

Cryptography lab day-1

Program 1:

Write a program to encrypt and decrypt a message using **Caesar cipher** along with the key

Aim: To write a c program to encrypt and decrypt a message using Caesar cipher along with the key and execute.

Algorithm:

1. Take the message and the key (an integer) as input.
2. Declare a character array to store the message and read the message from the user and store it in the array.
3. Iterate through each character in the message.
4. For each alphabetic character (a-z or A-Z), shift it by the key value.
5. Print the encrypted message.
6. Take the encrypted message and the key as input.
7. Declare a character array to store the decrypted message and read the encrypted message from the user and store it in the array.
8. Iterate through each character in the encrypted message.
9. For each alphabetic character (a-z or A-Z), shift it back by the key value.
10. Print the decrypted message.

Program:

```
#include<stdio.h>
#include<stdlib.h>
#define MAX_LENGTH 100

// Function to encrypt or decrypt the message

int encrypt_decrypt(char *message, int key, int mode) {
    for(; *message; message++) {
        char ch = *message;
        if ((ch >= 'a' && ch <= 'z') || (ch >= 'A' && ch <= 'Z'))
            { char base = (ch >= 'a') ? 'a' : 'A';
              *message = base + (ch - base + (mode * key)) %
                26; }
    }
}
```

```

int main() { char
    message[MAX_LENGTH];
    int key;

    // Input the message

    printf("Enter a message: ");
    fgets(message, sizeof(message),
    stdin); // Input the key

    printf("Enter key:

    "); scanf("%d",
    &key); // Encrypt
    the message

    encrypt_decrypt(message, key, 1);
    printf("Encrypted message: %s\n",
    message); // Decrypt the message

    encrypt_decrypt(message, key, -1);
    printf("Decrypted message: %s\n", message);

    return 0;
}

```

Input and Output:

The screenshot shows a C++ IDE with the following components:

- Code Editor:** Displays the source code for `caesar.cpp`. The code includes headers, defines `MAX_LENGTH` as 100, and implements the `encrypt_decrypt` function for both encryption (mode 1) and decryption (mode -1). The `main` function prompts the user for a message and a key, then performs the encryption and decryption steps.
- Output Window:** Shows the program's execution. It displays the prompts "Enter a message:" and "Enter key:", followed by the user input "Hello, world." and "3". The output shows the encrypted message "Khoor, zrung." and the decrypted message "Hello, world.".
- Compiler Output:** Shows the compilation results, indicating 0 errors and 0 warnings. The output file is `C:\Users\aiswarya\Desktop\caesar easy.exe` with a size of 129.3125 KiB and a compilation time of 0.27s.

Result: A C program to encrypt and decrypt a message using Caesar cipher along with the key is executed successfully.

Program 2:

Perform encryption and decryption of a message using Vigenère Cipher substitution technique.

Aim: To write a c program to perform encryption and decryption of a message using Vigenere Cipher substitution technique.

Algorithm:

1. Include necessary header files (<stdio.h> and <string.h>).
2. Declare character arrays for the original message (msg), encryption key (key), new key (newKey), encrypted message (encryptedMsg), and decrypted message (decryptedMsg).
3. Declare integer variables msgLen, keyLen, i, and j for storing lengths and loop indices.
4. Initialize msg and key with the original message and encryption key.
5. Calculate msgLen and keyLen using strlen.
6. Use a loop to generate the new key (newKey) based on the original key (key).
7. Initialize i and j to 0.
8. Use a loop to iterate over each character in the original message (msg).
9. Combine it with the corresponding character from the new key (newKey) using modular arithmetic.
10. Add a null terminator at the end of the decrypted message.

Program:

```
#include <stdio.h>
```

```
#include <string.h> #include <ctype.h> void vigenere(char *text,  
char *key, char *result, int encrypt) { int text_len = strlen(text);  
int key_len = strlen(key); int i;
```

```
    for (i = 0; i < text_len; i++) { if (!isalpha(text[i])) { result[i] =  
        text[i]; continue; } int offset = isupper(text[i]) ? 'A' : 'a'; int  
        key_index = i % key_len; int key_shift =  
        toupper(key[key_index]) - 'A'; if (!encrypt) key_shift = -  
        key_shift; result[i] = (text[i] - offset + key_shift + 26) % 26 +  
        offset;
```

```
}
```

```
result[i] = '\0';
```

```

} int
main() {
char
plaintext[
100],
ciphertext
[100],
decrypted
text[100],
keyword[1
00];
printf("Ent
er
plaintext:
");
fgets(plain
text,
sizeof(plai
ntext),
stdin);
printf("Ent
er
keyword:
");
fgets(key
word,
sizeof(key
word),
stdin);
plaintext[s
trcspn(plai
ntext,
"\n")] =
'\0';
keyword[s
trcspn(key
word,
"\n")] =
'\0';
vigenere(
plaintext,
keyword,
ciphertext
, 1);
printf("En
crypte
d text:
%s\n",

```

```

ciphertext
);
vigenere(c
iphertext,
keyword,
decrypted
text, 0);
printf("De
crypte
d text:
%s\n",
decrypted
text);
return 0;
}

```

Input and Output:

```

1 #include <stdio.h>
2 #include <string.h>
3 #include <ctype.h>
4 void vigenere(char *text, char *key, char *result, int encrypt) {
5     int text_len = strlen(text);
6     int key_len = strlen(key);
7     int i;
8     for (i = 0; i < text_len; i++) {
9         if (!isalpha(text[i])) {
10             result[i] = text[i];
11             continue;
12         }
13         int offset = isupper(text[i]) ? 'A' : 'a';
14         int key_index = i % key_len;
15         int key_shift = toupper(key[key_index]) - 'A';
16         if (!encrypt) key_shift = -key_shift;
17         result[i] = (text[i] - offset + key_shift + 26) % 26 + offset;
18     }
19     result[i] = '\0';
20 }
21 int main() {
22     char plaintext[100], ciphertext[100], decryptedtext[100], keyword[100];
23     printf("Enter plaintext: ");
24     fgets(plaintext, sizeof(plaintext), stdin);
25     printf("Enter keyword: ");
26     fgets(keyword, sizeof(keyword), stdin);
27     plaintext[strlen(plaintext) - 1] = '\0';
28     keyword[strlen(keyword) - 1] = '\0';
29     vigenere(plaintext, keyword, ciphertext, 1);
30     printf("Encrypted text: %s\n", ciphertext);
31     vigenere(ciphertext, keyword, decryptedtext, 0);
32     printf("Decrypted text: %s\n", decryptedtext);
33 }

```

```

C:\Users\jaishwarya\Downloads\4th ex (vigenere cipher).exe
Enter plaintext: WORLD
Enter keyword: NETWORK
Encrypted text: JSARR
Decrypted text: WORLD

-----
Process exited after 21.87 seconds with return value 0
Press any key to continue . . .

```

```

Compilation results...
- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\jaishwarya\Downloads\4th ex (vigenere cipher).exe
- Output Size: 130.853515625 KiB
- Compilation Time: 5.72s

```

Result: A c program to perform encryption and decryption of a message using Vigenere Cipher substitution technique is successfully executed.

Program 3:

Write a program for demonstration of encrypting and decrypting the messages by Playfair Substitution technique.

Aim: To write a c program to perform encryption and decryption of a message using Playfair substitution technique.

Algorithm:

1. Include necessary header files (<stdio.h> and <string.h>).
2. Declare character arrays for the original message (msg), encryption key (key), new key (newKey), encrypted message (encryptedMsg), and decrypted message (decryptedMsg).
3. Declare integer variables msgLen, keyLen, i, and j for storing lengths and loop indices.
4. Initialize msg and key with the original message and encryption key.
5. Calculate msgLen and keyLen using strlen.
6. Use a loop to generate the new key (newKey) based on the original key (key).
7. Initialize i and j to 0.
8. Use a loop to iterate over each character in the original message (msg).
9. Combine it with the corresponding character from the new key (newKey) using modular arithmetic.
10. Add a null terminator at the end of the decrypted message.

Program:

```
#include <stdio.h>

#include <stdlib.h>

#include <string.h> #define

SIZE 5 char

playfair[SIZE][SIZE];

void preparePlayfairKey(char *key) {

    char *ptr, *temp; int i, j,

    k, l, flag = 0; char

    alphabet[26] = {0};

    ptr = key;

    temp = key;
```

```

while (*ptr != '\0') { if (*ptr >= 'a'
    && *ptr <= 'z') { *ptr = *ptr -
    32;

    }
    ptr++;
    ;
}

while (*temp != '\0') {

    if (*temp == 'J') {
        *temp = 'I'; }

    if (alphabet[*temp - 65] == 0) {

        alphabet[*temp - 65] = 1; playfair[flag /
        SIZE][flag % SIZE] = *temp;

        flag+
        +; }
        temp++;

    }

// Fill the remaining characters
for (i = 0; i < 26; i++) {

    if (alphabet[i] == 0) {

        playfair[flag / SIZE][flag % SIZE] = (char) (i + 65);
        flag++;

    }

}

}

void constructPlayfairTable(char *key) {

    int i, j; preparePlayfairKey(key);

    printf("\nPlayfair Key Matrix:\n"); for
    (i = 0; i < SIZE; i++) {

        for (j = 0; j < SIZE; j++) {

            printf("%c ", playfair[i][j]);

        }

        printf("\n");

    }

}

```

```
}
```

```
void encryptPlayfair(char *text, char *key) {
```

```
    constructPlayfairTable(key);
```

```
    int i, j, a, b, m, n;
```

```
    char p1, p2;
```

```
    for (i = 0; i < strlen(text); i += 2) {
```

```
        p1 = text[i]; p2 = text[i + 1]; for (j  
        = 0; j < SIZE; j++) { for (m = 0; m <  
        SIZE; m++) { if (playfair[j][m] ==  
        p1) {
```

```
            a = j;
```

```
            b = m;
```

```
        } else if (playfair[j][m] == p2) { a =  
            j;
```

```
            b = m;
```

```
        }
```

```
    }
```

```
}
```

```
if (a == 0) {
```

```
    p1 = playfair[0][b]; p2 =  
    playfair[SIZE - 1][b];
```

```
} else if (b == 0) {
```

```
    p1 = playfair[a][0]; p2 =  
    playfair[a][SIZE - 1];
```

```
} else { p1 = playfair[a][b  
- 1]; p2 = playfair[a -  
1][b]; } printf("%c%c ",  
p1, p2);
```

```
}
```

```
printf("\n");
```

```
}
```

```
void decryptPlayfair(char *text, char *key) {
```

```
    constructPlayfairTable(key);
```

```
    int i, j, a, b, m, n;
```

```
    char p1, p2;
```



```

for (i = 0; i < strlen(text); i += 2) {

    p1 = text[i]; p2 = text[i + 1]; for (j
    = 0; j < SIZE; j++) { for (m = 0; m <
    SIZE; m++) { if (playfair[j][m] ==
    p1) {

        a = j;
        b = m;
    } else if (playfair[j][m] == p2) { a =
        j;

        b = m;

    }

    }

    } if (a == SIZE - 1) { p1 =
    playfair[SIZE - 1][b];

    p2 = playfair[0][b];

    } else if (b == SIZE - 1) { p1 =
    playfair[a][SIZE - 1]; p2 =
    playfair[a][0];

    } else { p1 = playfair[a][b
    + 1]; p2 = playfair[a +
    1][b];

    }

    printf("%c%c ", p1, p2);

}

printf("\n");
}

int main() { char
text[100], key[25]; int
choice;

printf("Enter the key (no spaces, all uppercase): "); scanf("%s",
key);

printf("Enter the text (uppercase): "); scanf("%s",
text);

printf("\n1. Encrypt\n2. Decrypt\nEnter your choice: "); scanf("%d",
&choice);

switch (choice) {

```

case 1:

```
printf("\nEncrypted Text: ");  
encryptPlayfair(text, key); break;
```

case 2:

```
printf("\nDecrypted Text: ");  
decryptPlayfair(text, key); break;
```

default:

```
printf("\nInvalid choice!\n");
```

```
}
```

```
return 0;
```

```
}
```

Input and Output:

The screenshot displays a C++ IDE with the source code for a Vigenere cipher program. The code includes functions for encryption and decryption using a Playfair key matrix. The main function prompts the user for a key and text, then processes the input based on the user's choice (1 for Encrypt, 2 for Decrypt). The output window shows the execution results, including the key matrix and the encrypted text.

```
hill cipher.cpp  play fair.cpp  pt2.cpp  hill cipher 2.cpp  4th ex (vigenere cipher).cpp  
101 p1 = text[i];  
102 p2 = text[i + 1];  
103 for (j = 0; j < SIZE; j++) {  
104     for (m = 0; m < SIZE; m++) {  
105         if (playfair[j][m] == p1) {  
106             a = j;  
107             b = m;  
108         } else if (playfair[j][m] == p2) {  
109             a = j;  
110             b = m;  
111         }  
112     }  
113 }  
114 if (a == SIZE - 1) {  
115     p1 = playfair[SIZE - 1][b];  
116     p2 = playfair[0][b];  
117 } else if (b == SIZE - 1) {  
118     p1 = playfair[a][SIZE - 1];  
119     p2 = playfair[a][0];  
120 } else {  
121     p1 = playfair[a][b + 1];  
122     p2 = playfair[a + 1][b];  
123 }  
124 printf("%c%c ", p1, p2);  
125 }  
126 printf("\n");  
127 }  
128  
129 int main() {  
130     char text[100], key[25];  
131     int choice;  
132 }  
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Result: A c program to perform encryption and decryption of a message using Play fair substitution technique is successfully executed.