THIS IS THE README FILE FOR LAB 4.

BY SUBMITTING THIS FILE TO CARMEN, I CERTIFY THAT I HAVE PERFORMED ALL

OF THE WORK TO DETERMINE THE ANSWERS FOUND WITHIN THIS FILE MYSELF WITH

NO ASSISTANCE FROM ANY PERSON OTHER THAN THE INSTRUCTOR OF THIS COURSE

OR ONE OF OUR UNDERGRADUATE GRADERS.

.file "lab4.s"

.globl main

.type main, @function

.text

main:

pushq %rbp #stack housekeeping

movq %rsp, %rbp

Label1:

#as you go through this program note the changes to %rip

movq $0x8877665544332211, %rax # the value of %rax is:

movb $-1, %al # the value of %rax is:

movw $-1, %ax # the value of %rax is:

movl $-1, %eax # the value of %rax is:

movq $-1, %rax # the value of %rax is:

movl $-1, %eax # the value of %rax is:

cltq # the value of %rax is:

movl $0x7fffffff, %eax # the value of %rax is:

cltq # the value of %rax is:

movq $0x8877665544332211, %rax # the value of %rax is:

# the value of %rdx \*before\* movb $0xAA, %dl executes is:

movb $0xAA, %dl # the value of %rdx is:

movb %dl, %al # the value of %rax is:

movsbw %dl, %ax # the value of %rax is:

movzbw %dl, %ax # the value of %rax is:

movq $0x8877665544332211, %rax # the value of %rax is:

movb %dl, %al # the value of %rax is:

movsbl %dl, %eax # the value of %rax is:

movzbl %dl, %eax # the value of %rax is:

movq $0x8877665544332211, %rax # the value of %rax is:

movb %dl, %al # the value of %rax is:

movsbq %dl, %rax # the value of %rax is:

movzbq %dl, %rax # the value of %rax is:

movq $0x8877665544332211, %rax # the value of %rax is:

# the value of %rdx \*before\* movb $0x55, %dl executes is:

movb $0x55, %dl # the value of %rdx is:

movb %dl, %al # the value of %rax is:

movsbw %dl, %ax # the value of %rax is:

movzbw %dl, %ax # the value of %rax is:

movq $0x8877665544332211, %rax # the value of %rax is:

movb %dl, %al # the value of %rax is:

movsbl %dl, %eax # the value of %rax is:

movzbl %dl, %eax # the value of %rax is:

movq $0x8877665544332211, %rax # the value of %rax is:

movb %dl, %al # the value of %rax is:

movsbq %dl, %rax # the value of %rax is:

movzbq %dl, %rax # the value of %rax is:

# movq $0x8877665544332211, %rax # the value of %rax is:

# pushb %al

# movq $0, %rax

# popb %al # the value of %rax is:

movq $0x8877665544332211, %rax # the value of %rax is: the value of %rsp is:

pushw %ax # the value of %rsp is:

# the difference between the two values of %rsp is:

movq $0, %rax # the value of %rax is:

popw %ax # the value of %rax is:

#How did the value of %rsp change?

movq $0x8877665544332211, %rax # the value of %rax is: the value of %rsp is:

pushw %ax # the value of %rsp is:

# the difference between the two values of %rsp is:

movq $-1, %rax # the value of %rax is:

popw %ax # the value of %rax is:

# How did the value of %rsp change?

# movq $0x8877665544332211, %rax # the value of %rax is:

# pushl %eax

# movq $0, %rax

# popl %eax # the value of %rax is:

movq $0x8877665544332211, %rax # the value of %rax is: the value of %rsp is:

pushq %rax # the value of %rsp is:

# the difference between the two values of %rsp is:

movq $0, %rax # the value of %rax is:

popq %rax # the value of %rax is:

# How did the value of %rsp change?

# what eflags are set?

movq $0x500, %rax # the value of %rax is:

movq $0x123, %rcx # the value of %rcx is:

subq %rax, %rcx # the value of %rax is:

# the value of %rcx is:

# what eflags are set?

movq $0x500, %rax # the value of %rax is:

movq $0x123, %rcx # the value of %rcx is:

subq %rcx, %rax # the value of %rax is:

# what eflags are set?

movq $0x500, %rax # the value of %rax is:

movq $0x500, %rcx # the value of %rcx is:

subq %rcx, %rax # the value of %rax is:

# what eflags are set?

movb $0xff, %al # the value of %rax is:

incb %al # the value of %rax is: what eflags are set?

movq $-1, %rax # the value of %rax is:

incq %rax # the value of %rax is: what eflags are set?

movq $0x8877665544332211, %rax # the value of %rax is: the value of %rsp is:

movq $0x8877665544332211, %rcx # the value of %rax is: what eflags are set?

addq %rcx, %rax # the value of %rax is: what eflags are set?

leave

ret

.size main, .-main

1. Write a paragraph that describes what you observed happen to the value in register %rax as you watched movX (where X is ‘q’, ‘l’, ‘w’, and ‘b’) instructions executed. Describe what data changes occur (and, perhaps, what data changes you expected to occur that didn’t). Make a point to address what happens when moving less than 8 bytes of data to a register.
2. What did you observe happens when the cltq instruction is executed? Did it matter what value is in %eax? Does cltq have any operands?
3. Write a paragraph that describes what you saw with respect to what happens as you use the movsXX and movzXX instructions with different sizes of registers. Describe what data changes occur (and, perhaps, what data changes you expected to occur that didn’t).
4. Write a paragraph that describes what you observed as you watched different push/pop instructions execute. What values were actually put on the stack? How did the value in %rsp change? Did you figure out how to print values from the stack?
5. What did you observe happened to the condition code values as instructions that process within the ALU executed? What instructions caused changes? Were the changes what you expected? Why or why not?
6. What did you observe happening to the value in register %rip over the course the program? Did it always change by the same amount as each instruction executed?
7. What did you observe when you took the comments away from the two different instruction sets and tried to reassemble the program? Include answers to the questions in item L.