CMPSC 311 Fall 2019

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Homework 6 Disassemble x86-64 Code

Due Tuesday 10/1/2019 11pm

This is a written assignment. You will print out this document, fill it in, scan/take a picture of the pages and convert it to **hw6.pdf** and then upload to gradescope. You must fill in the blanks where it is indicated for gradescope to understand your answer. Please make sure you uploaded hw6.pdf has **legible writing** for graders to read.

Textbook homework problem 3.60

Consider the following assembly code:

```
        long loop(long x, int n)
        x in %rdi, n in %esi
1       loop:
2         movl  %esi, %ecx
3         movl  $1, %edx
4         movl  $0, %eax
5         jmp   .L2
6       .L3:
7         movq  %rdi, %r8
8         andq  %rdx, %r8
9         orq   %r8, %rax
10        salq  %cl, %rdx
11      .L2:
12        testq %rdx, %rdx
13        jne   .L3
14        rep; ret
```

The preceding code was generated by compiling C code that had the following overall form:

```
long loop(long x, long n)
```

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```
{
    long result = 0 ;
    long mask;
    for (mask = 1 ; mask != 0 ; mask = mask << n ) {
        result |= (x & mask) ;
    }
    return result;
}
```

Your task is to fill in the missing parts of the C code to get a program equivalent to the generated assembly code. Recall that the result of the function is returned in register %rax. You will find it helpful to examine the assembly code before, during and after the loop to form a consistent mapping between the registers and the program variables.

A. Which registers hold program values x, n, result, and mask?

Variable	x	n	result	mask
Register	%rdi	%esi	%rax	%rdx

B. What are the initial values of result and mask?

variables	result	mask
initial value	0	1