CISS360: Computer Systems and Assembly Language
Quiz q0501

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Open `main.tex` and enter answers (look for `answercode`, `answerbox`, `answerlong`). Turn the page for detailed instructions. To rebuild and view pdf, in bash shell execute `make`. To build a gzip-tar file, in bash shell execute `make s` and you'll get `submit.tar.gz`.

Q1. Write a MIPS program gets a string from the user (assume a maximum length of 100), store the string in the data segment, for each character in the data segment, if the character is a lowercase letter, it is replaced by its uppercase. Finally the program prints the resulting string in the data segment.

Test the following inputs: `"hello world", "hello World", "helLO 123 world"`

Answer:

```
        .text
        .globl main
main:
        # get input from the user
        li      $v0, 8   # syscall for reading string
        la      $a0, input_string
        li      $a1, 100 # maximum length for the string
        syscall

        # copy the input string to result_string
        la     $t0, input_string   # load address of input string in t0
        la     $t1, result_string   # load address of result string in t1

copy_loop:
        lb     $t2, 0($t0)   # load byte from input_String
        beq    $t2, $zero, print_result

        # check if the character is a lowercase letter and convert to uppercase
        li      $t3, 97      # ascii value for 'a'
        li      $t4, 122     # ascii value for 'z'
        blt     $t2, $t3, not_lowercase
        bgt     $t2, $t4, not_lowercase

        # converting
        sub     $t2, $t2, 32    # subtract 32 to convert to uppercase

not_lowercase:
        sb      $t2, 0($t1)    # store character in result_string
```

```
        addi    $t0, $t0, 1    # move to the next character in input_string
        addi    $t1, $t1, 1    # move to the next character in result_string
        j       copy_loop

print_result:
        li      $v0, 4
        la      $a0, result_string
        syscall

        li      $v0, 10
        syscall

        .data
input_string: .space 100   # allocate space for input string
result_string: .space 100  # allocate space for result string
```

Instructions

In `main.tex` change the email address in

```
\renewcommand\AUTHOR{jdoe5@cougars.ccis.edu}
```

to yours. In the bash shell, execute "`make`" to recompile `main.pdf`. Execute "`make v`" to view `main.pdf`. Execute "`make s`" to create `submit.tar.gz` for submission.

For each question, you'll see boxes for you to fill. You write your answers in `main.tex` file. For small boxes, if you see

```
1 + 1 = \answerbox{}.
```

you do this:

```
1 + 1 = \answerbox{2}.
```

`answerbox` will also appear in "true/false" and "multiple-choice" questions.

For longer answers that needs typewriter font, if you see

```
Write a C++ statement that declares an integer variable name x.
\begin{answercode}
\end{answercode}
```

you do this:

```
Write a C++ statement that declares an integer variable name x.
\begin{answercode}
int x;
\end{answercode}
```

`answercode` will appear in questions asking for code, algorithm, and program output. In this case, indentation and spacing is significant. For program output, I do look at spaces and newlines.

For long answers (not in typewriter font) if you see

```
What is the color of the sky?
\begin{answerlong}
\end{answerlong}
```

you can write

```
What is the color of the sky?
\begin{answerlong}
The color of the sky is blue.
\end{answerlong}
```

For students beyond 245: You can put LaTeX commands in `answerbox` and `answerlong`.

A question that begins with "T or F or M" requires you to identify whether it is true or false, or meaningless. "Meaningless" means something's wrong with the statement and it is not well-defined. Something like "$1+_2$" or "$\{2\}^{\{3\}}$" is not well-defined. Therefore a question such as "Is $42 = 1+_2$ true or false?" or "Is $42 = \{2\}^{\{3\}}$ true or false?" does not make sense. "Is $P(42) = \{42\}$ true or false?" is meaningless because $P(X)$ is only defined if X is a set. For "Is $1 + 2 + 3$ true or false?", "$1 + 2 + 3$" is well–defined but as a "numerical expression", not as a "proposition", i.e., it cannot be true or false. Therefore "Is $1 + 2 + 3$ true or false?" is also not a well-defined question.

When writing results of computations, make sure it's simplified. For instance write 2 instead of $1 + 1$. When you write down sets, if the answer is $\{1\}$, I do not want to see $\{1, 1\}$.

When writing a counterexample, always write the simplest.

Here are some examples (see `instructions.tex` for details):

1. T or F or M: $1 + 1 = 2$ ..... T
2. T or F or M: $1 + 1 = 3$ ..... F
3. T or F or M: $1+^2 =$ ..... M
4. $1 + 2 =$ 3
5. Write a C++ statement to declare an integer variable named `x`.

   ```
   int x;
   ```

6. Solve $x^2 - 1 = 0$.

   Since $x^2 - 1 = (x - 1)(x + 1)$, $x^2 - 1 = 0$ implies $(x - 1)(x + 1) = 0$. Therefore $x - 1 = 0$ or $x = -1$. Hence $x = 1$ or $x = -1$.

7. Which is true? C
   (A) $1 + 1 = 0$
   (B) $1 + 1 = 1$
   (C) $1 + 1 = 2$
   (D) $1 + 1 = 3$
   (E) $1 + 1 = 4$