**EE277 Embedded System Design Course**

**LAB 2: Implement and Debug String Reverse Function in ARM Assembly Language and C**

# Implement a string reversal function in assembly and call it in C (30 points)

# Please answer the following questions based on your program debugging

1. Run the program until the opening brace in the main function is highlighted. Open the Registers window (Window->Show View->Registers). What are the values of the stack pointer (SP), LR, and the PC? (Insert screenshot of your editor.) **(3 points)**

Write answer in different text color

1. Open the Disassembly window (Window->Show View->Disassembly). Which instruction is highlighted, and what is its address? How does this address relate to the value of PC? (Insert screenshot of your disassembly window.) **(3 points)**

Write answer in different text color

1. Switch to “Step by Instruction” mode by clicking  in the Debug Control window. Step one machine instruction using the F5 key while the Disassembly window is selected. Which two registers have changed (they should be highlighted in the Registers window), and how do they relate to the instruction just executed? (Insert the screenshot.) **(3 points)**

Write answer in different text color

1. Look at the instructions in the Disassembly window. Do you see any instructions that are four bytes long? If so, what are the instructions? (Insert screenshot.) **(3 points)**

Write answer in different text color

1. Continue execution (using F5) until reaching the BL my\_strcpy instruction. What are the values of the SP, PC, and LR? (Insert screenshot.) **(3 points)**

Write answer in different text color

1. Watch the Variables window (Window->Show View-> Variables) to analyze the variables “a” and “b” (Insert screenshot). What is the value of “a”? What is the value of “b”? **(3 points)**

Write answer in different text color

1. Which registers hold the arguments to my\_strcpy, and what are their contents? (Insert screenshot.) **(3 points)**

Write answer in different text color

1. Use the Expressions window to watch the values in the address held in R0 and R1. Do the values match variables “a” and “b”? (Insert screenshot.) **(3 points)**

Write answer in different text color

1. Execute the BL instruction. What are the values of the SP, PC, and LR? What has changed and why? Does the PC value agree with what is shown in the Disassembly window? (Insert screenshot.) **(3 points)**

Write answer in different text color

1. Single step through the assembly code watching the “Expressions” window to see the string being copied character by character from a to b. Which register holds the character? **(3 points)**

Write answer in different text color

1. What are the values of the character, the src pointer, the dst pointer, the LR, and the PC when the code reaches the last instruction in the subroutine (BX lr)? (Insert screenshot.) **(3 points)**

Write answer in different text color

1. Execute the BX lr instruction. Now what is the value of the PC? **(3 points)**

Write answer in different text color

1. What is the relationship between the PC value and the previous LR value? Explain. **(3 points)**

Write answer in different text color

1. Now step through the str\_reverse subroutine and verify it works correctly, converting from “Hello world!” to “!dlrow olleH”. ((Insert final screenshot.) **(11 points)**

Write answer in different text color

1. Video Demonstration **(20 points)**