Description

Subroutines:

MODULUS – Takes R0 and R1 and performs R0 mod R1 and the output is stored in R2.

XOR – Takes R6 and R1 and performs R6 XOR R1 and the output is stored in R3.

ASCIItoBinary – Store 3 digits in ASCIIBUFF and it will store the output binary value at x4500.

Start – Prompts the main menu and takes the input of X or D or E.

Test – Tests for the input if it is X or D or E and call the corresponding subroutines.

StoreIn – Stores the input of X or D or E at x6000 for later use.

Exit – Prompts exit message and halts.

tenChar – takes the 10 character string input to encrypt and store in edToSt

Vigenere – performs XOR on the string with Key, character by character and store in edToSt

Ceaser – performs the sum of string and key character by character and performs modulus with 128 and stores in MESSAGE.

reverseCeaser - performs the negative sum of string and key character by character and performs modulus with 128 and stores in MESSAGE.

Decryption – OUTPUT the main text if the key matches.

Assumptions:

- User inputs second Digit in the to be either 0 or non-numeric ascii from the keyboard.
- User inputs last 3 digits of the key to be less than or equal to 128.
- Although my algorithm supports the functionality of adding string of less than or equal to 10 when pressed <enter>, but to encrypt it is preferred to enter a 10 character input.

Questions:

Question (during your design): what do you echo when the user types in the key?

- It echoes the key. If automatically proceeds to the next subroutine when the user inputs the 5 character key.

Question: How would you change the program if instead of at most 10 messages, you want to allow strings of any length?

- I have implemented this in my algorithm. When you press <enter> after, lets say 4 characters you press <enter> it will store the ASCII value of 10 in the memory, it will simultaneously check for this that if the user has input a character <enter> it will terminate the loop and proceed to the next step.

Question: Figure out how decryption works.

- You reverse engineer the encryption method. In this case you will back trace the method. It will perform the inverse of the methods. In this case it will subtract the Key from the value of string and mod it will 128 in Ceaser Cipher, next it will XOR it with the key to get the original string. XOR properties allow us to do this.

Question: How do you decrypt a message that has been encrypted using this scheme?

- You redo/perform the XOR on it with the same key again and it will give you the original string back again.

Question: Why are we using modulo 128 ?Should we be using 128 or a different value if the characters have to be alpha numeric or special characters (i.e., they have to be visible characters from the keyboard –cannot be space, tab etc.).

- I believe we are using 128 because there are 128 ASCII characters on normal table that can be viewed. It is better to do this since it will give us a number in range to identify.

Question: How do you shift left in LC3? How do you right shift in LC3?

- You take BITWISE AND of two numbers to shift bit left.
- You divide the binary by 2. Since there is no division we repeatedly subtract in a loop to right shift in LC3.

Pseudo code

```
Start code at x3000
Prompt the start message
Start( )
        Prompt for input X or D or E
        Store input int register 1
Test( )
        Store the input at location charSt
        Call StoreIn subroutine to store the input
        If input = X
                Clear the MESSAGE
                Halt exit
        If input = E
                Go to Key Input EDprompt
                Go to tenChar to take 10 character input to encrypt
```

```
        If input = D
                Go to key input EDprompt
                Take MESSAGE string
                Decrypt
        Else
                Start( )
StoreIn( )
        Store the input at x6000
Exit ( )
        Prompt the exit
        Clear the MESSAGE
        HALT
EDprompt( )
        Prompt the input key criteria
        Take 5 character input key
        Use cloop to iterate 5 times
        Store it in KeySt
        If 5 character input
                exLoop
        RET
tenChar( )
        prompt 10 char input message
        take 10 character input
        loop it 10 times and iterate
        if cloop1 == 10 or <enter> is pressed
                exLoop1
        else
                take character input
                store it in space address
                cloop1++
Vigenere( )
        Take the second digit of Key stored in KeySt
        Store it in R1
        R4 is set to loop 10 times or when <enter> found in MESSAGE
        If xloop = 10 or <enter> found
                endString
        else
                iterate through MESSAGE
                take the char store it in R0
                call subroutine XOR
```

R0 XOR R1

Store it in MESSAGE

Xloop++

Ceaser( )

Take the last 3 digits of keySt

Store them in ACIIBUFF

Call subroutine ASCIItoBinary

Store the output binary at x4500 int

Read from MESSAGE

Use bloop to iterate through the MESSAGE

If bloop==10 or <enter> found

Go to next and store it in MESSAGE

Else

Call subroutine modulo

(keySt[ ] + int) modulo 128

Store it in MESSAGE

Modulo( )

Used from HW5

Takes modulus of 2 numbers

ASCIItoBinary( )

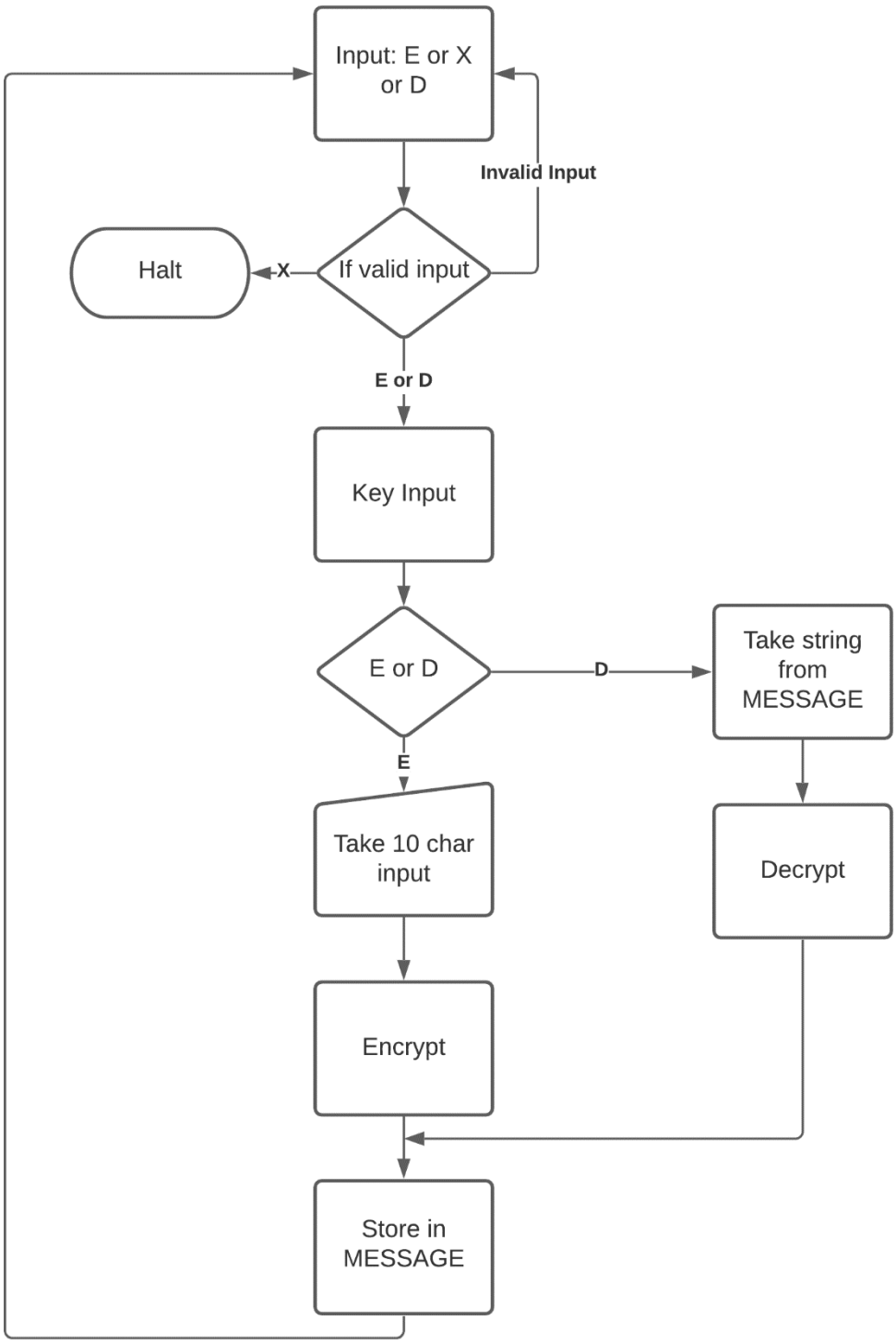
Taken from Textbook Calculator Example

Converts ascii to binary for addition of numbers

XOR( )

Taken from HW5

Takes XOR of 2 ascii values


Input: E or X or D
Invalid Input
If valid input
X
Halt
E or D
Key Input
E or D
D
Take string from MESSAGE
E
Take 10 char input
Decrypt
Encrypt
Store in MESSAGE