Exercise Problems - 9

String Manipulations

1. Write a program that takes two strings S1 and S2 as input and produces a new string S3 by replacing the first occurrence of substring S2 in S1 by the reverse of the string S2. For example, if S1 is "hellow, how are you?" and S2 is "ow", the resultant string S3 should be "hellwo, how are you?". If S2 is not a substring of S1, then S3 should be the same as S1.

2. The objective of this exercise is to device a method for encoding strings so that you can send secret messages to your friend. Suppose the input will be a long string $S1$ consisting of many words and sentences and the output of your program has to be an encoded string $S2$. To obtain $S2$, each occurrence of letter `a` in $S1$ is replaced by `d`, letter `b` is replaced by `e`, `c` is replaced by `f`, ..., `x` is replaced by `a`, `y` is replaced by `b` and `z` is replaced by `c`. While doing this conversion, convert all characters to lower case. For example, the string "Good Morning!" should be encoded to "jrrg pruqlqj!".

3. Write another program that your friend can execute so that when (s)he receives your encoded message $S2$ produced by the previous program, (s)he can recover the lower case version of the original message communicated by you. For example, if (s)he receives "jrrg pruqlqj!", (s)he should be able to recover the message as "good morning!". Will it be possible to recover the original message exactly the way you initially had it?

4. Now, we device a second way of encoding strings. Suppose the input string will be a long string $S1$ consisting of many words and sentences. You and your friend agree upon a table of letter substitutions. For example, you decide that `A` in S1 will be replaced by `X` in S2, `B` in S1 is replaced by `J` in S2 etc. Write program 1 for this method of encoding to produce the secret message. Write program 2 that your friend can execute to recover the message.

5. Now, we will make the encoding scheme a little bit more complicated. Here, you need to take each word of S1 one by one and to obtain the corresponding word of S2, the word of S1 cyclically rotated to left by one position and then, the encoding scheme developed in Question 1 is also applied. There is also an additional condition that if a letter in S1 is in capital letter, the corresponding letter in S2 is also a capital letter and if a letter in S1 is a small letter, the corresponding letter in S2 is also a small letter. For example, if the input string is "good Morning!", the output string should be "rrgj Ruqlqjp!". Write a program for doing this encoding.

6. Write a program that your friend can use to recover the original message that you communicated to him/her using the above program.