Fall ’16 CIS 314 Assignment 4 – 100/100 points – Due Wednesday, 10/26, 11:59 PM

Please submit individual source files for coding exercises (see naming conventions below) and a single solution document for non-coding exercises (.txt or .pdf only). Your code and answers need to be documented to the point that the graders can understand your thought process. Full credit will not be awarded if sufficient work is not shown.

1. [25] B&O’H 3.56.

(See book for code)

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 %eax. 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?

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

C. What is the test condition for mask?

D. How does mask get updated?

E. How does result get updated?

F. Fill in all the missing parts of the C code.

Write your answers in your solutions document. Hint: this problem is very similar to practice problem 3.12 (solution at back of chapter).

2. [25] B&O’H 3.62.

(See book for code)

A. What is the value of M?

B. What registers hold program values i and j ?

C. Write a C code version of transpose that makes use of the optimizations that occur in this loop. Use the parameter M in your code rather than numeric constants.

Write your answers for parts A-B in your solutions document. For part C, Also write a main() function to test your procedure. Use typedefs and #defines to define *Marray_t* and *M* appropriately. Name your source file 3.62C.c. Hint: use pointer arithmetic to avoid the A[i][j] and A[j][i] lookups.

3. [25] B&O'H 3.69.

(See book for code)

A. Generate a C version of the function, using a while loop. B. Explain in English what this function computes.

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For part A, Also write a main() function to test your function. Write your answer for part B in the comments of your code. Name your source file 3.69A.c.

4. [25] Write x86 code equivalent to the following C code:

```
int f(int x) {

    return 16*x;

}

int g(int a, int b) {

    return f(a) + f(b);

}
```

Follow the register usage conventions outlined in B&O'H section 3.7.3. Write your code in your solutions document.

Zip the source files and solution document (if applicable), name the .zip file <Your Full Name>Assignment4.zip (e.g., EricWillsAssignment4.zip), and upload the .zip file to Canvas (see Assignments section for submission link).