HW 3 – Floyd-Hoare Logic

CS 477 – Spring 2013

Revision 1.3

Assigned February 16, 2013
Due February 22, 2013, 11:59 pm
Extension 48 hours (20% penalty)

1 Change Log

1.3 The postcondition for Problem 1 was changed from $\{z > x \wedge z > y\}$ to $\{z \geq x \wedge z > y\}$

1.2 The guard in the while-loop in Problem 2 was changed to $\geq$ instead of $\leq$.

1.1 Changed the title to match the contents.

1.0 Initial Release.

2 Objectives and Background

The purpose of this HW is to test your understanding of

- proving correctness of a program using Floyd-Hoare Logic

Another purpose of HWs is to provide you with experience answering non-programming written questions of the kind you may experience on the midterm and final.

3 Turn-In Procedure

The pdf for this assignment (`hw3.pdf`) should be found in the `mps/hw3/` subdirectory of your svn directory for this course. Your solution should be put in that same directory. Using your favorite tool(s), you should put your solution in a file named `hw3-sol.pdf`. If you have problems generating a pdf, please seek help from the course staff. Your answers to the following questions are to be submitted electronically from within `mps/hw3/` subdirectory by committing the file as follows:

```
svn add hw3-sol.pdf
svn commit -m "Turning in hw3"
```

4 Problems

Give a proof in Floyd-Hoare Logic of each of the following Hoare triples. You should state clearly which rue you are using at each step.

1. (10pts) $\{x > 1 \wedge y > 0\}$ $if\ y > 1\ then\ z := x * y\ else\ z := x/y$ $\{z \geq x \wedge z > y\}$
   In this problem, the variables range over real numbers.

2. (15 pts) $\{n > 0\}$ $i := n;\ j := 0;\ while\ i \geq 0\ do\ (j := j + i; i := i - 1)$ $\{j = (n \times (n + 1))/2\}$
   In this problem, the variables range over the integers.

5 Extra Credit

3. (5 pts) $\{a > 0 \wedge b > 0\}$
   $m := a;$
   $n := b;$
   $while\ n\ \neq\ m\ do(if\ m < n\ then\ n := n - m\ else\ m := m - n)$
   $a\ mod\ m = 0 \wedge b\ mod\ m = 0$

   In this problem, the variables range over the integers.