CISS360: Computer Systems and Assembly Language
Quiz q0403

Name: aoro1@cougars.ccis.edu Score:

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 continually gets integers from the user and stores the running sum in the data segment. The program terminates when the user enters 0. For instance if the user enters 1, 5, 2, 0 the program stores the following numbers in the data segment:

$$1, 6, 8$$

Note that of course the user can enter more than 4 integers.

Test 1

Console:

```
1
5
2
0
```

Data segment:

```
       DATA
[0x10000000]...[0x10010004]  0x00000000
[0x10010004]                 0x00000001  0x00000006  0x00000008
[0x10010010]...[0x10040000]  0x00000000
```

Answer:

```
        .text
        .globl main

main:   li     $s0, 0       # initialize sum = 0
        la     $s1, running_sums

loop:   li     $v0, 5
        syscall
        move   $t1, $v0     # store x in t1

        beq    $t1, $zero, terminate
        add    $s0, $t1, $s0    # s = s + x
        sw     $s0, 0($s1)
```

```
        addi    $s1, $s1, 4    # move to the next element in data segment
        j      loop
terminate:
        li     $v0, 10
        syscall

        .data
running_sums: .word 0
space:      .asciiz " "
```

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: $1 + 1 = 2$ .... $\boxed{\text{T}}$
2. T or F or M: $1 + 1 = 3$ .... $\boxed{\text{F}}$
3. T or F or M: $1+^2 =$ .... $\boxed{\text{M}}$
4. $1 + 2 = \boxed{3}$
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? .... $\boxed{\text{C}}$
   (A) $1 + 1 = 0$
   (B) $1 + 1 = 1$
   (C) $1 + 1 = 2$
   (D) $1 + 1 = 3$
   (E) $1 + 1 = 4$