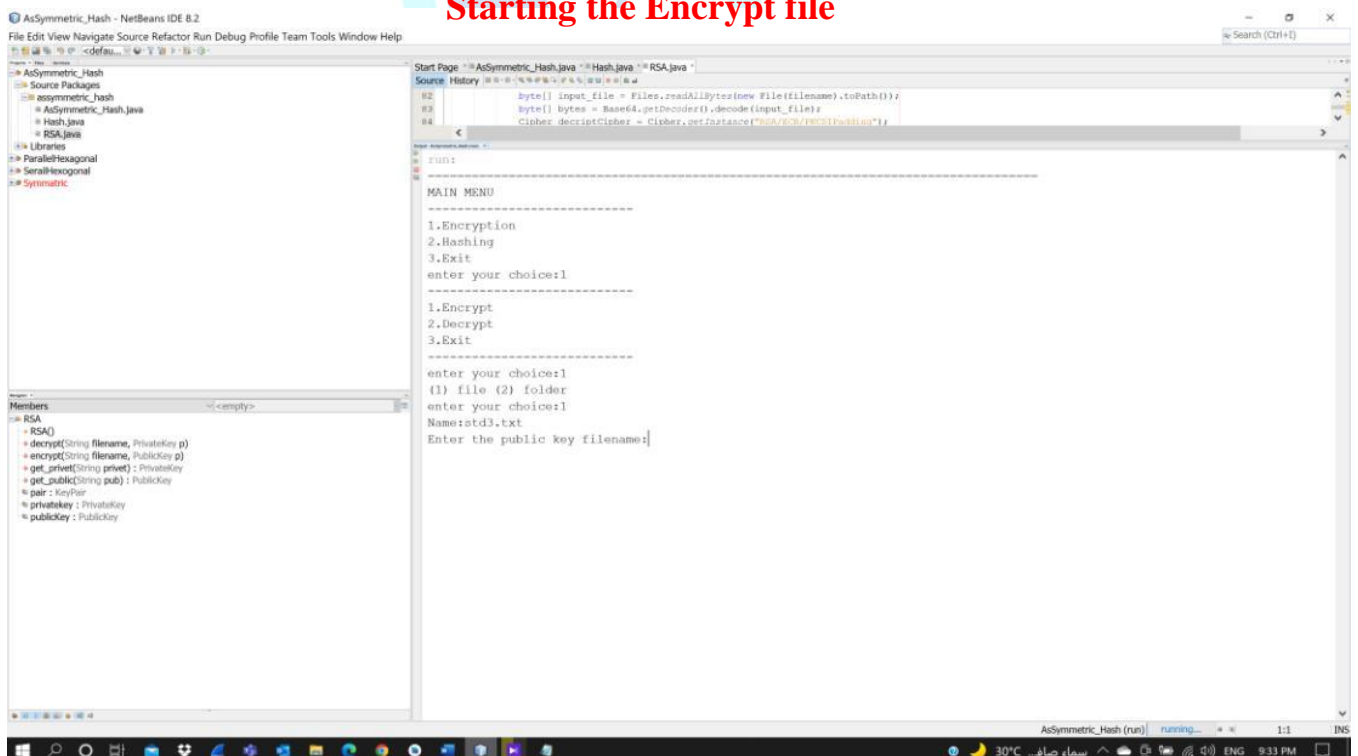


**These are the files and the folder to which we will apply the encryption and decryption algorithm**

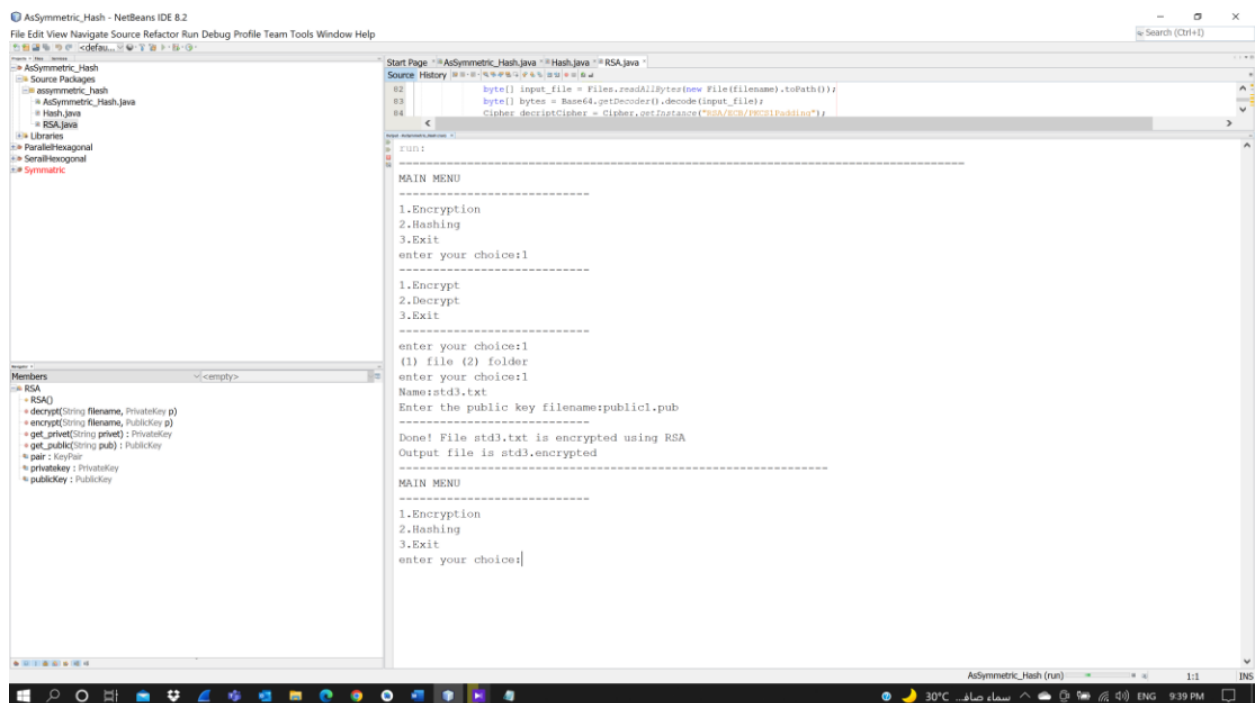
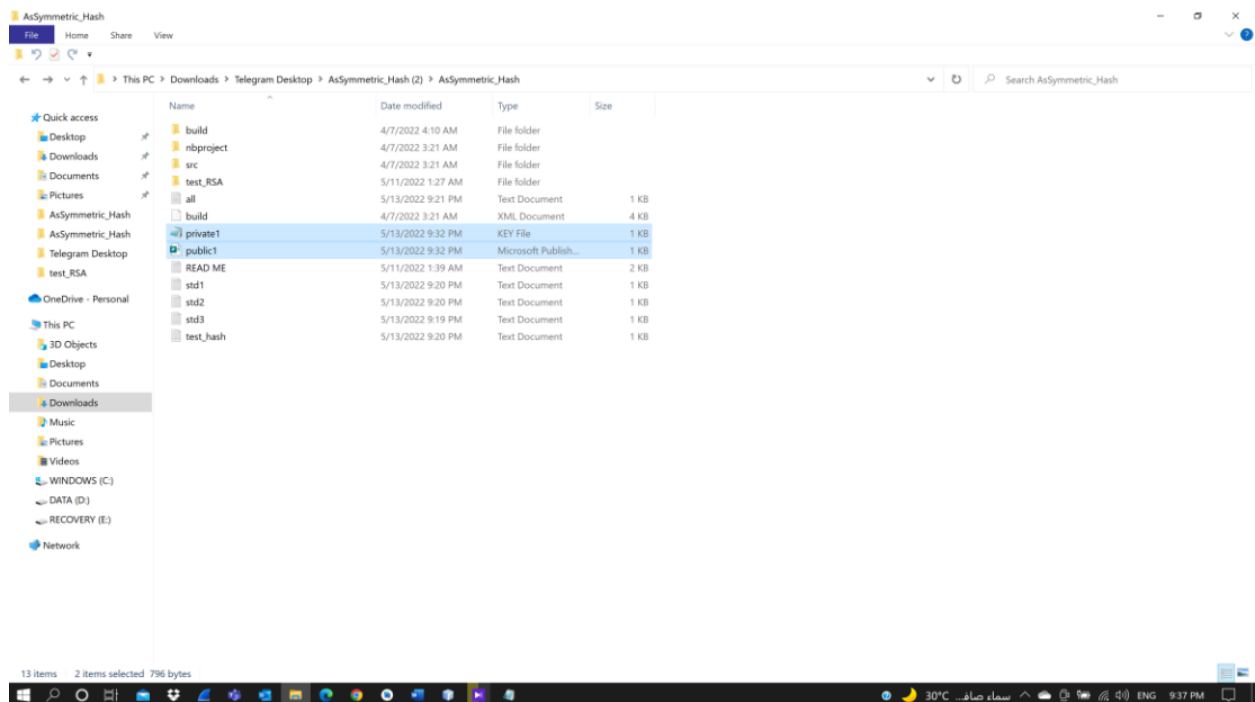


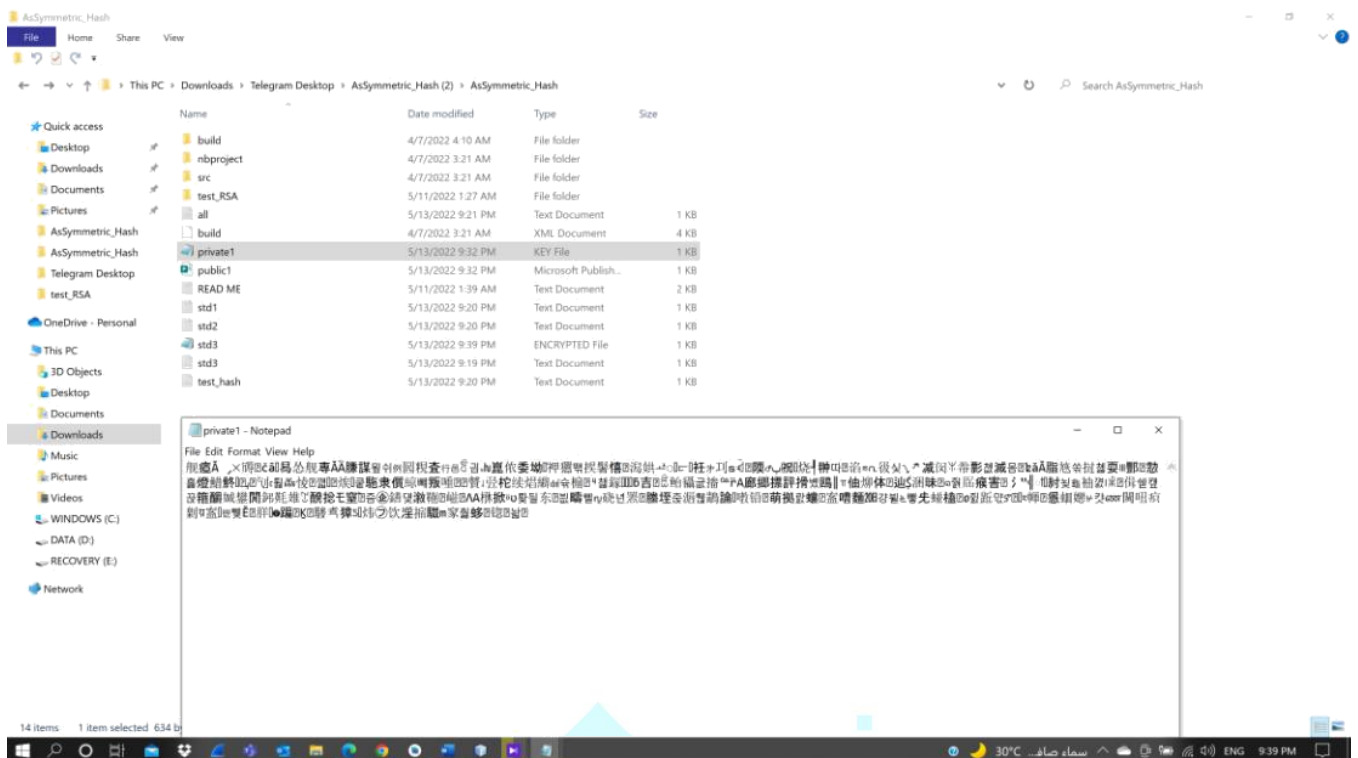
**We will apply encryption and decryption to a file named std3**

**Starting the Encrypt file**

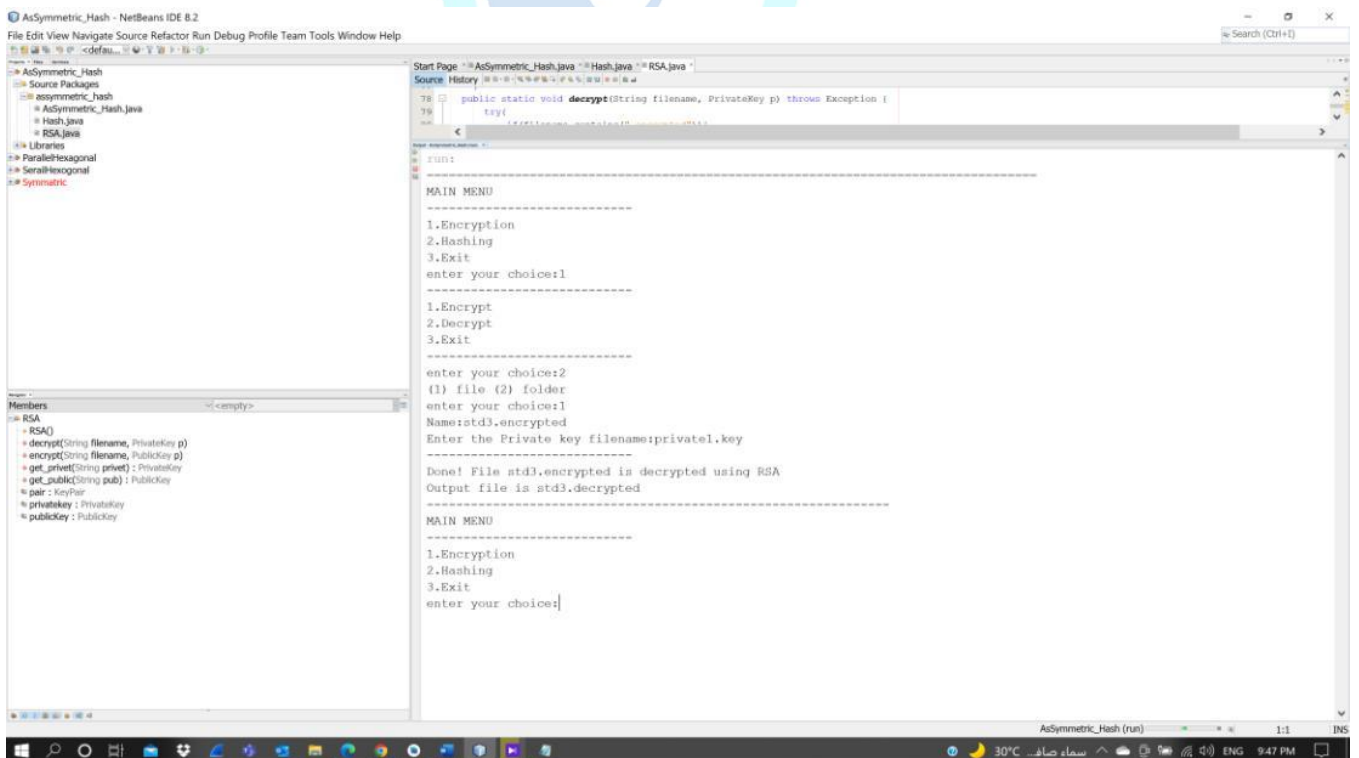


**When encrypt the file we can see it has created a key file name (Private key and public Key)**



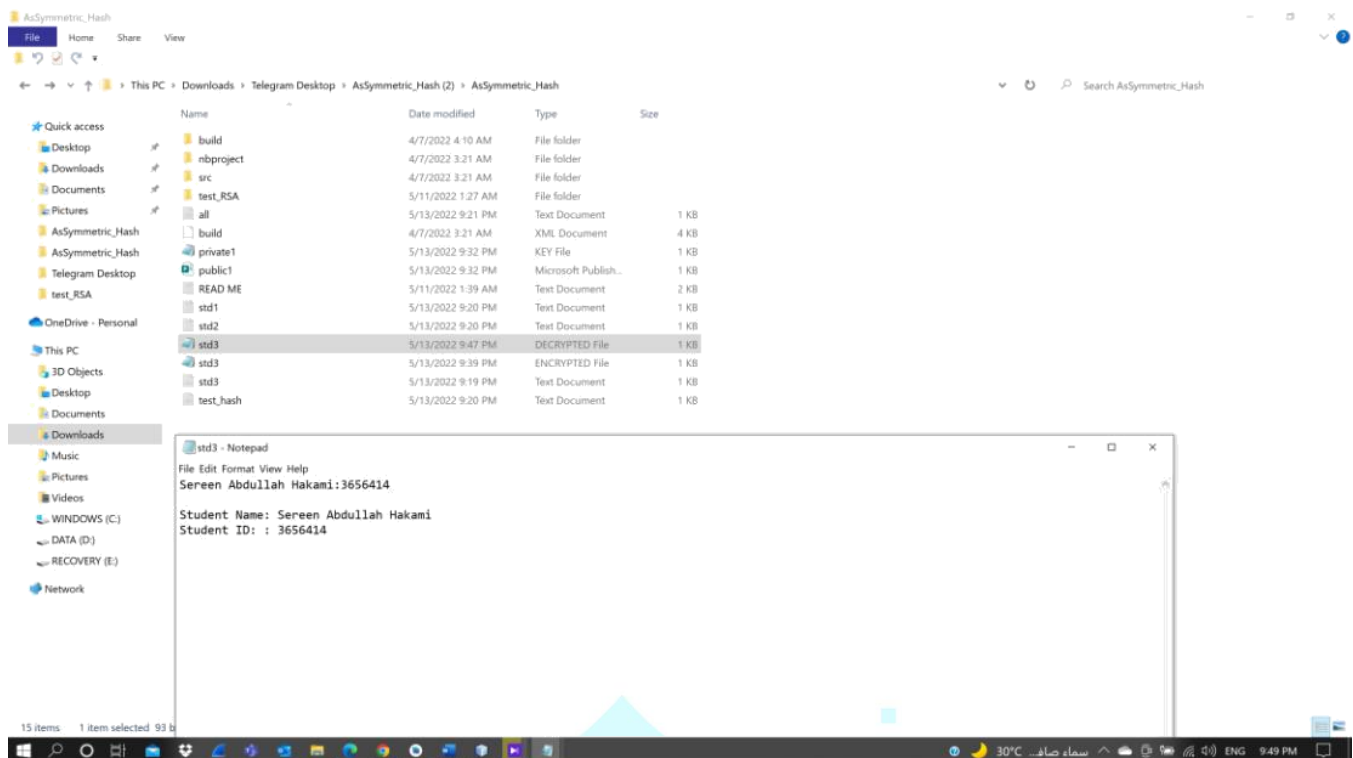


**After doing the encryption using the public key, we notice that the text in the file has been encrypted**



**Now we are using the decrypt with the private key to open the encrypted file**





File Explorer window showing the contents of the 'AsSymmetric\_Hash' folder. The folder contains the following items:

Name	Date modified	Type	Size
build	4/7/2022 4:10 AM	File folder	
nbproject	4/7/2022 3:21 AM	File folder	
src	4/7/2022 3:21 AM	File folder	
test_RSA	5/11/2022 1:27 AM	File folder	
all	5/13/2022 9:21 PM	Text Document	1 KB
build	4/7/2022 3:21 AM	XML Document	4 KB
private1	5/13/2022 9:32 PM	KEY File	1 KB
public1	5/13/2022 9:32 PM	Microsoft Publish...	1 KB
READ ME	5/11/2022 1:39 AM	Text Document	2 KB
std1	5/13/2022 9:20 PM	Text Document	1 KB
std2	5/13/2022 9:20 PM	Text Document	1 KB
std3	5/13/2022 9:47 PM	DECRYPTED File	1 KB
std3	5/13/2022 9:39 PM	ENCRYPTED File	1 KB
std3	5/13/2022 9:19 PM	Text Document	1 KB
test_hash	5/13/2022 9:20 PM	Text Document	1 KB

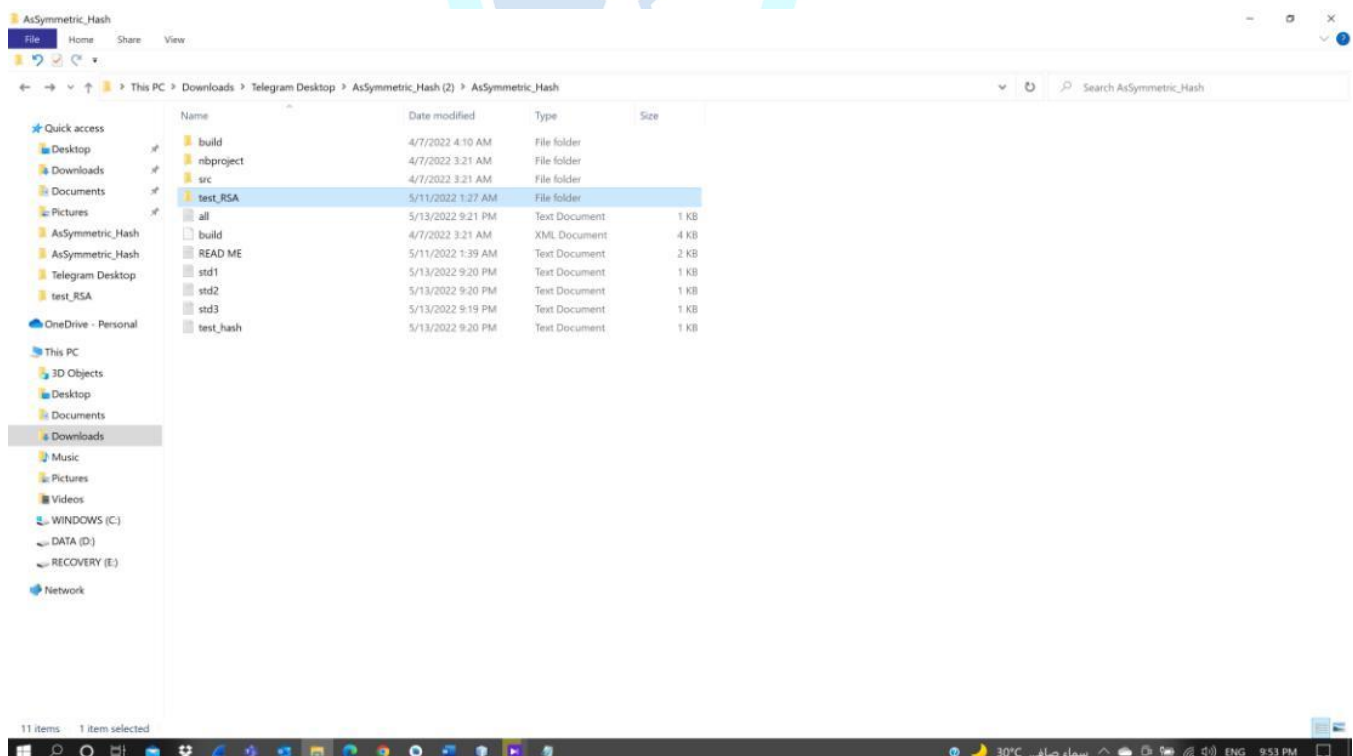
A Notepad window is open, displaying the following text:

```

File Edit Format View Help
Sereen Abdullah Hakami:3656414

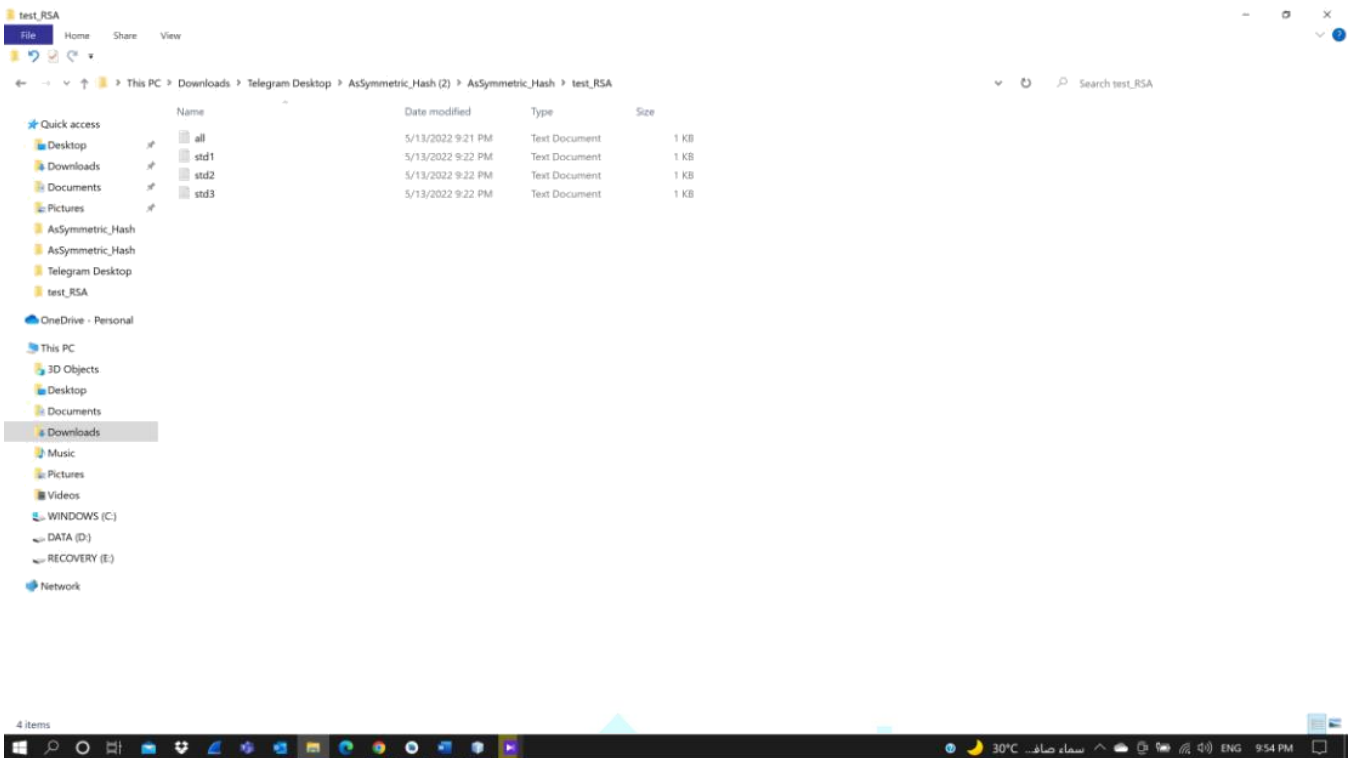
Student Name: Sereen Abdullah Hakami
Student ID: : 3656414
  
```

**Starting the Encrypt folder**

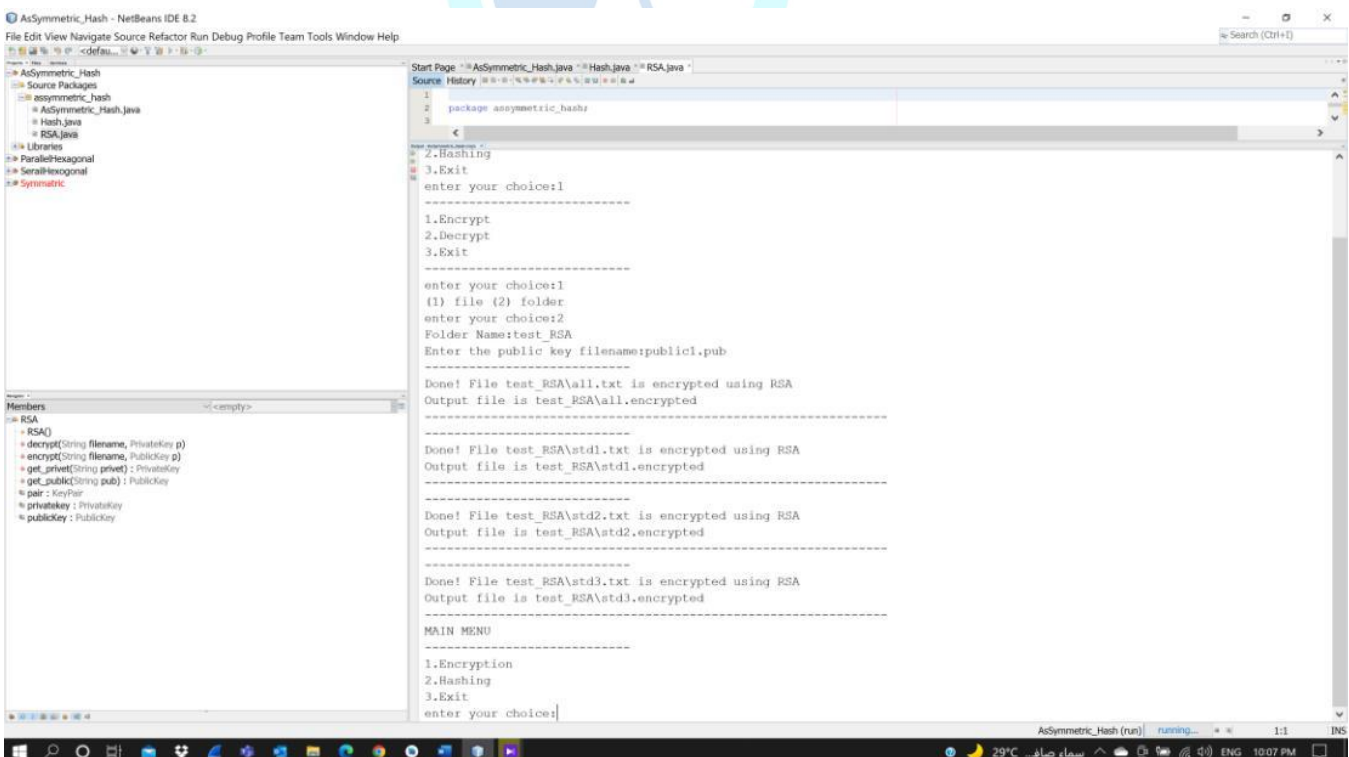


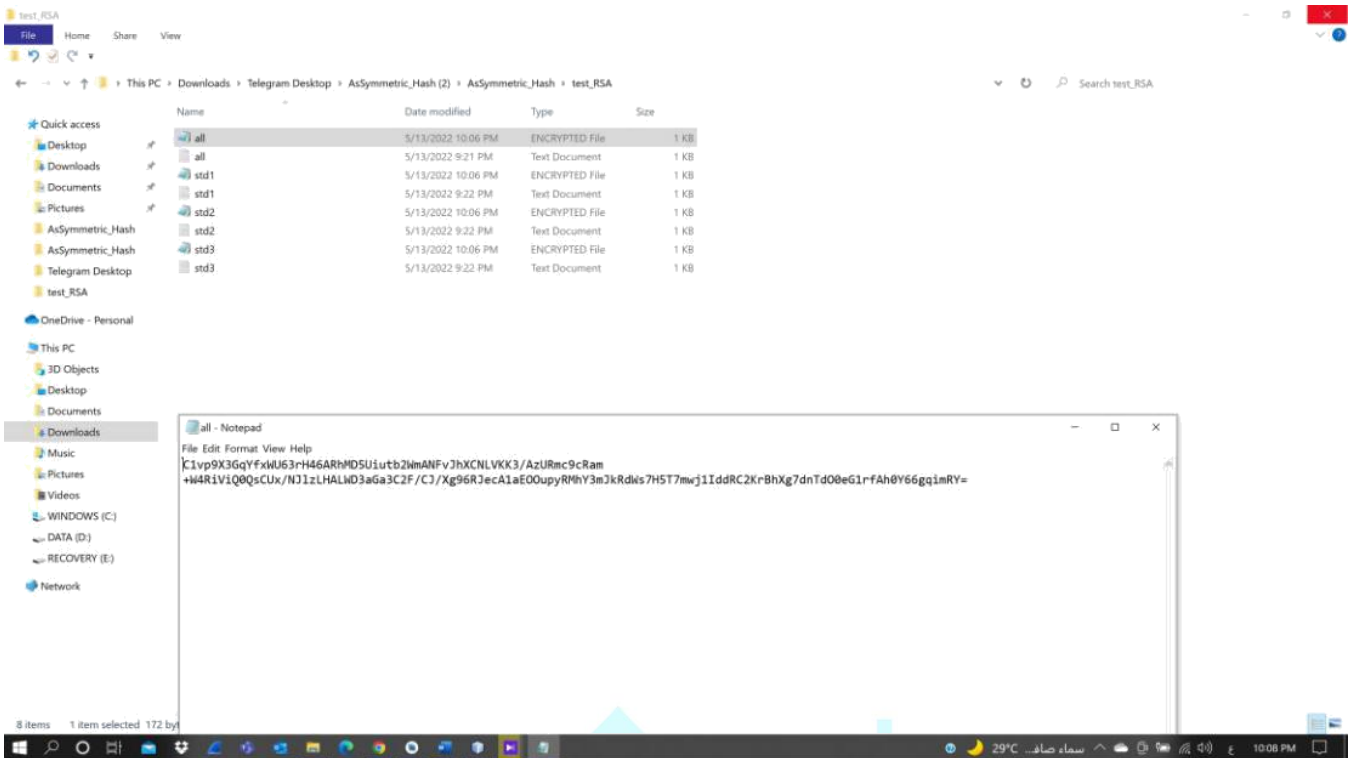
File Explorer window showing the contents of the 'AsSymmetric\_Hash' folder. The folder contains the following items:

Name	Date modified	Type	Size
build	4/7/2022 4:10 AM	File folder	
nbproject	4/7/2022 3:21 AM	File folder	
src	4/7/2022 3:21 AM	File folder	
test_RSA	5/11/2022 1:27 AM	File folder	
all	5/13/2022 9:21 PM	Text Document	1 KB
build	4/7/2022 3:21 AM	XML Document	4 KB
READ ME	5/11/2022 1:39 AM	Text Document	2 KB
std1	5/13/2022 9:20 PM	Text Document	1 KB
std2	5/13/2022 9:20 PM	Text Document	1 KB
std3	5/13/2022 9:19 PM	Text Document	1 KB
test_hash	5/13/2022 9:20 PM	Text Document	1 KB

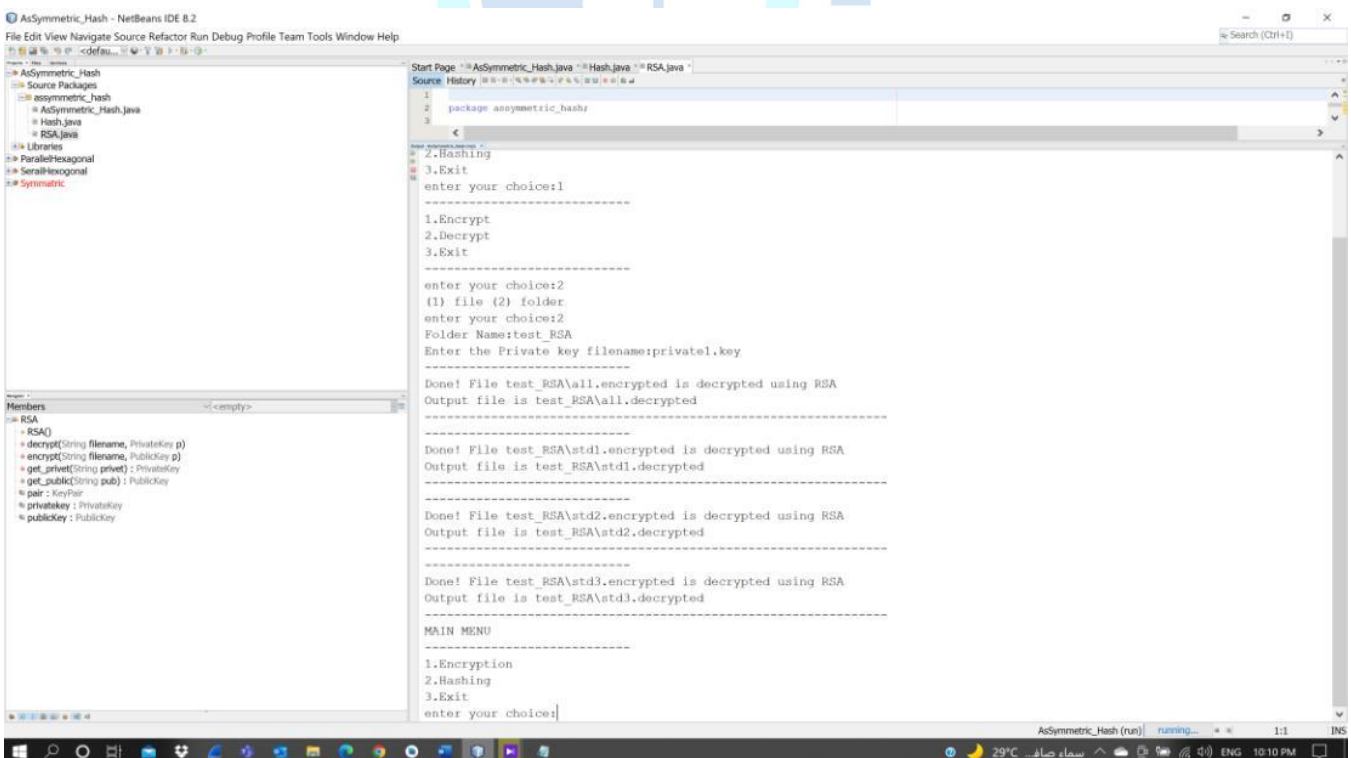


**We will now encrypt and decrypt the folder named (test\_RSA), which contains 4 files inside**





**We can see that all the files inside the folder have been encrypted**



**Now we take the opposite step, decryption**



The image shows a Windows File Explorer window. The title bar at the top reads 'test\_RSA'. Below the title bar are tabs for 'File', 'Home', 'Share', and 'View'. The address bar shows the path: 'This PC > Downloads > Telegram Desktop > AsSymmetric\_Hash (2) > AsSymmetric\_Hash > test\_RSA'. The left sidebar shows the 'Downloads' folder selected. The main pane displays a list of files with columns for Name, Date modified, Type, and Size. The files are: 'all' (5/13/2022 10:10 PM, DECRYPTED File, 1 KB), 'all' (5/13/2022 10:06 PM, ENCRYPTED File, 1 KB), 'all' (5/13/2022 9:21 PM, Text Document, 1 KB), 'std1' (5/13/2022 10:10 PM, DECRYPTED File, 1 KB), 'std1' (5/13/2022 10:06 PM, ENCRYPTED File, 1 KB), 'std1' (5/13/2022 9:22 PM, Text Document, 1 KB), 'std2' (5/13/2022 10:10 PM, DECRYPTED File, 1 KB), 'std2' (5/13/2022 10:06 PM, ENCRYPTED File, 1 KB), 'std2' (5/13/2022 9:22 PM, Text Document, 1 KB), 'std3' (5/13/2022 10:10 PM, DECRYPTED File, 1 KB), 'std3' (5/13/2022 10:06 PM, ENCRYPTED File, 1 KB), and 'std3' (5/13/2022 9:22 PM, Text Document, 1 KB). The status bar at the bottom indicates '12 items', '4 items selected', and '382 bytes'.

## Second: hashing code

The screenshot shows the NetBeans IDE interface with the following components:

- Top Bar:** File Edit View Navigate Source Refactor Run Debug Profile Team Tools Window Help
- Search Bar:** Search (Ctrl+F)
- Left Sidebar (Project Explorer):**
  - Asymmetric\_Hash - NetBeans IDE 8.2
  - Source Packages
    - Asymmetric\_Hash
      - Asymmetric\_Hash.java
      - Hash.java
      - RSA.java
    - Libraries
      - ParallelHexagonal
      - SerialHexagonal
    - Systemic
- Main Editor:** Displays the source code of `Asymmetric_Hash.java`. The code is as follows:

```
1 package asymmetric_hash;
2
3
4 import java.io.File;
5 import java.io.FileInputStream;
6 import java.nio.file.Files;
7 import java.nio.file.NoSuchFileException;
8 import java.security.MessageDigest;
9 import java.security.NoSuchAlgorithmException;
10
11
12 public class Hash
13 {
14
15     public static void hash_File(String filename,String algo)
16     {
17         try{
18             MessageDigest SHA1Digest = MessageDigest.getInstance(algo);
19             FileInputStream new_file = new FileInputStream(filename.replace(".txt", ""+"_msgdigest"));
20             byte[] input_file = Files.readAllBytes(new File(filename).toPath());
21             byte[] digest = SHA1Digest.digest(input_file);
22             new_file.write(digest);
23             new_file.close();
24             System.out.println("-----");
25             System.out.println("Done! The message digest of the file "+filename+" is generated using "+algo);
26             System.out.println("Output file is "+filename.replace(".txt", ""+"_msgdigest");
27             System.out.println("-----");
28         }
29         catch (NoSuchFileException e) {
30             System.out.println();
31             System.out.println("File not found");
32             System.out.println("Please make sure to write the full file name with the extension");
33         }
34         catch (NoSuchAlgorithmException e){
35             System.out.println("No such Algorithm is implementor");
36             System.out.println("catch Exception e");
37             System.out.println(e);
38         }
39     }
40 }
41
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48
49
```
- Bottom Left (Members):** Shows the members of the `Hash` class:
  - Hash
  - hash\_File(String filename, String algo)
- Bottom Right:** Status bar showing 1:1 and INS.

File Edit View Navigate Source Refactor Run Debug Profile Team Tools Window Help

Search (Ctrl+F)

Start Page Asymmetric\_Hash.java Hash.java RSA.java

Source History

```
1 package asymmetric_hash;
2
3
4 import java.io.File;
5 import java.io.FileNotFoundException;
6 import java.io.IOException;
7 import java.security.PrivateKey;
8 import java.security.PublicKey;
9 import java.util.InputMismatchException;
10 import java.util.Scanner;
11
12
13 public class Asymmetric_Hash {
14
15
16     public static void main(String[] args) throws Exception {
17         // TODO code application logic here
18         Scanner s = new Scanner(System.in);
19         int imp_type=1;
20         System.out.println("Enter key type:");
21
22         while(imp_type != 3){
23             try {
24                 System.out.println("RSA or SHA?");
25                 System.out.println("1.RSA");
26                 System.out.println("2.SHA");
27                 System.out.println("3.Exit");
28                 System.out.println("Enter key type:");
29                 imp_type = s.nextInt();
30                 switch(imp_type){
31                     case 1:// RSA
32                         case 1: // RSA
33                             System.out.println("Enter message:");
34                             System.out.println("1.RSA");
35                             System.out.println("2.SHA");
36                             System.out.println("3.Exit");
37                             System.out.println("Enter message:");
38                             System.out.println("1.RSA");
39                             System.out.println("2.SHA");
40                             System.out.println("Enter message:");
41                             int i1 = s.nextInt();
42                             switch(i1){
43                                 case 1:// RSA
44                                     RSA R = new RSA();
45                                     System.out.println("File 01 folder");
46                                     System.out.println("Enter message:");
47                                     int i4 = s.nextInt();
48                                     switch(i4){
```

Members

Asymmetric\_Hash

main(String[] args)

1:1

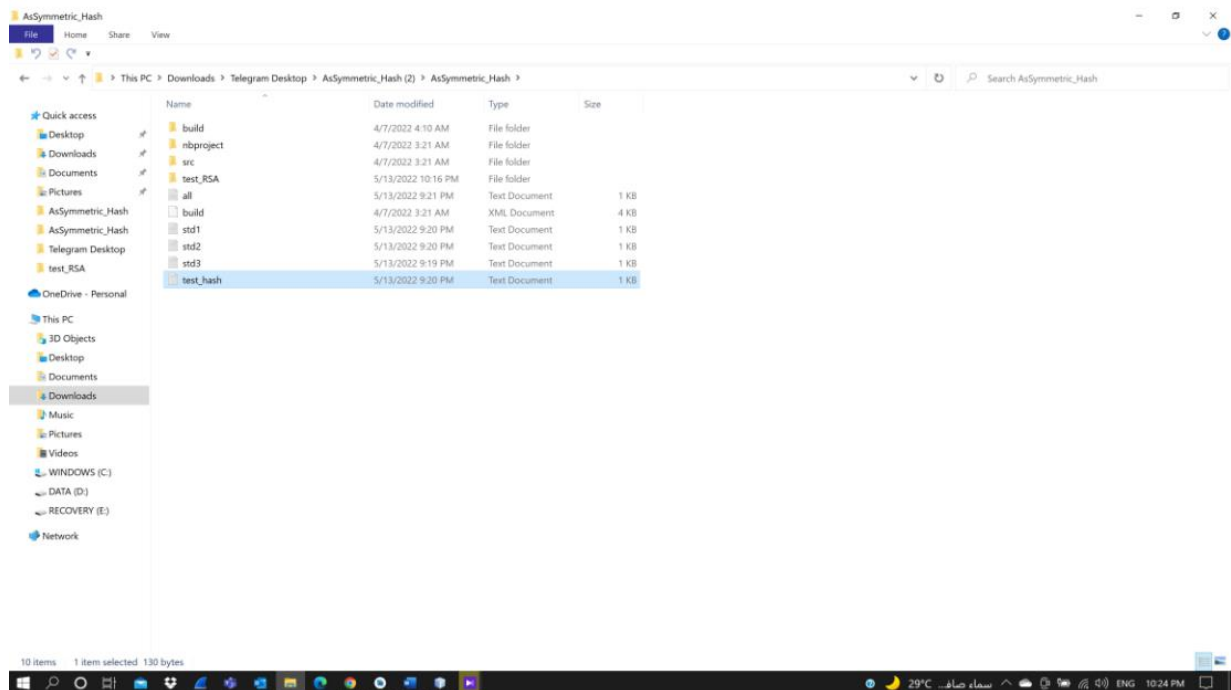
```

ASymmetric_Hash - NetBeans IDE 8.2
File Edit View Navigate Source Refactor Run Debug Profile Team Tools Window Help
Source: ASymmetric_Hash.java Hash.java RSA.java
49
50 switch(t4){
51     case 1://encrypt file
52         System.out.println("Name");
53         String filename = s.next();
54         System.out.println("Enter the public key filename");
55         String pub_key = s.next();
56         PublicKey pub = R.get_public(pub_key);
57         R.encrypt(filename, pub);
58         break;
59     case 2://decrypt folder
60         System.out.println("Folder Name");
61         String foldername = s.next();
62         File dir = new File(foldername);
63         File[] files = dir.listFiles();
64         System.out.println("Enter the public key filename");
65         pub_key = s.next();
66         pub = R.get_public(pub_key);
67         for (int k = 0; k< files.length; k++) {
68             R.encrypt(files[k].toString(), pub);
69         }
70         break;
71     case 3://decrypt file
72         System.out.println("(1) File (2) folder");
73         System.out.println("Enter your choice");
74         int t5 = s.nextInt();
75         switch(t5){
76             case 1://decrypt file
77                 System.out.println("Name");
78                 String filename = s.next();
79                 System.out.println("Enter the private key filename");
80                 String pub_key = s.next();
81                 PrivateKey privet = RSA.get_privet(pub_key);
82                 RSA.decrypt(filename, privet);
83                 break;
84             case 2://decrypt folder
85                 System.out.println("Folder Name");
86                 String foldername = s.next();
87                 File dir = new File(foldername);
88                 File[] files = dir.listFiles();
89                 System.out.println("Enter the private key filename");
90                 pub_key = s.next();
91                 privet = RSA.get_privet(pub_key);
92                 for (int k = 0; k< files.length; k++) {
93                     RSA.decrypt(files[k].toString(), privet);
94                 }
95                 break;
96         }
97     }
98 }
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```

117 // ...
121 }
122 catch (IOException e)
123 {
124     System.out.println("An error occurred.");
125     e.printStackTrace();
126 }
127
128 // ...
129
130 catch (InputMismatchException ex)
131 {
132     System.out.println("=====");
133     System.out.println("Try again ");
134     System.out.println("and choose between 1,2 , 3 ");
135     System.out.println("=====");
136     a.next();
137     continue;
138 }
139
140 // ...
141
142 catch (NullPointerException e)
143 {
144     System.out.println("Please check the folder name..."+a+"for the folder is empty.");
145 }
146 catch (Exception ex)
147 {
148     System.out.println("An error occurred: "+ex);
149 }
150
151 // ...
152
153 // ...
154
155 // ...
156
157 // ...
158

```



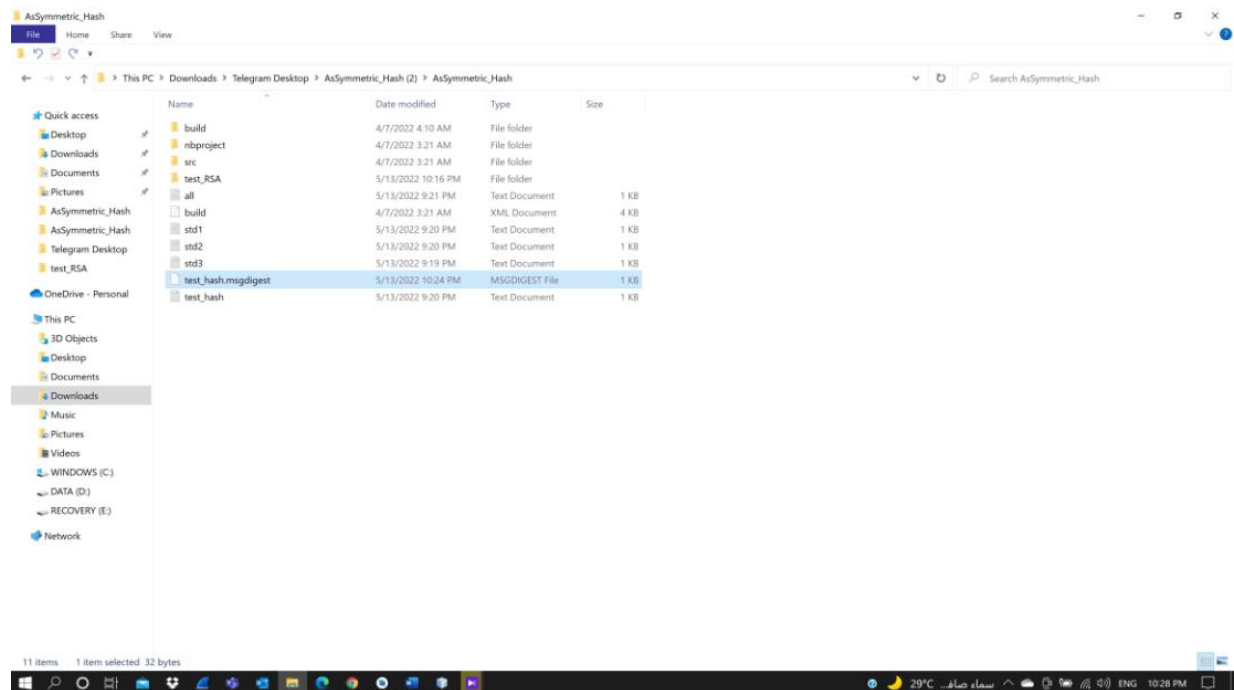
Now we will encrypt this file using the hashing algorithm.

**We will be using first Algorithm (SHA-256)**

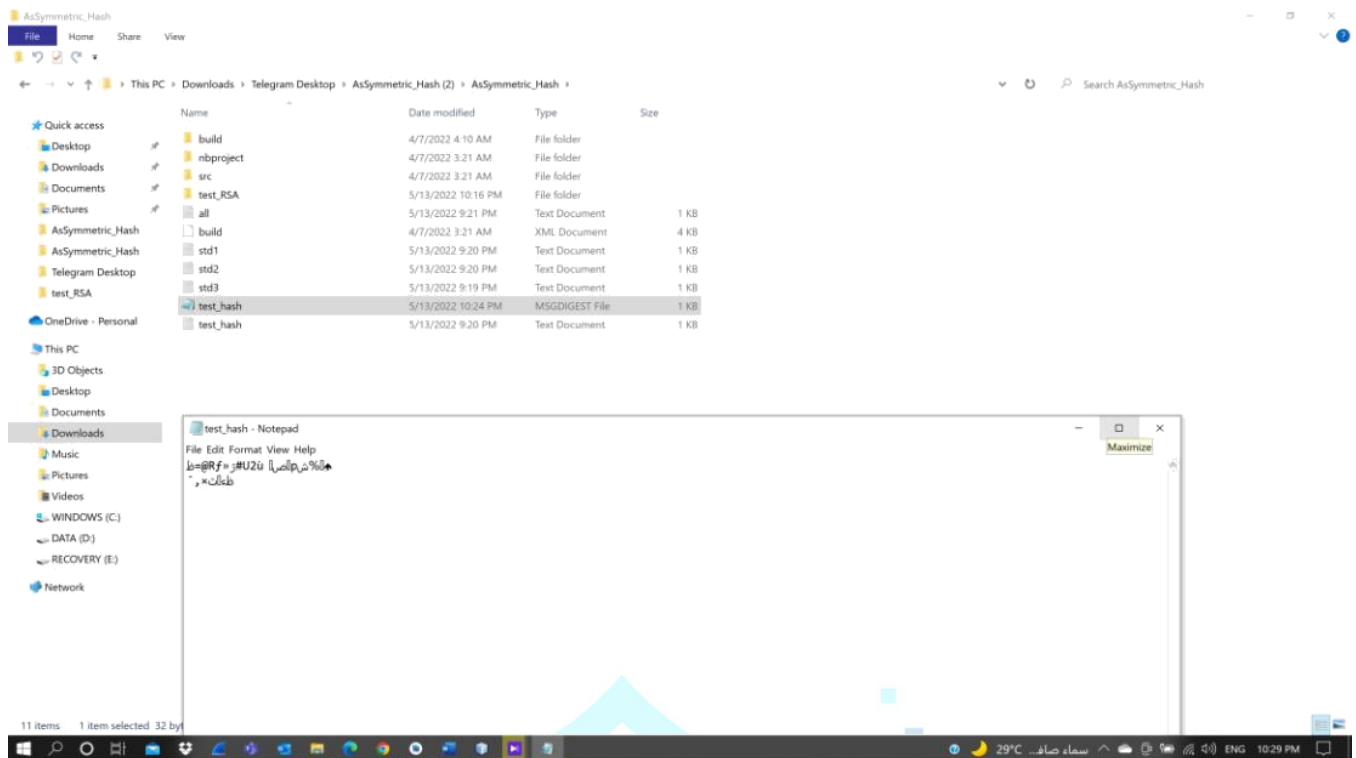
```

Start Page: AsSymmetric_Hash.java, Hash.java, RSA.java
Source: History: C:\Users\user\src\AsSymmetric_Hash.java
119: System.out.println("New TEST DOCUMENT.");
121: e.printStackTrace();
122: catch (IOException e)
123: {
124: }
125: }
126: }

MAIN MENU
-----
1.Encryption
2.Hashing
3.Exit
enter your choice:2
Name: test_hash.txt
Chose the Algorithm (SHA-256, SHA-512): SHA-256
Done! The message digest of the file test_hash.txt is generated using SHA-256
Output file is test_hash.msgdigest
-----
MAIN MENU
-----
1.Encryption
2.Hashing
3.Exit
enter your choice:
  
```







**Now we will use the second Algorithm (SHA-512)**

