CISS360: Computer Systems and Assembly Language
Quiz q0304

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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 that places the following integers in the data segment (start at the beginning, starting at 0x10010000): 1, 2, 3, 4, 5, 6, 7, 8. Create a label for the address where you have the integer 5 in the above list. Get an integer x from the user and replace the 6 in your data segment with the integer x. In your program, do NOT hardcode any address values; you must use labels.

Test 1
Console:

```
0
```

Data segment:

```
[0x10010000]  0x00000001  0x00000002  0x00000003  0x00000004
[0x10010010]  0x00000005  0x00000000  0x00000007  0x00000008
```

Test 2
Console:

```
9
```

Data segment:

```
[0x10010000]  0x00000001  0x00000002  0x00000003  0x00000004
[0x10010010]  0x00000005  0x00000009  0x00000007  0x00000008
```

Answer:

```
                .text
        .globl main

main:
                la          $t0, address_of_six    # load the address of the label into t0

        li     $v0, 5                               # get x from user
```

```
        syscall
        sw     $v0, 0($t0)                      # store it into &(t0)

                # replace the value 6 with x
                lw           $t1, 0($t0)         # x from user is in t1
                la           $t2, integers               # &integers 1-8
                li           $v0, 1
            lw           $a0, 20($t2)
                syscall

                li           $v0, 4
                la     $a0, NEWLINE
            syscall

                sw     $t1, 20($t2)         # replace 6 with x

                li           $v0, 1
            lw           $a0, 20($t2)
                syscall

        li     $v0, 10
        syscall

        .data
integers:
                .word 1 2 3 4 5 6 7 8
address_of_six:
                .word 0
NEWLINE:
                .asciiz "\n"
```

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) $1 + 1 = 4$