

Assignment #4

String Procedures

Develop the MASM Assembly source code required to solve the following problem.

Problem

Develop a MASM assembly program that contains four procedures for performing basic string operations (concatenation, repetition, to lowercase, and to uppercase) as defined below:

1. A procedure that creates a new null-terminated string by concatenating two null-terminated strings.
 - **Name:** strcat
 - **Explanation:** newString = strcat(string1, string2)
 - EDI points to the beginning of newString.
 - ESI points to the beginning of string1.
 - EDX points to the beginning of string2.
 - If string1 = "CS" and string2 = "2350" then newString = "CS2350"
 - **Receives:** ESI (first string address), EDX (second string address), and EDI (destination address).
 - **Returns:** EDI pointing to beginning of the new **null terminated** string.
 - **Requires:** Knowledge that EDI, ESI and EDX may point to the same memory address.
2. A procedure that creates a new null-terminated string by repeating a null-terminated string a given number of times.
 - **Name:** strep
 - **Explanation:** newString = strep(oldString, int32)
 - EDI points to the beginning of newString.
 - ESI points to the beginning of oldString.
 - EAX stores an int32.
 - If oldString = "CS2350" and EAX = 2 then newString = "CS2350CS2350"
 - **Receives:** ESI (input string address), EAX (32-bit integer), and EDI (destination string address).
 - **Returns:** EDI pointing to beginning of the new **null terminated** string.
 - **Requires:** Knowledge that ESI and EDI may point to the same memory address.
3. A procedure that creates a copy of a string in which all case-based characters in a null-terminated string have been lowercased.
 - **Name:** strlower
 - **Explanation:** newString = strlower(oldString)
 - EDI points to the beginning of newString.
 - ESI points to the beginning of oldString
 - If oldString = "CS2350" then newString = "cs2350"
 - **Receives:** ESI (input string address) and EDI (destination string address).
 - **Returns:** EDI pointing to beginning of the new **null terminated** string.
 - **Requires:** Knowledge that ESI and EDI may point to the same memory address.

4. A procedure that creates a copy of a string in which all case-based characters in a null-terminated string have been uppercased.
 - **Name:** strupper
 - **Explanation:** newString = strupper(oldString)
 - EDI points to the beginning of newString.
 - ESI points to the beginning of oldString
 - If oldString = "cs2350" then newString = "CS2350"
 - **Receives:** ESI (input string address) and EDI (destination string address).
 - **Returns:** EDI pointing to beginning of the new **null terminated** string.
 - **Requires:** Knowledge that ESI and EDI may point to the same memory address.

Assignment Guidelines

- 1) Your solution must print out your Name and R Number as the first line of output from your program. This will be considered part of your program's "Correctness".
 - a. Keep in mind the example input/output below does not show this line.
- 2) You may not make use of any assembly instructions or concepts we have not yet covered in class.
- 3) You may not make use of conditional control flow directives.
- 4) "Assignment_4.zip" is a zip archive containing the starting Visual Studio project. For those not using Visual Studio, the file "Assignment_4.asm" located within the zip archive can be used as a starting point instead. **Do not alter code within the main procedure.**

Solution Layout

Your MASM assembly source code should have the following elements in this order:

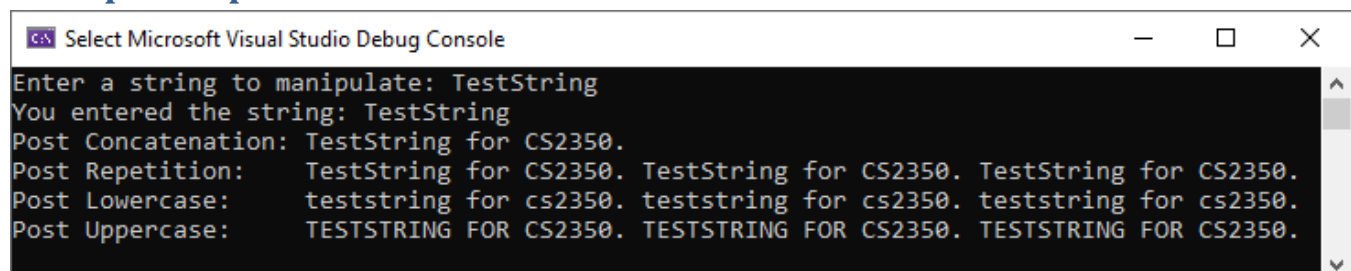
- 1) Your name, the date, and the assignment commented along the top.
- 2) A comment giving a brief description of the problem.
- 3) A comment laying out the algorithm/pseudocode/methodology you used to solve the problem.
- 4) Your commented MASM source code.

What to turn in to BlackBoard

A 'zip' file named "assignment_4.zip" that contains the following:

- Your .asm source code file
- A copy of your assembled executable

Example Output



```
CSX Select Microsoft Visual Studio Debug Console
Enter a string to manipulate: TestString
You entered the string: TestString
Post Concatenation: TestString for CS2350.
Post Repetition:    TestString for CS2350. TestString for CS2350. TestString for CS2350.
Post Lowercase:     teststring for cs2350. teststring for cs2350. teststring for cs2350.
Post Uppercase:      TESTSTRING FOR CS2350. TESTSTRING FOR CS2350. TESTSTRING FOR CS2350.
```